



## **The Partisan Paradox and the U.S. Tariff, 1877-1934**

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# The partisan paradox and the U.S. tariff, 1877–1934

David Epstein and Sharyn O'Halloran

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Most explanations of U.S. trade policy emphasize either the effect of domestic political pressures seeking to obtain product-specific benefits or the role of trade policy in securing international competitive advantage.<sup>1</sup> These explanations, however, assume that identifying and pursuing political interests is straightforward, without considering the political institutions that shape those interests and translate them into public policy. This article contends that U.S. trade policy during the critical years between 1877 and 1934 responded both to the interests that lobbied government for favorable policies and the political institutions, namely political parties, that mediated these demands. It thus constructs a view of trade policy that is compatible with yet broader than purely interest-based approaches.

Tariff policy has long been seen as the quintessential example of distributive politics. The 1930 Smoot–Hawley Tariff Act, for example, contained over 3,221 items, as each member of Congress introduced product-specific measures to protect his or her constituents from foreign competition. The end result was the highest tariff rates in the twentieth century, igniting a round of beggar-thy-neighbor policies and, according to some accounts, deepening the Great Depression.<sup>2</sup>

Such distributive policies often are described as either the result of interest group politics or party dynamics. On one hand, a large literature predicts that reelection-minded legislators cater to special interests when enacting distributive policies. According to this view, legislative outcomes are characterized by universalism and logrolling, in which each member receives some benefit for his

Thanks to David Brady, Jim Granato, Gary Jacobson, Roger Noll, Douglas Rivers, and Charles Stewart for comments and suggestions on an earlier version of this paper. All remaining errors and omissions are the authors' alone.

1. On domestic political pressures, see Schattschneider 1935; Pincus 1975; 1977; Cassing, McKeown, and Ochs 1986; and W. Hansen 1990. On trade policy and international competitive advantage, see Lake 1988; and Rogowski 1987.

2. For a discussion of the effects of the 1930 tariff act, see Pastor 1980, 79.

or her district in exchange for supporting other members' projects.<sup>3</sup> On the other hand, many scholars also have emphasized the importance of stable partisan coalitions in shaping policy. These studies argue that despite the supposed decline in party cohesion over the past quarter-century, party affiliation continues to be the best single predictor of legislative behavior and that intraparty coalitions determine distributive policies.<sup>4</sup>

These two views are not necessarily competing. Political preferences are not immediately translated into policy; outcomes also reflect the method by which these interests are aggregated. Thus, understanding political outcomes requires an analysis of both preferences and institutions. In particular, we argue that strong parties can have an independent effect on policy above that explained by interest group demands alone.<sup>5</sup> More precisely, when strong parties take divergent positions on an issue, changes in the preferences of the median voter that result in a new party taking office will lead to changes in policy outcomes above and beyond those explained by changes in the median voter alone. Furthermore, parties have electoral bases built on specific groups and constituencies. These coalitions will aggregate interests in different ways, implying that policy will be biased towards the coalitional base of the party in power.

To test these propositions, this essay examines U.S. tariff policy in the post-Reconstruction-to-1934 era. In this period, the Democrats consistently advocated free trade while the Republicans were protectionist, and each shift in partisan control of national government was followed by a revision of the tariff schedule. Thus, even though the median of all voters determined which party would hold office, tariff rates may not have reflected the interests of the median voter alone.

The next section of this article reviews the literature on tariff policy formation. We then provide a model of tariff formation that incorporates economic pressures and political parties and tests its implications using time series econometric analysis. Our results suggest that tariff policy from 1877 to 1934 responded both to changes in aggregate economic conditions and to changes in unified partisan control of national government. The last section summarizes our conclusions, and an appendix contains technical notes on the data and estimation techniques.

3. For efforts to explain the scope and nature of these legislative logrolls, see, for example, Fenno 1973; Mayhew 1974; Weingast and Marshall 1988; and Baron 1991.

4. On the importance of stable party coalitions even in the face of declining party cohesion, see Brady, Cooper, and Hurley 1979; and Collie and Brady 1985. On intraparty coalitions, see, for instance, Brady 1973; Ferejohn 1986; Hurley and Wilson 1989; Rohde 1991; and Cox and McCubbins 1993.

5. In the time period studied here, parties are the single most important political institution aggregating preferences over the tariff. After 1934, delegation of authority to the executive also had a significant impact on outcomes. See Goldstein 1988; Destler 1992; and O'Halloran 1994 for a discussion of these issues.

## The partisan paradox

Did partisan politics influence the level of protectionism in the late nineteenth and early twentieth centuries? Published studies of this topic leave us with a paradox. Historians easily noticed the two parties' opposing stands on the tariff and the seeming correlation between party turnover and tariff changes; yet careful quantitative studies have found no independent partisan influence. On the pro-party side of the debate, many historical accounts of early tariff legislation note the importance of party affiliation in postbellum politics.<sup>6</sup> Edward Stanwood argues, for example, that "all tariff acts have been to a large degree political measures, chiefly designed by their promoters to further the ends of party."<sup>7</sup> Historians and political scientists agree that during this period, "the Democrats favored free trade, or tariffs for revenue only; the Republicans favored a protective tariff," and that the platforms of the parties were consistent with this view.<sup>8</sup>

Indeed, tariffs changed regularly in roller-coaster fashion when a new party entered office. High tariffs were followed by low tariffs, which were succeeded by high tariffs. The tariff acts of 1883, 1890, 1894, 1897, 1912, 1922, and 1930 were passed close on the heels of federal elections, with each peak in the tariff rate associated with Republican control of government and each trough with Democratic control.<sup>9</sup> Table 1 lists each of these acts and the partisan affiliation of both houses of Congress and of the President at the time of their enactment.

It would thus seem irrefutable that partisan politics affected the tariff in the period from 1877 to 1934. Yet oddly enough, most quantitative studies conclude that political parties did not have a significant impact on the tariff. For instance, Bennett Baack and Edward Ray find little evidence that political parties had any effect on the tariff during the postbellum period and argue that production and market characteristics were the major factors.<sup>10</sup> Similarly, John Conybeare argues that once constituency interests are taken into account, party affiliation has no effect on changes in labor-weighted tariff levels across congressional districts.<sup>11</sup> Barry Eichengreen asserts that the Smoot–Hawley tariff act resulted more from an unusual coalition of interest groups than from party politics.<sup>12</sup> And Timothy McKeown omits party entirely from his analysis of tariff levels from 1857 to 1914.<sup>13</sup>

Indeed, the fact that the tariff changed every time a new party took office may simply reflect changing public preferences over levels of protection.

