Trade-Based Interactions: An Interdisciplinary Perspective
(first draft: 10/24/00)
(revised: 2/28/01)

Solomon W. Polachek
Department of Economics and Political Science
State University of New York
Binghamton, New York 12902-6000

Presidential Address
Peace Science Society
presented at
Yale University
October 28, 2000

1 I dedicate this address to Dora Polachek who induced me to work on this topic in the first place; to Mark Gasiorowski my first political science graduate student for his excellent research assistance early on; to Gary Becker for his interest in the early stages of this research at the Hoover Institution; to Lloyd Dumas for sharing my initial research with Walter Isard; to Walter Isard for introducing me to the Peace Science Society; to Stuart Bremer, Brian Polins and the GLOBUS project participants for the opportunity to discuss my work at the Wissenschaftszentrom in Berlin; to Katherine Barbieri for being more a colleague than a graduate student; to Carlos Seiglie, an economist who broadened my perspectives on international security; and finally to J. David Singer, for being so helpful as my senior statesperson mentor at the University of Michigan during my sabbatical leave 2000-2001.
I. Introduction

Walter Isard, with the help of Kenneth Boulding, William Vickrey and others founded the Peace Science Society in 1964. Unlike today, the Society was comprised mostly of economists, with mathematicians, psychologists, political scientists and representatives of other disciplines in the minority. All were bound together with a mission to scientifically study how to prevent war and create a lasting peace. The methodology was threefold: (1) to be rigorous, (2) to be innovative, and (3) to be interdisciplinary.

Now in the year 2000, when political scientists are in the majority, I would like to address the interdisciplinary aspects of the society. I do so in two ways: First, I explore a topic -- conflict and trade -- that by its very nature spans at least political science and economics. And second, I couch the topic within the framework of a personal story. The moral is how one discipline can gain analytical and conceptual insights by applying material from another. I begin with the personal story.

II. A Personal Story

My first real academic job was as an assistant professor of labor economics at Chapel Hill. My main research focus was human resources, particularly gender discrimination. To the common non-economist, questions relating to such social issues as discrimination were often thought to be out of an economist’s domain, and more in line with a sociologist’s job description. Indeed when I first met my wife to be (who at the time a French major at Barnard College), she couldn’t understand why “a labor economist wasn’t working on institutional questions pertaining to unions and strike activity.” After all, her undergraduate economics course emphasized Jimmy Hoffa, Walter Reuther, the Knights of Labor, and the AFL-CIO. I tried to explain that labor economists did more than describe unions, but frankly I wasn’t too successful in convincing her, and thus always knew I couldn’t gain her respect as a labor economist unless I did work on unions.

---

2 For a definitive history, see Walter Isard (2000).
3 The original editorial Journal of Conflict Resolution, 1(1):1-2 states “Our belief in the fruitfulness of an interdisciplinary approach … is based on the conviction that the behavior and interactions of nations are … part of a much wider field of behavior …. “ Others have espoused an interdisciplinary approach to international relations. A good example is Singer (1961a) who discusses the relevance of behavioral science.
4 The autobiographical approach is used in the humanities. For example see, Leslie Heywood, Dedication to Hunger: The Anorexic Aesthetic in Modern Culture, Berkeley: University of California Press, 1996.
5 As an illustrative example, I understand the Nobel Laureate Gary Becker had difficulty defending his now famous dissertation Economics of Discrimination to the Economics Department at the University of Chicago because some economics faculty thought the topic a bit afieldeconomics (personal correspondence). Another example is Louis Fry Richardson who also had difficulty publishing his classic work on war. His son, Stephen Richardson (1957) states “There was no learned society to which he [Lewis Fry Richardson] dared offer so unconventional a work.”
So after getting tenure (the after is important when venturing out of one’s sub-discipline), I thought the time appropriate to finally study why workers unionize and why workers strike, a labor economics sub-field about which I knew little.

[Table 1 about here]
[Table 2 about here]

Not surprisingly, as a quantitative person, I began by examining data. Mystifyingly, as indicated in Table 1, unionization rates were not uniform across the economy. Both unionization and strike activity (measured as percent unionization in column 1 and various indicators of strike activity in columns 2-5) appeared more prevalent in the blue-collar rather than the white-collar occupations. Further, as illustrated in Table 2, the less educated are over 50% more likely to be unionized. For the life of me, I couldn’t understand these patterns. Even today, not all my labor economist colleagues agree why these patterns pervade. But that’s jumping ahead.