6. Classic accounts include Thompson 1888; Stanwood 1903; and Taussig 1931.

7. Stanwood 1903, 389.

8. The quotation is drawn from Brady 1988, 55. On party platforms, see Porter 1924.

9. Stewart 1991.

10. Baack and Ray 1983.

11. Conybeare 1991.

12. Eichengreen 1989.

13. McKeown 1984.

TABLE 1. *Trade legislation and partisan control, 1877–1934*

<i>Trade legislation</i>	<i>President</i>	<i>Senate</i>	<i>House</i>
1883 Tariff Act	Republican	Republican	Democrat
1890 McKinley Tariff Act	Republican	Republican	Republican
1894 Wilson–Gorman Tariff Act	Democrat	Democrat	Democrat
1897 Dingley Tariff Act	Republican	Republican	Republican
1909 Payne–Aldrich Tariff Act	Republican	Republican	Republican
1913 Underwood Tariff Act	Democrat	Democrat	Democrat
1921 Emergency Tariff Act	Republican	Republican	Republican
1922 Fordney–McCumber Tariff Act	Republican	Republican	Republican
1930 Smoot–Hawley Tariff Act	Republican	Republican	Republican
1934 Reciprocal Trade Agreements Act	Democrat	Democrat	Democrat

According to this scenario, when voters wanted lower tariffs, they would elect the Democrats, and when they preferred higher tariffs, the Republicans were voted in. The party elected would then implement the policy preferences of the median voter, so partisan control of government had no independent effects on the tariff. At the very least, this line of reasoning indicates that the econometric findings cited above cannot be dismissed out of hand.

However, there is a potential flaw in the analysis. The data used in most of these studies are cross-sectional; consequently, they are unable to test systematically the impact of party on tariff levels over time. The question of why some industries or regions receive more protection than others at a given point in time is different from the question of what impact changes in partisan control of government have on tariff rates from one period to the next. Thus analysis of tariff rates from year to year, or time series analysis, is needed to test adequately the impact of party on protectionism.

One comprehensive time series study of the tariff is by Stephen Magee, William Brock, and Leslie Young, who examine U.S. trade policy from 1900 to 1988.<sup>14</sup> They expand the interest group model by postulating that economic pressures are channeled through the party of the President. Their model assumes that Democrats represent labor, which is used more intensively in import-competing industries that benefit from protective tariffs. Republicans represent capital, which is used more intensively in export-oriented industries that favor free trade. Thus, Republican Presidents should enact lower tariffs than their Democratic counterparts.

14. Magee, Brock, and Young 1989.

According to Magee, Brock, and Young's analysis, political parties cater solely to the interests of lobbying groups, with one party representing protectionism and the other free trade. Thus, political parties serve as a conduit for interest group demands and have no independent effect on policy: lobbying interests are monolithic and the parties serve one group consistently over time. While Magee, Brock, and Young's analysis is an important first step toward placing parties in the tariff debate, their treatment of the political process does not explicitly consider the possibility of coalition building within parties or fluctuations in these coalitions from election to election.

Two recent books also analyze the behavior of tariff rates over time. Beth Simmons examines tariff policy using a cross-sectional time series data set that comprises nineteen different countries between 1924 and 1938.<sup>15</sup> Simmons concludes that left-wing governments reduced *changes* in tariff levels during this period, although she does not test the more direct hypothesis that these governments were also associated with lower tariff *levels* as well. Daniel Verdier investigates the determinants of U.S. trade policy from 1887 to 1913. He concludes that in this period partisan effects in fact dominated business cycle effects, implying that economic interests had no independent impact on protectionism.<sup>16</sup> As discussed below, we find that both partisan and business cycle effects were significant in the period studied. Also, neither Simmons nor Verdier extends the analysis to the coalitional basis of partisan support for higher or lower tariff rates.

### **A model of partisan competition over the tariff**

We now present a model of the tariff-setting process in which both constituent preferences and political parties combine to shape policy outcomes. From our model, we derive the equations to be tested in the empirical section that follows and interpret the possible results from these tests. Our approach is a variant of the "endogenous tariff formation" models now common in the economics literature, of which the Magee, Brock, and Young volume is one example. These models treat tariff formation as a noncooperative game among competing interests, which are endowed with productive capacity and interact in the economic market.<sup>17</sup> The role of political institutions in these models is to provide a means for the preferences of the median voter to be translated directly into policy.

In our model, on the other hand, institutions play a stronger role in aggregating preferences. Voters elect one of two parties to office. Once in office, parties implement a policy that is some combination of their stated

15. Simmons 1994.

16. Verdier 1994.

17. See Findlay and Wellisz 1982; and Mayer 1984. For an overview of this literature, see Nelson 1988.

platform and the median voter's preferred policy. Thus, the ideal point of the median voter will not necessarily be the same as the final policy enacted.

The model is constructed as follows. Assume a unidimensional policy space, which represents the degree of tariff protection in the economy. Voters have single-peaked preferences on this dimension, with the median voter's ideal point labeled  $X_M$ . Further, there are two parties,  $D$  and  $R$ , which adopt platforms  $X_D$  and  $X_R$ ; assume without loss of generality that  $X_D \leq X_R$ .<sup>18</sup>

We assume that the parties' platforms are different from the ideal point of the median voter. Although in the standard Downsian framework platforms do collapse to the median voter, recent theoretical work has shown that when voting is costly, when candidates have policy preferences, or when voters are imperfectly informed about government policy and interest groups with extreme preferences make campaign contributions, platforms will separate from the median in equilibrium.<sup>19</sup> We believe that the latter argument, derived from the fact that interest groups are usually more informed than the public at large, is the most applicable to tariff policy in the period studied. Given this theoretical basis, our conclusions would be valid as long as the interest group coalitions supporting protection and free trade were stable over time.

For the period under study, this condition did indeed hold. The coalitional support for the political parties remained remarkably stable up until the onset of the Great Depression and the passage of the 1934 Reciprocal Trade Agreements Act. For instance, David Brady and David Epstein show that the sectional support of the two parties reflected deep differences in constituency.<sup>20</sup> Measures of industrialization—population density per square mile and the value added by manufactures—explain over 65 percent of the total variance of House and Senate electoral success from 1886 to 1916; urban districts largely favored Republican candidates, while rural districts supported Democrats.

To capture this dynamic between constituency, parties, and final outcomes, we define the order of play as follows. First, an election is held in which voters cast their ballots for one of the two parties. The party that wins the election takes office. It then implements a policy that is a combination of its stated platform and the preferred policy of the median voter, according to the equation:

$$p = \lambda \cdot X_j + (1 - \lambda) \cdot X_M, \quad (1)$$

where  $j \in \{D, R\}$  is the party that won the election.<sup>21</sup> Thus if  $\lambda = 1$ , then the policy enacted is the platform of the winning party, while if  $\lambda = 0$ , then policy is

18. The classic references on single-peaked utility functions are Downs 1957; and Black 1958.

19. On the costliness of voting, see Feddersen 1992; on the effects of candidates' preferences, see Besley and Coate 1994; and on the effects of imperfect voter information combined with the influence of extreme preferences, see Baron 1994. For a good summary of the various competing explanations of why parties take divergent policy positions, see Alesina and Rosenthal 1994.

20. Brady and Epstein 1995.

21. This functional form is similar to that used in Fiorina 1992 to represent the relative strengths of Congress and the President in setting policy. Our model could be extended to include values of both  $\lambda_D$  and  $\lambda_R$ , indicating that the parties respond differently to changes in public preferences.

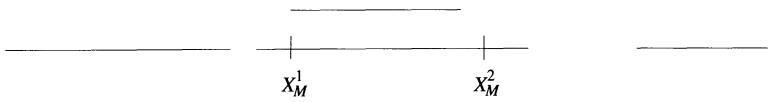


FIGURE 1. Median voter model, where  $X_M^1$  and  $X_M^2$  represent the ideal point of the median voter in periods 1 and 2, respectively

the preferred outcome of the median voter. Intermediate values of  $\lambda$  would signify that policy is influenced both by the stated platform of the winning party and by interests lobbying government.

The equilibrium to a one-shot version of this game is easy to calculate. Working backwards, voters know what final policies will be implemented, so as long as they do not use weakly dominated strategies they will rationally vote for the party whose platform is closest to their ideal point.<sup>22</sup> Thus the party that wins is the one whose platform is closest to  $X_M$ .

Now consider what happens if the game is iterated over several periods. Assume that from period to period all parameters remain constant except for voters' preferences. These preferences are affected by external economic conditions, so that the median voter's ideal point changes from  $X_M^t$  to  $X_M^{t+1}$ . This shift in preferences in turn may result in a new party's being elected to office.

The question is, what change in policy will accompany this change in voters' preferences? For example, assume that  $\lambda = 0$  in equation (1), and that there is a change in constituency preferences represented by a change in the median voter's ideal point from  $X_M^1$  to  $X_M^2$ , as shown in Figure 1. Note that the identity of the median voter may, in general, change from period to period, as the individual-specific shocks may re-order the voters' ideal points. Consequently, a purely preference-based voting model predicts that policy shifts from  $X_M^1$  to  $X_M^2$ , as shown. In this case, outcomes simply respond to the preferences of the median voter, and parties play no real role in setting policy.

However, if the parties take distinct positions on an issue and enact these platforms when elected to office ( $\lambda = 1$ ), then certainly which party controls government will have an important influence on policy, as in Figure 2. Again, suppose there is a change in voter preferences, shifting the median voter's ideal point from  $X_M^1$  to  $X_M^2$ . But notice that this change in the median voter's ideal policy crosses the midpoint between the two parties,  $(P_D + P_R)/2$ . Accordingly, new majority party is elected, and policy outcomes change from the platform of the first party,  $P_D$ , to the platform of the second,  $P_R$ . Formally, if  $X_M^1$  moves a distance greater than  $[(P_D + P_R)/2 - X_M^1]$ , then policy in period 2 is  $P_R$ ; otherwise, it is  $P_D$ . This policy change is more dramatic than that in Figure 1, even though the same change in preferences motivated it.

22. This is derived from the fact that if  $|X_i - X_D| < |X_i - X_R|$ , in which case voter  $i$  prefers party  $D$ , then also  $|X_i - (\lambda X_i + (1 - \lambda)X_D)| < |X_i - (\lambda X_i + (1 - \lambda)X_R)|$ , so that the voter also prefers the policy which party  $D$  would implement once elected to office.



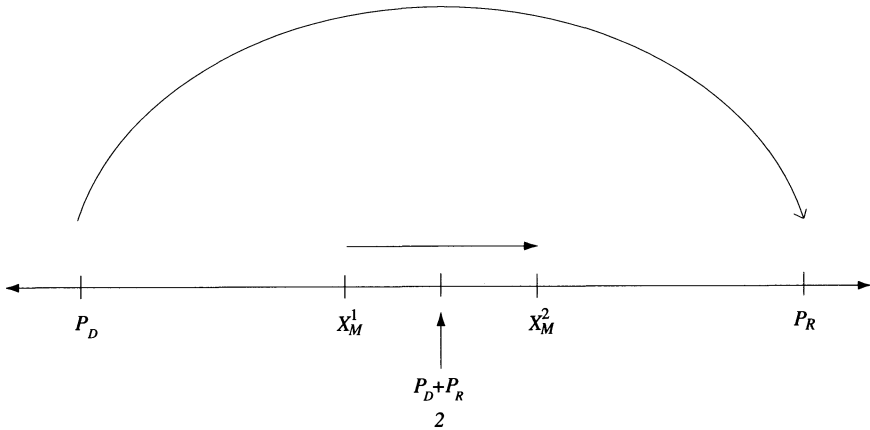


FIGURE 2. Party model, where  $P_D$  and  $P_R$  represent the platforms of two political parties and  $X_M^1$  and  $X_M^2$  represent the ideal point of the median voter

We now use our theoretical model to derive the empirical equations to be estimated. Consistent with the possibility that both constituent interests (*PREFS*) and partisan control of government (*PARTY*) affect tariffs (*TARIFF*), we rewrite equation (1) as:

$$TARIFF_t = \lambda PARTY_t + (1 - \lambda) PREFS_t + \epsilon_t, \quad (2)$$

where  $\epsilon_t$  is a random disturbance term in time  $t$ . Again,  $\lambda$  measures the weight given to party platforms in determining policy outcomes, and  $(1 - \lambda)$  is the weight on voters' preferences.

We measure party by dummy variables for partisan control of national government:

$$PARTY_t = \gamma_R REP_t + \gamma_D DEM_t, \quad (3)$$

where  $\gamma_R$  and  $\gamma_D$  are the policies embodied in the Republican and Democratic platforms, respectively. We also assume that preferences are captured by a series of economic variables:

$$PREFS_t = \alpha + \delta' x_t + \mu_t. \quad (4)$$

Here, the vector  $x$  includes the economic variables which are proxies for constituent preferences,  $\delta$  is a vector of coefficients giving the relative weights of these variables, and the  $\mu_t$  are period-specific disturbances. Combining equations (2), (3), and (4) then, the equation to be tested is

$$TARIFF_t = \lambda(\gamma_R REP_t + \gamma_D DEM_t) + (1 - \lambda)(\alpha + \delta' x_t + \mu_t) + \epsilon_t.$$

TABLE 2. *Parameter values and impact on policy*

<i>Value of <math>\lambda</math></i>	<i>Parameter values</i>	<i>Interpretation</i>
$\lambda = 0$	$\beta_1^* = 0, \beta_2^* = 0, \beta_3^* \neq 0$	Policy responds only to changes in partisan control of government
$\lambda = 1$	$\beta_1^* \neq 0, \beta_2^* \neq 0, \beta_3^* = 0$	Policy responds only to changes in the preferences of the median voter
$0 < \lambda < 1$	$\beta_1^* \neq 0, \beta_2^* \neq 0, \beta_3^* \neq 0$	Policy responds to both changes in partisan control and the median voter

This can be rewritten more simply as

$$TARIFF_t = \beta_0^* + \beta_1^* REP_t + \beta_2^* DEM_t + \beta_3^* x_t + \epsilon_t^* \quad (5)$$

where

$$\beta_0^* = (1 - \lambda)\alpha;$$

$$\beta_1^* = \lambda\gamma_R;$$

$$\beta_2^* = \lambda\gamma_D;$$

$$\beta_3^* = (1 - \lambda)\delta; \text{ and}$$

$$\epsilon_t^* = (1 - \lambda)\mu_t + \epsilon_t.$$

In this simplified form, equation (5) can then be estimated using ordinary least squares analysis. Note that  $\lambda = 0$  (only preferences matter) implies  $\beta_1^* = \beta_2^* = 0$ , and  $\lambda = 1$  (only party matters) implies  $\beta_3^* = 0$ . Our results may thus lead us to reject either the party hypothesis or the interest group hypothesis in their strong forms. (In fact, even if  $\beta_3^* = 0$ , it would be imprecise to conclude that preferences do not matter, for changes in party control are of course linked to changes in constituent preferences.) On the other hand, if  $0 < \lambda < 1$ , then the coefficients on all three variables ( $\beta_1^*$ ,  $\beta_2^*$ , and  $\beta_3^*$ ) should be significant, indicating that both constituent preferences and partisan control of government are significant determinants of the tariff. These possibilities are summarized in Table 2.