III. International Interactions: Conflict and Cooperation Among Nations

At about this very same time, I ran across Edward Azar’s Conflict and Peace Data Bank (COPDAB) which I found by browsing the university data library. Somehow Azar’s events data intrigued me, as I thought perhaps they could shed light on worker-firm unrest, despite being solely international in nature.

COPDAB was rather unique and controversial. As an events data set, Azar and his students went through about 50 newspapers, culling all reported bilateral interactions. Each was classified on a scale from 1 (unification) to 15 (all out war). Many including me, were skeptical of such reported events both because of biases in reporting and tabulation. Nonetheless, I shifted focus from unions, hoping that if I could understand international interactions, then I could understand conflict and cooperation among workers and firms.

Obviously, in retrospect, the questions of war and peace and international relations are far more pervasive, and apply to a much wider population than unionization and strike activity, which is why I am glad my work took this detour. Nonetheless, as I shall show, I think both international and worker-firm conflict might share a common theory. As I mentioned, one moral of my story is that we can learn a great deal from comparative studies, not just across international arenas, but across disciplinary boundaries. Probably for this reason, Walter Isard so continuously stressed a rigorous interdisciplinary approach.

Just as with worker and firm unrest, conflict and cooperation were not uniform. As illustrated in Table 3, countries like the U.S. had excellent relations with Canada and England, but poor relations with the Soviet Block. Though basically cooperative, U.S. relations with Mexico were more conflictive than with Canada. Indeed, for all 30

---

6 The problem with events data is that newspapers need not accurately report country interactions. See Kegley (1975) containing essays on the issues one need be aware of when using events data.
countries I initially studied (the data was later expanded to over 115 countries), each country had both good and bad relations simultaneously. In fact, how conflictive and how cooperative a country happened to be depended on the target. The question I saw was: why does a particular country such as the U.S. have good relations with England yet poor relations with a country like the Soviet Union; and why at the same time does a country like the Soviet Union have good relations with other Eastern Block countries, yet poor relations with the United States? Clearly looking at the attributes of only one country in isolation, rather than countries comprising the dyad would not provide a full answer. Nor would systemic variables provide an answer, since they would not be able to explain how cooperative and hostile relations coexist simultaneously. For this reason I concentrated on dyads rather than countries as the unit of observation. Much later I began to consider multilateral situations on which I am still working.

This notion that something about the dyad is the important ingredient in understanding cooperation and conflict spurred on my thinking. For a long while I couldn’t figure out what aspects of the dyad were important in understanding conflict and cooperation. And so again making use of an interdisciplinary approach, I began to think of other types of dyads, hoping that another arena could shed light on the question. After a while, the inspiration hit me that the same pattern of conflict and cooperation I had seen among nation state dyads also occurs in human interactions. I realized that a given person is often cooperative with some friends but at the same time belligerent, or at least not gregarious with others. So I began to examine human relations, exploring particularly close relations, namely marriages and families.

### IV. The Basic Theory

In the late 1960s and early 1970s, the germs of a very small literature on the “economics of the family” were beginning to emerge. One theory of marriage had to do with gains from trade: the greater the trade gains between partners the greater the marital bonds and the lower the probability of divorce. The theory had been tested using data on divorce by assessing the probability of marital dissolution associated with particular husband-wife characteristics; and the results proved promising. Husband-wife characteristics that increased the gains from trade such as having the same religion and having similar education levels increased marital stability, while characteristics that decreased trade

---

7 The appropriate level of analysis is an important issue in international relations. For example, see Singer (1961b) who contrasts micro and systemic analysis.
8 Progress on this latter work is reported in Polachek, Robst and Chang (1999). Also see Wan Dorussen (1999) and Kang and Reuvany (1999/2000) for other analyses of trade and conflict in a multi-country environment.
such as comparable labor incomes increased marital dissolution.\textsuperscript{10} I thought that if the basic causal factors explaining interpersonal interactions are at all similar to factors explaining international interactions, then perhaps gains from trade might be an important consideration in understanding international relations. The two-country gains from trade case is illustrated in Figure 1. For each country A and B gains from trade can be illustrated as $U_A^2 - U_A^1$ and $U_B^2 - U_B^1$ respectively. For the purposes of this address one need not delve into deriving these measures. However, the interested reader can turn to the appendix.

The underlying model is simple: If conflict leads either to the cessation or to a weakening of the terms of trade, then (all else constant) both the price of conflict as well as benefits from cooperation are proportional to the lost gains from trade. The higher these gains from trade losses, the less incentive to clash and the more motivation to collaborate.

Little did I know then that the “liberal theorists” already had this idea. In fact, the concept of using trade to reduce conflict was very old. As early as 1623, the French monk Eméric Crucé argued that the answer to decreasing the likelihood of war lay in free trade.\textsuperscript{11} Subsequently in 1750 Baron de Montesquieu stated in his \textit{L’Esprit des Lois} that “peace is the natural effect of trade.” He argued that “two nations who traffic with each other become reciprocally dependent; for if one has the interest in buying, the other has the interest in selling; and thus their union is founded on their mutual necessities.”\textsuperscript{12} Much later British statesmen Richard Cobden (1846) and John Bright (1858), as well as others such as Sir Norman Angell (1913), H.Gordon Selfridge (1918), and Jacob Viner (1937) espoused these same views.

My reading of the literature seems to indicate a progression of ideas. First, theologian philosophers (e.g., Erasmus) realized that war was “bad”. Next, they (e.g., Crucé and Abbé de Saint Pierre) sought international bodies to arbitrate international disputes. Then, they (e.g., Jean Jacques Rousseau’s \textit{A Lasting Peace Through the Federation of Europe} (circa 1756)) realized that using these arbitration entities would bring nations closer through communication. Finally, they recognized that political and economic relations such as through governance (Immanuel Kant) and trade (Crucé and de Montesquieu) would induce the necessary laws and country interdependencies to bring about peace.

It is my contention that the liberal theorists present too simplified a picture. They ignore at least three major factors. First, the underlying model conglomerates a country’s

\textsuperscript{10} Actually there were several empirical tests. For example, Santos (1975) used each of the U.S. interior 48 states as units of observation to show how aggregate husband-wife characteristics influence the proportion married. Other empirical studies, such as by Keeley (1979), use individual data.

\textsuperscript{11} One should also note that Crucé was probably the first to advocate “a United Nations Assembly to settle international differences,” Michael Howard (1978:19). Also see Howard for a good overall history of liberal ideas.

\textsuperscript{12} Baron de Montesquieu (1900 edition) p. 316.
economy by looking at aggregate trade without decomposing trade into particular commodities. In reality many commodities are produced, consumed and traded; and trade gains vary accordingly. Second, the underlying model assumes only two trading countries whereas an n-country economy trading multiple goods is more realistic. Third, the underlying model assumes that both countries’ combined trade gains spur cooperative behavior, but it ignores the possibility that widely asymmetric actor-target trade gains might induce gamesmanship-like behavior if one country knows the other has vastly greater incentives to protect trade (Anderton et al. (1999) and Morrow(1999)).

V. Empirical Analysis: What Have We Found Out About International Interactions and Trade?

A lot can be said about statistical analysis. Early empirical studies found a relatively strong inverse relationship indicating that higher trade levels were negatively related to conflict, though not in all cases. Many others support this conclusion, including a number of papers that apply the techniques to understand the democratic peace. On the other hand, a number of studies do not support trade’s role in increasing cooperation and diminishing conflict.

I present two pieces of relevant data illustrating some of the ambiguities; then I address data, theory and empirical testing as three possible areas needing improvement. For the two relevant pieces of data (contained in Figures 2 and 3), I present graphical illustrations of the simple bivariate conflict-trade relationship. First is a curve fit for U.S. Eastern block trade and conflict for 1948-1978 (Figure 2). It shows that the conflict-trade relationship tends to be nonlinear. High trade is associated with very little conflict, but low trade can be associated with either much or little conflict. Second are graphs of the conflict-trade relationship between the U.S. and 115 countries, again for 1948-1978 data (Figure 3). As can be seen, not all conflict-trade curves are negatively sloped. While most dyads show an inverse relationship between trade and conflict, a significant number exhibit positive signs.

In the remainder of this address, my substantive point regarding conflict and trade is to assess what we can learn from discrepancies in the results and to suggest where the analysis should go from here.

1) The Data

No data are ever 100% accurate. By its nature measures of conflict and cooperation are based more on judgement, since conflict and cooperation are less precisely conceptualized than most measured constructs. Indeed, even Lewis Fry Richardson’s

---

13 S. Polachek, (1980) notes that the strength of the relationship depends both on the particular countries and the nature commodities traded. In particular, differences in the trade-conflict relationship between oil-importers and oil-exporters are explored.

14 In this context the trade interdependence caused by more developed democracies appears to be an important factor in explaining why democracies engage in less conflict with each other. See, O’Neil et al. (1996) and O’Neil and Russett (1997) and Polachek (1997) and Polachek and Robst (1998).

classic book questions how we define conflict. He is more general than most, for
example, including crime and domestic unrest. Early war compendiums use battle deaths
as a criterion. However, since wars are the most severe type of conflict, and as such
relatively rare, one need cover many years of history and many very diverse sets of
countries to obtain a sufficiently large enough number of observations for analysis. But
going back in history also has complications because not all history is either accurately
reported or even reported at all.