Thus our analysis should not be seen as a critical test between the economic and political determinants of the tariff. Both factors could be important, and both our model and empirical test allow for this possibility. However, our

model does imply that the coefficients for at least one set of variables (economic or political) should be significantly different from zero. If our data fail to produce significant coefficients for all three variables ( $\beta_1^* = \beta_2^* = \beta_3^* = 0$ ), then the validity of our model would be called into question.

## Econometric analysis

### *Data*

As outlined above, the heyday of pressure group dominance over tariff policy occurred from 1877 to 1934. For this period, we examine three estimates of the tariff, two of which have been standard in previous studies. The first is the average duty levied on dutiable imports (*AVGDUTY*), defined as the ratio of the duties collected to the total value of dutiable imports. A second measure of the level of protection is the average duty levied on total imports (*AVGTOTAL*), defined as the ratio of duties collected to the total value of imports (dutiable and free). While each of these measures captures some aspects of the overall tariff burden, neither ratio alone indicates the degree to which the tariff burden is concentrated on a few products. However, the difference between these ratios (*AVGDUTY* – *AVGTOTAL*), which we label *AVGDIFF*, provides a useful measure of tariff concentration. For instance, if all imported goods received the same rate of duty, then *AVGDIFF* would be zero. If a few goods receive 50 percent duties while the rest are allowed to enter the country duty-free, *AVGDIFF* would be close to 50.<sup>23</sup> *AVGDIFF*, then, measures the degree to which the tariff burden is concentrated in a few imports. In particular, when tariffs are used for revenue purposes rather than product-specific protection, *AVGDIFF* should be relatively low.

Table 3 and Figure 3 describe these three estimates of the tariff (*AVGDIFF* is the region between the two lines in Figure 3). Several facts are immediately apparent from inspecting Figure 3. The most obvious is that since the 1830s, except during the Civil War, the average duty on total imports has declined. Although the 1930 tariff act resulted in the highest tariff rates in the twentieth century, it would have been considered a rather moderate trade law fifty years earlier. Further, the trends show that although the average tariff on dutiable imports was about 60 percent in the early 1930s, only 20 percent of the value of total imports was affected. Thus, the tariff burden was concentrated in a few goods. Second, beginning with the 1890s, earlier wild swings in the tariff taper off. For example, the mean level of protection on all goods from 1821 to 1890 is 30.5 percent with a standard deviation of 10.2 percent; the mean tariff between 1890 and 1934 is 18.8 percent with a standard deviation of 6.6 percent; and in

23. Specifically, if *DI* is the value of dutiable imports, *FI* is the value of free imports, and *DC* is the total duties collected, then  $AVGDIFF = AVGDUTY - AVGTOTAL = DC/DI - DC/(DI + FI)$ . So if  $FI = 0$ , then  $AVGDIFF = 0$ , and if *DI* is small compared to *FI*, then  $AVGDIFF \approx DC/DI - 0 = DC/DI = AVGTOTAL$ .

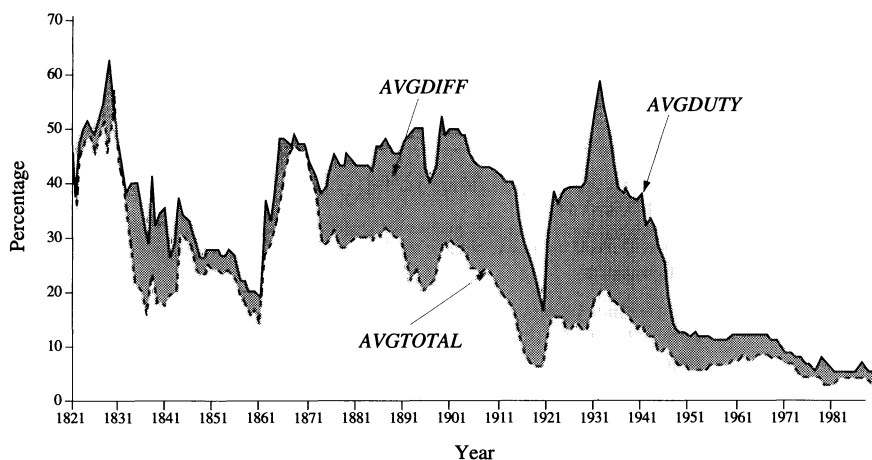
TABLE 3. *Descriptive statistics of aggregate trade data, 1877–1934*

<i>Variable</i>	<i>Description</i>	<i>Mean</i>	<i>S.D.</i>
<i>AVGDUTY</i>	Duties collected as a percentage of the value of dutiable imports	42.2%	7.9%
<i>AVGTOTAL</i>	Duties collected as a percentage of the value of total imports	21.3%	7.5%
<i>AVGDIFF</i>	The difference between the average duty on dutiable imports and the average duty on total imports ( <i>AVGDUTY</i> – <i>AVGTOTAL</i> )	20.9%	5.8%
<i>GNP</i>	Gross national product, in millions of 1982 dollars	354.3	175.3
<i>NETEX</i>	Value of exports less the value of imports, in thousands of 1982 dollars	4,020	7,321
<i>INCTAX</i>	Custom revenues as a percentage of total government revenues	37.3%	18.2%
<i>PENET</i>	Imports as a percentage of gross national product	4.79%	1.03%
<i>REPUBLICAN</i>	Dummy variable equal to 1 if the Republicans control both a majority in Congress and the presidency and 0 otherwise.	0.48	0.50
<i>DEMOCRAT</i>	Dummy variable equal to 1 if the Democrats control both a majority in Congress and the presidency and 0 otherwise.	0.17	0.38

the contemporary era, the mean tariff is 7.4 percent with a standard deviation of 3.9 percent. Third, the means of these ratios are closest when the tariff is employed for revenue purposes, as in the beginning of the 1800s and during the Civil War, whereas the means of these ratios are furthest apart (*AVGDIFF* is largest) during the late 1800s and the early 1930s, both highly politicized periods in U.S. trade history.

These statistics, however, also have several weaknesses. First, a full measure of protection would also include the value of imports discouraged by the tariff rate and the duties foregone because of lost imports—that is, the price elasticity of demand. For example, if tariffs are raised to the point where imports are forestalled totally, then no duties are collected and no dutiable imports are sold.<sup>24</sup> Second, the average duty on dutiable and total imports, as well as their difference, is affected by changes in duties collected and by changes in national income. Thus, the ratios can decrease in two situations:

24. Note, however, that although these elasticity problems affect the interpretation of the measures themselves, they are present both when Democrats and Republicans implement tariff policy. Thus our major conclusions concerning the *differences* between the parties will not be significantly affected by different demand elasticities.



**FIGURE 3.** Three estimates of the tariff, 1877–1984, where *AVGDUTY* is the ratio of duties collected to the total value of dutiable imports, *AVGTOTAL* is the ratio of duties collected to the total value of all imports, and *AVGDIFF* is the difference between these two measures

when the demand for dutiable imports decreases relative to the demand for nondutiable or free imports and when the actual tariff rate decreases.

To avoid the problem of separating changes in demand from changes in the tariff ratios, we also disaggregate the data and calculate the average duty levied on sixteen commodity-specific groupings, which comprise the principal classes of imported dutiable merchandise used for consumption during the sample period. Table 4 describes these variables.

The independent variables include both economic and political measures. Our proxies for constituent demand are real gross national product (*GNP*), real net exports (*NETEX*), import penetration (*PENET*), and customs as a percentage of total government revenues (*INCTAX*).<sup>25</sup> *GNP* captures the general level of economic activity. In general, endogenous tariff theories predict that during times of economic decline, industries will demand greater protection from import competition, and the government should respond with higher tariffs. The other aggregate indicators, *NETEX* and *PENET*, measure trade-related economic activity. Favorable trade balances, represented by a high value of real net exports, suggest that producers benefit from foreign

25. Unfortunately, reliable data for other common economic variables are unavailable for the time period studied. This is why Stephen Magee, William Brock, and Leslie Young, Alok Bohara and William Kaempfer, and other authors of time series studies of endogenous tariff formation begin their analysis only after the 1890 census, the point at which certain economic data series, including unemployment, became available. See Magee, Brock, and Young 1989; and Bohara and Kaempfer 1991. To improve the fit of the economic variables, *NETEX* and *INCTAX* were lagged one year and *PENET* was lagged two years. Gross national product data are contemporaneous. See the data appendix for more details on the economic variables in general, and *GNP* in particular.

TABLE 4. *Descriptive statistics of commodity-specific trade data, 1877–1934*

<i>Variable</i>	<i>Description</i>	<i>Mean (percentage)</i>	<i>S.D. (percentage)</i>
<i>AGRI</i> <sup>a</sup>	Agricultural products and provisions	27.3	7.9
<i>CHEM</i>	Chemicals, oils, and paints	29.2	6.2
<i>CHINA</i>	Earths, earthenware, and glassware	46.9	7.5
<i>COTTON</i>	Cotton manufactures	40.5	8.8
<i>FLAX</i> <sup>b</sup>	Unmanufactured and manufactures of flax, hemp, and jute	33.4	9.6
<i>METAL</i>	Metals and metal manufactures	35.4	8.0
<i>PAPER</i>	Pulp, paper, and books	22.7	3.2
<i>SILKS</i>	Silks and silk goods	52.0	5.5
<i>SPIRITS</i>	Spirits, wines, and other beverages	65.6	16.6
<i>SUGAR</i>	Sugar, molasses, and sugar manufactures	59.7	29.8
<i>SUNDRY</i>	Luxury articles (lace, embroideries, etc.)	29.3	6.3
<i>TOBACCO</i>	Tobacco and tobacco manufactures	83.8	20.3
<i>WOOD</i>	Wood and wood manufactures	18.3	3.7
<i>WOOL</i> <sup>c</sup>	Wool and wool manufactures	59.1	14.0
<i>RAWWOOL</i>	Wool (unprocessed)	42.0	6.3
<i>MANWOOL</i>	Manufactures of wool	78.1	14.4

<sup>a</sup>For 1877 to 1889, the tariff rate was calculated from a weighted average of bread stuffs and fruits.

<sup>b</sup>For 1877 to 1889, the tariff rate was calculated from a weighted average of manufactured and unmanufactured imports of flax.

<sup>c</sup>For 1877 to 1889, the tariff rate was calculated from a weighted average of manufactured and unmanufactured imports of wool.

commerce and will have less incentive to demand protective tariffs. On the other hand, the more foreign competition that domestic producers face, as captured by the level of import penetration, the greater their incentive to lobby the government for restrictive tariffs. Thus, economic theories predict that the coefficients for *GNP* and net exports will be negative, and the coefficient for import penetration will be positive.

The variable *INCTAX* measures custom revenues as a percentage of total federal receipts and indicates the extent to which tariffs reflect government fiscal demands. This variable accounts for changes in the tariff that result from shifts in fiscal policy, namely the 1916 enactment of the income tax, after which

tariffs comprised a much smaller proportion of total government revenue.<sup>26</sup> By including a proxy for the income tax, we also control for the major structural break in our time series over the period studied.

The political variables incorporate party control of the government. *DEMOCRAT* government exists when the Democrats control both a majority in Congress and the presidency. *REPUBLICAN* government exists when the Republicans control both a majority in Congress and the presidency. Usually, Congress requires at least a year to pass and enact legislation. Because of the delay between when a new Congress takes office and when a policy takes effect, we lagged the party control variables by two years. For instance, the Republicans gained control of Congress in 1888 and passed the McKinley Tariff Act in October of 1890. The sample period contains twenty-eight Republican and ten Democratic governments. The effects of the party control variables are measured against twenty observations of divided government. The average duty levied on dutiable imports is 39 percent when the Democrats control government as opposed to 43 percent when the Republicans control government. These statistics concur with the above historical discussion and reinforce the expectation that, on average, Republicans increase and the Democrats decrease the tariff.

### *Estimation*

As mentioned above, previous empirical studies have failed to identify significant partisan effects on the tariff. We contend that parties do have a significant impact and that this impact is best measured by using time series analysis to relate changes in tariff levels over time to changes in economic and political conditions. In fact, modern time series techniques provide a powerful tool for separating the effects of changing preferences from the effects of changing institutions on trade policy.

The analysis proceeds in three steps: testing for serial correlation, testing for stationarity, and testing for cointegration. The details of these procedures are reported in the appendix. To summarize, the series were first found to be heteroscedastic and first-degree autoregressive. To correct for the inefficient estimates, the reported variances and standard errors are White heteroscedastic-consistent estimates. Also, all three measures of protectionism tested positive for a unit root and were not cointegrated with the economic variables. After first differencing, however, the three measures were all stationary.

Thus our general strategy is to estimate equation (5) by regressing changes in protection on changes in economic and political conditions. First, however, we

26. For a discussion of the relation between tariff behavior and fiscal policy prior to the income tax, see Baack and Ray 1985; J. Hansen 1990; and Gardner and Kimbrough 1992.

include only a constant and the economic variables, to see how well the economic model alone performs:

$$\Delta TARIFF_t = \alpha + \beta_1 \Delta GNP_t + \beta_2 \Delta PENET_t + \beta_3 \Delta NETEX_t + \beta_4 \Delta INCTAX_t + \epsilon_t. \quad (6)$$

We then include the political control variables, *REPUBLICAN* and *DEMOCRAT*:

$$\Delta TARIFF_t = \alpha + \beta_1 \Delta GNP_t + \beta_2 \Delta PENET_t + \beta_3 \Delta NETEX_t + \beta_4 \Delta INCTAX_t + \beta_5 \Delta REPUBLICAN_t + \beta_6 \Delta DEMOCRAT_t + \epsilon_t. \quad (7)$$

Equation (7) asks whether changes in partisan control of government affect changes in the tariff above and beyond that variation explained by changes in economic conditions alone. As mentioned above, the results of this test might support the economic variables, the political variables, or both.

### Results

Table 5 shows the results of estimating the tariff measures by equations (6) and (7). The findings reported in columns 1, 3, and 5 of the table indicate that, overall, the economic variables perform fairly well when estimated by equation (6). *GNP* is significant and negative in all three instances, indicating that increases in national output lead to a decrease in protectionism and less product-specific protection. The coefficient on penetration is positive in all three cases and significant in two, indicating that protectionism rises with greater import penetration into the U.S. market. And the net exports coefficient is negative in all cases and significant in two, indicating that an unfavorable trade balance is correlated with greater levels of protection. The only significant coefficient on *INCTAX* occurs in column 5, suggesting that in years when the tariff comprised a large percentage of total government revenues, it was also targeted toward protecting specific commodities. In general, then, our findings support the importance of economic conditions in determining tariff rates.<sup>27</sup>

Next, equation (7) tests the hypothesis that partisan control influences the aggregate tariff rate above the effect of changes in national income. Columns 2, 4, and 6 of Table 5 show the results. Interestingly, the economic variables perform exactly as they did without the political variables, indicating that constituent preferences still have a significant effect on the tariff. Crucially, the party control variables are also significant. The Democrats lower *AVGTOTAL*

27. These results agree with previous time series studies including economic variables only. See, Bohara and Kaempfer 1991.



**TABLE 5.** *Partisan effects on average duty as a percentage of dutiable imports (AVGDUTY), average duty as a percentage of total imports (AVGTOTAL), and the difference between average duty on dutiable imports and average duty on total imports (AVGDIFF)<sup>a</sup>*

Independent variables	$\Delta AVGDUTY_t$		$\Delta AVGTOTAL_t$		$\Delta AVGDIFF_t$	
	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Constant	0.58 (1.30)*	0.57 (1.49)*	-0.13 (-0.52)	-0.17 (-0.71)	0.71 (2.02)**	0.74 (2.37)**
$\Delta GNP_t$	-0.041 (-2.33)**	-0.042 (-2.49)**	-0.012 (-1.54)*	-0.010 (-1.29)*	-0.029 (-2.52)**	-0.032 (-2.90)**
$\Delta NETEX_{t-1}$	-0.14 (-1.39)*	-0.13 (-1.58)*	-0.11 (-2.38)**	-0.11 (-2.60)**	-0.028 (-0.38)	-0.016 (-0.27)
$\Delta INCTAX_{t-1}$	17.34 (1.25)	10.31 (0.93)	-1.54 (-0.18)	-4.99 (-0.61)	18.90 (2.23)**	15.30 (2.54)**
$\Delta PENET_{t-2}$	1.58 (1.92)**	1.66 (2.56)**	0.16 (0.41)	0.082 (0.24)	1.42 (2.58)**	1.58 (3.02)**
$\Delta REPUBLICAN_{t-2}$		1.72 (1.70)**		-0.041 (-0.050)		1.76 (1.87)**
$\Delta DEMOCRAT_{t-2}$		-5.85 (-4.45)**		-2.21 (-2.96)**		-3.64 (-2.80)**
No. observations	58	58	58	58	58	58
$R^2$	0.26	0.47	0.11	0.20	0.25	0.41
Wald test $\sim \chi^2$		21.96**		8.88**		12.07**
$REP - DEM$		7.57 (4.46)**		2.17 (1.85)**		5.40 (3.47)**

<sup>a</sup>The *t* statistics are within parentheses; standard errors are White heteroscedastic-consistent estimates. For definitions of the variables, see Table 3.

\* $\alpha < 0.10$ .

\*\* $\alpha < 0.05$ .

and *AVGDUTY*, while the Republicans significantly raised *AVGDUTY*. The Republicans also increased *AVGDIFF*, while the Democrats significantly decreased product-specific protection.

The case of wool is typical. In 1894, the Democrats lowered tariff rates generally and removed woollens from the dutiable list altogether. When the Republicans regained control in 1896, they reintroduced the tariff on woolen imports and moderately raised protective tariff rates. This example helps illustrate why the average duty on both dutiable and total imports is necessary to fully capture the effects of tariff policy. Overall, our findings lend support to the hypothesis that  $0 < \lambda < 1$  in equation (2); that is, that both economic conditions and political parties played a significant role in setting tariff policy during the period studied.

To determine whether the political models outperform the base economic models, we conduct a linear restrictions test. The Wald statistic, described in the appendix and reported at the bottom of the table, indicates that in all cases, including the political variables significantly improves the explanatory power of the model. For instance, the Wald statistic at the bottom of the second column, 21.96, exceeds the critical value of  $\chi^2(2)$ , 5.99.

Another test of our hypothesis investigates whether, once in office, Republicans and Democrats enact significantly different tariff policies. If Republicans are significantly more protectionist than Democrats, then the difference in the coefficients  $\beta_5$  and  $\beta_6$  will be significantly greater than 0.

The row labeled *REP – DEM* in columns 2, 4, and 6 reports the results of a difference of means test. The estimated *t* statistics are 4.46, 1.85, and 3.47 for *AVGDUTY*, *AVGTOTAL*, and *AVGDIFF*, respectively. Thus, we reject the hypothesis that  $\beta_5 - \beta_6 = 0$  at the 5-percent level. These findings indicate that the Republicans were indeed significantly more protectionist than the Democrats in their treatment of the tariff. On the other hand, after taking into account economic effects, these differences may not be as great as one would initially suppose. The average differences between tariffs from Republicans to Democrats are a modest 7.57 percent for *AVGDUTY* and 2.17 percent for *AVGTOTAL*, respectively.

Finally, to investigate further the effect that political parties have on the tariff, we estimate the sixteen commodity-specific groupings by equation (7). According to a simple economic model, a downturn in economic activity should lead to roughly similar levels of protection for special interests no matter whether the Democrats or the Republicans control government. In contrast to this prediction, Table 6 suggests that Republicans raise duties on agricultural products, cotton, flax (used for rope and twine), paper, silks, sundries, and wool manufactures. On the other hand, the Democrats alone lowered tariffs on agricultural products, chemicals, china, cotton, flax, metal products, paper, silks, wool, and raw wool. Surprisingly, the Republicans lowered duties on tobacco, and the Democrats raised duties on wood. As discussed above, the Republicans created a separate category that distinguished manufactured woolen articles from other wool products. Accordingly, although the Republicans had no significant effect on wool imports in general, they raised tariffs on wool manufactures. Moreover, the difference of means tests reported in the last column of Table 6 shows that except for metal, spirits, sugar, tobacco, and wood products, the political parties differed significantly in how they treated various commodity groupings, with the Republicans enacting higher tariffs in every case.

Table 6 shows that the Republicans focused their protective efforts on a few items, reflecting their industry-based orientation. For the majority of goods, they either raised tariffs moderately or left them unchanged. The Democrats significantly lowered tariffs on all goods except for sundries, wood items, and sugar. Consistent with the party model, these findings suggest that a particular

**TABLE 6.** *Change in commodity-specific data estimated by equation (7), 1877–1934<sup>a</sup>*

<i>Dependent variable</i>	<i>Constant</i>	$\Delta GNP_t$	$\Delta NETEX_{t-1}$	$\Delta INCTAX_{t-1}$	$\Delta PENET_{t-2}$	$\Delta REP_{t-2}$	$\Delta DEM_{t-2}$	<i>REP – DEM</i>
$\Delta AGRI_t$	0.69 (1.14)	-0.039 (-1.50)*	-0.093 (-1.06)	6.81 (0.63)	0.71 (0.74)	1.98 (2.29)**	-3.50 (-2.74)**	5.48 (4.00)**
$\Delta CHEM_t$	0.48 (1.22)	-0.021 (-1.29)*	-0.098 (-1.28)*	13.56 (1.77)**	0.13 (0.19)	0.89 (1.15)	-2.58 (-1.87)**	3.47 (2.15)**
$\Delta CHINA_t$	0.24 (0.42)	0.013 (0.79)	-0.087 (-1.58)*	13.53 (1.27)	0.79 (0.11)	-0.29 (-0.22)	-5.30 (-1.94)**	5.01 (1.69)**
$\Delta COTTON_t$	0.17 (0.29)	0.00064 (0.026)	-0.11 (-1.78)**	6.15 (0.96)	0.13 (0.24)	1.84 (1.60)*	-3.02 (-1.87)**	4.86 (2.62)**
$\Delta FLAX_t$	0.35 (0.77)	-0.038 (-2.65)**	0.094 (1.91)**	8.48 (1.48)*	0.91 (1.76)**	2.61 (1.68)**	-2.13 (-2.04)**	4.74 (2.78)**
$\Delta METAL_t$	0.045 (0.081)	0.020 (0.96)	-0.058 (-0.57)	12.00 (1.25)	0.34 (0.33)	-0.53 (-0.46)	-4.04 (-1.54)*	3.51 (1.27)
$\Delta PAPER_t$	0.015 (0.042)	-0.0074 (-1.04)	0.011 (0.29)	12.89 (3.56)**	0.18 (0.40)	1.74 (3.22)**	-0.59 (-1.59)*	2.33 (4.02)**
$\Delta SILKS_t$	-0.11 (-0.34)	0.024 (1.90)**	-0.10 (-2.11)**	9.68 (1.88)**	-0.19 (-0.34)	0.98 (1.98)**	-2.39 (-2.55)**	3.37 (3.40)**
$\Delta SPIRITS_t$	0.0026 (0.0030)	0.0045 (0.20)	-0.084 (-0.32)	36.85 (1.26)	-2.57 (-1.53)*	-5.10 (-1.09)	-2.20 (-0.87)	-2.90 (-0.51)
$\Delta SUGAR_t$	3.17 (1.49)*	-0.26 (-2.63)**	0.14 (0.413)	50.76 (1.10)	8.86 (2.57)**	4.74 (1.14)	-0.61 (-0.064)	5.35 (0.54)
$\Delta SUNDRY_t$	0.60 (1.53)*	-0.025 (-1.86)**	-0.077 (-1.37)*	15.76 (2.96)**	-0.11 (-0.23)	2.60 (2.50)**	-0.52 (-0.43)	3.12 (2.06)**
$\Delta TOBACCO_t$	0.44 (0.50)	-0.011 (-0.38)	0.24 (0.98)	31.08 (1.36)*	-0.44 (-0.35)	-2.82 (-1.34)*	-2.52 (-1.08)	-0.30 (-0.11)
$\Delta WOOD_t$	-0.12 (-0.50)	0.011 (0.87)	-0.083 (-1.84)**	-3.65 (-0.68)	-0.40 (-1.08)	0.32 (0.66)	2.09 (1.38)*	-1.77 (-1.12)
$\Delta WOOL_t$	1.09 (0.96)	-0.061 (-1.46)*	0.094 (0.48)	20.85 (0.91)	1.90 (1.03)	1.62 (0.93)	-8.38 (-1.41)*	10.00 (1.63)**
$\Delta RAWWOOL_t$	-0.15 (-0.22)	0.020 (0.38)	0.082 (0.18)	-27.73 (-1.58)*	0.31 (0.23)	-0.038 (-0.034)	-5.24 (-2.62)**	5.20 (2.02)**
$\Delta MANWOOL_t$	2.09 (1.24)	-0.17 (-2.35)**	0.87 (1.03)	8.45 (0.16)	2.23 (0.86)	5.43 (1.92)**	-17.98 (-1.16)	23.41 (1.50)*

<sup>a</sup>The *t* statistics are within parentheses. Standard errors are White heteroscedastic-consistent estimates. For definitions of the independent variables, see Table 3. For definitions of the dependent variables, see Table 4.

\* $\alpha < 0.10$ .

\*\* $\alpha < 0.05$ .

constituency base underlies partisan preferences for high and low tariffs, respectively, and that the relation between interest group demands and tariff levels depends on which party controls national government.

## Conclusion

We address a simple question: Did political parties influence U.S. tariff policy from 1877 to 1934? Historical accounts of this period claim that the tariff was a highly partisan issue; yet previous empirical studies had failed to reveal significant partisan effects, raising the possibility that changes in partisan control and changes in protection were both attributable to economic forces.

After reexamining the data using time series analysis motivated by a model of the policy-making process, we found that parties indeed did significantly affect tariff levels even after accounting for changing economic conditions. Furthermore, parties affected the manner in which interests were translated into policy outcomes by aggregating interests through coalitional politics, as indicated by our sixteen commodity-specific groups. Thus both interests and institutions matter; they interact to shape policy outcomes.

Our methods could be extended to other important issues in international trade. First, the relevant domestic political institutions in the time period covered by this study were political parties. One way to assess changes in party impact on the tariff would be to extend our analysis to periods in which trade policy was characterized by delegation to the executive branch. Second, the effect of emerging international institutions on trade, such as the General Agreement on Tariffs and Trade, could be incorporated into the analysis in later periods. Thus, the degree to which trade policy is influenced by individual countries' domestic interests as opposed to international institutions could be judged more precisely, leading to a broader view of trade institutions and their impact on trade flows over time.

## Appendix

### *Data*

Early *GNP* estimates are dubious at best. Until the Budget and Accounting Act of 1921, there was no systematic method to obtain accurate figures for gross national product and its components. These estimates were constructed from available input-output data. The first figures were reported by Simon Kuznets and were later revised, respectively, by John W. Kendrick, Robert Gallman, and Thomas Berry.<sup>28</sup> Recently, Christina Romer as well as Nathan Balke and Robert Gordon separately published new estimates.<sup>29</sup> The central difference between these studies concerns the volatility and the

28. See Kuznets 1946; Kendrick 1961; Gallman 1966; and Berry 1988.

29. See Romer 1989; and Balke and Gordon 1989.

TABLE A1. *Data sources*

<i>Variable type</i>	<i>Source</i>
<i>Aggregate tariff data</i>	U.S. Bureau of the Census, 1975, <i>Historical statistics of the United States</i> , Series U 207-12.
<i>Commodity-specific tariff data</i>	U.S. Bureau of the Census, <i>Statistical abstract of the United States</i> , Bureau of the Census (Washington, D.C., 1876-1964).
<i>Political data</i>	U.S. Bureau of the Census, 1975, <i>Historical statistics of the United States</i> , Series Y 204-10.
<i>Economic Data</i>	
Gross national product (GNP)	For years between 1869 and 1928, estimates taken from Balke and Gordon 1989; for later years, GNP data are from U.S. Bureau of the Census, 1975, <i>Historical statistics of the United States</i> , Series F-1.
Import penetration	For 1869-1928, GNP estimates are from Balke and Gordon 1989; for later years, after GNP data are from U.S. Bureau of the Census, 1975, <i>Historical statistics of the United States</i> , Series F-1; imports are from U.S. Bureau of the Census, 1975, <i>Historical statistics of the United States</i> , Series U-188.
Real net exports	U.S. Bureau of the Census, 1975, <i>Historical statistics of the United States</i> , Series, U 187-188.
1982 price deflator	For 1889-1928, Balke and Gordon 1989; for 1929-34, <i>Economic report of the President</i> (Washington, D.C.: Government Printing Office, 1991), Table B-3, p. 290.
<i>Income Tax Proxy</i>	U.S. Bureau of the Census, 1975, <i>Historical statistics of the United States</i> , Series Y 352-353.

amplitude of the business cycles. The variance of these estimates hinges on the elasticity assumption and on the accuracy of the underlying commodity output estimates.

In our analysis, we use the estimates reported by Balke and Gordon for two reasons. First, Kuznet's assumption that deviations from the trend of gross national product and commodity output move together in one-to-one correspondence was replaced by Romer with estimates of the percentage deviations from the trend of gross national product and commodity output for which accurate data are available. By definition, if the rate at which gross national product responds to a one-unit change in output decreases, then cyclical peaks and troughs will be moderated. Predictably, this is Romer's central finding. Second, Balke and Gordon include railroad and construction data, sectors of the economy that are highly responsive to economic conditions, whereas Romer does not. The data sources are provided in Table A1.

### *Time series analysis*

*Testing for serial correlation.* A common problem of time series analysis is that the error terms covary systematically over time. Generally, economic variables (customs, duties, gross national product, etc.) are nonrandom phenomena, so that variances or

excluded variables tend to be correlated, and thus the moments exhibit autocorrelation. This effect does not create biased estimators, but inefficient ones. To explore these possibilities, we conducted an ordinary least-squares regression of each of the three tariff series on the economic variables. The Durbin–Watson statistics showed that our model was first-degree autoregressive in all cases. We then included a first-order lagged dependent variable and again tested for serial correlation. The Durbin  $h$  test now indicated that we could not reject the null hypothesis of no autocorrelation. Furthermore, a White test supports the hypothesis that the tariff series is heteroscedastic. To correct for the inefficient estimates, the reported variances and standard errors are White heteroscedastic-consistent estimates.

A final test conducted was for autoregressive conditional heteroscedasticity (ARCH), which determines if the error terms correlate with previous error terms. We estimated the square of the equation's error terms by the first- and second-order lagged error terms and found that in neither case were the lagged error terms a significant explanatory variable. We therefore rejected the hypothesis that the model was ARCH.

*Testing for unit roots.* To determine if the dependent variables exhibit a unit root, we first estimated a simple first-order autoregressive equation:

$$Y_t = \rho Y_{t-1} + \epsilon_t, \quad (\text{A1})$$

using annual data of each of the three tariff measures for the period 1877 to 1934. The null hypothesis  $\rho = 1$  was tested against the alternative that  $\rho \neq 1$  at the 5-percent significance level. If the null hypothesis can be rejected, then the series is stationary. If the null hypothesis cannot be rejected, then the series must be differenced until we can reject the hypothesis that  $\rho = 1$ .

The estimated  $t$  statistics for equation (A1) are  $-0.24$ ,  $-1.28$ , and  $0.15$  for *AVGDUTY*, *AVGTOTAL*, and *AVGDIFF*, respectively. Using the tables provided by Wayne Fuller, the critical value is  $-1.95$ .<sup>30</sup> Thus, we cannot reject the null hypothesis that  $\rho = 1$  at the 5-percent level, indicating that the tariff has a unit root. To determine the level of differencing for each tariff measure, we reestimated equation (A1) in first differences. The estimated  $t$  statistics are now  $-5.32$ ,  $-5.73$ , and  $-6.21$ . This time we are able to reject the hypothesis that the differenced tariff series have a unit root.<sup>31</sup>

*Testing for cointegration.* Finally, we must check if the dependent variable is cointegrated (moves together over time) with the independent variables. This is done by first performing the standard regression:

$$Y_t = \beta X_t + \epsilon_t \quad (\text{A2})$$

to obtain estimates of the error terms  $\epsilon_t$ , where  $X_t$  represents the vector of independent variables. Next, these error terms are checked for stationarity by estimating the regression:

$$\epsilon_t = \theta \epsilon_{t-1} + u_t \quad (\text{A3})$$

30. The tables are from Fuller 1976.

31. Gardner and Kimbrough 1989.

and testing the null hypothesis that  $\theta = 1$  (no cointegration) against the alternative  $\theta \neq 1$ . If the null hypothesis can be rejected, then the independent and dependent variables are cointegrated.

We estimated equation (A2) using *GNP*, *PENET*, *NETEX*, and *INCTAX* as the independent variables and then tested the residuals using equation (A3). The estimated *t* statistics are  $-3.58$ ,  $-3.10$ , and  $-3.14$  for *AVGDUTY*, *AVGTOTAL*, and *AVGDIF*, respectively. Using the tables provided by James MacKinnon the critical value for five series with no trend is  $-4.10$ .<sup>32</sup> Thus, we cannot reject the hypothesis that the tariff series are not cointegrated at the 5-percent significance level. This indicates that no equilibrium relationship exists between the series and that the analysis should therefore be undertaken in first differences.

### Linear restrictions test

The standard *F* test is inappropriate given our data, because the underlying error structure is heteroscedastic. The Wald test is preferable because it relaxes the normality assumption and can be calculated using only the unrestricted coefficient estimates from the original regressions. The null hypothesis is that  $\beta_5 = \beta_6 = 0$ , and the test statistic is calculated as  $W = \hat{g}' \Sigma_g^{-1} \hat{g} \sim \chi_m^2$ , where  $\hat{g}' = g(\hat{\beta}_1, \hat{\beta}_2, \dots, \hat{\beta}_k)'$  is the vector of restrictions evaluated at the unrestricted coefficient estimates, *m* is the number of restrictions, and

$$\Sigma_g^{-1} = \left( \frac{\partial \hat{g}}{\partial \hat{\beta}} \right)' \hat{\sigma}^2 (x'x)^{-1} \left( \frac{\partial \hat{g}}{\partial \hat{\beta}} \right)$$

is the estimated variance-covariance matrix of  $\hat{g}$ .

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32. For the tables, see MacKinnon 1991.

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