Since in reality the liberal trade-conflict theory is more a model of cooperation than
conflict (i.e., one protects gains from trade by being both more cooperative and less
hostile), data that take account of cooperation as well as conflict might be more
appropriate. As already mentioned, my research utilizes events data which contain
information both on conflict and cooperation. I look at the difference between the two,
concentrating on the amount of conflict minus cooperation, what I call “net conflict”.
Using net conflict also reduces “selectivity” biases occurring when newspapers over or
under report events of particular dyads.\(^\text{16}\)

As mentioned, events data are not the panacea either. Compiled based on newspaper and
wire service reports, one must be cognizant of a whole array of reporting biases. Press
agencies might not have sufficient coverage of all trouble spots. Even if covered,
reporters depict what they see in light of their own and their newspaper’s prejudices.
Thus I cannot imagine ever getting perfectly accurate data. On the other hand, I do not
believe the inherent data pitfalls in conflict measures provide an explanation for the
mixed support obtained for the conflict-trade model. For one, we have many
independently compiled data sets. Second, we have various methodologies of
compilation. Third, the correlation between events data and war data is fairly high.

Trade data are another story. The theory predicts a correlation between gains from trade
and conflict/cooperation. Yet most analyses use trade levels to perform the correlation.
This is a crucial simplification, which could have significant biases in interpreting tests of
the liberal hypothesis. Trade levels and trade gains are not necessarily correlated. The
correlation depends on trade’s importance to the exporter and to the importer. In turn,
trade’s importance depends on (1) the strategic nature of the particular commodities
being traded, and (2) the availability of other importers and exporters.\(^\text{17}\)

Very few studies take account of trade gains, and perhaps the way they do accounts for
the mixed results supporting the liberal conflict-trade model. My (1980) study
disaggregated by country to get at the strategic nature of oil production. Gasiorowski

\(^\text{16}\) The same selectivity issues plague war data if the data do not contain all wars.

\(^\text{17}\) Technically, as will be mentioned later, gains from trade are proportional to trade levels when each
country’s import demand and export supply curves are comparable, implying the same elasticities. The
validity of this assumption is farfetched, given notions of comparative advantage.
(1982) and Barbieri (1996) created highly nonlinear hybrid trade variables, which likely camouflage trade’s effect. To the best of my knowledge, only Judith McDonald and my (1992) study utilize more direct elasticity measures. When we do, the inverse trade-conflict relationship is enhanced, and the effect of demand elasticities which underlie trade gains are in the predicted direction, and statistically significant.

Getting at detailed elasticities is difficult, but I believe necessary to effectively test the liberal trade-conflict model. The IMF Directions of Trade data which most studies use is simply too aggregated to obtain the necessary detail. However, more precise trade data available from the United Nations would enable one to better identify trade’s strategic nature, and lead to better gains from trade measures. Perhaps now is the time to move in this direction.\(^{18}\)

\section*{2) The Theory}

There is no question that international trade theory is simplified from what goes on in the world. It has to be. However, world is simply far too complex to model without abstract synthesis. No one (and no computer) currently can depict the trade patterns between 150 nations trading literally thousands of goods and services. Compound this with the many buyers and sellers in each country, and the very vast range of commodities. There are simply too many variables and too many players. Nevertheless, despite the complexity, some theoretical results are unambiguous. These are the tried and true theorems indicating that two trading entities \textit{gain} from trade (in spite of Marxian and Neo-Marxian literature), or why else would they trade? What isn’t self-evident \textit{is how much} they gain from trade, and how the gains are distributed between the parties. Theory doesn’t say.

Similarly theory gives no indication of the validity of the liberal conflict-trade model’s underlying assumption that conflict reduces trade. Nor does theory indicate how these trade reductions occur when conflict arises, though I actually envision two possibilities: (1) simply cutting trade for example through quotas or embargoes, and/or (2) changing prices such as through tariffs. But theory is more than simply a two-equation system of conflict diminishing trade and trade augmenting cooperation. Perhaps, as mentioned above, the most tenuous aspect of the theory is assuming that all import demand and supply curves have the same elasticity, essentially meaning that gains from trade are equal across all countries.

Trade gains do not arise in a vacuum. Even if they are not directly measured, various country and market characteristics influence their magnitudes. The current “liberal” theory of conflict/cooperation appears to neglect the factors affecting trade gains; but

\(^{18}\) Also most studies convert trade flows into dollar equivalents, which could also have problems depending on exchange rates. For some countries exchange rates are fixed and for others they are market determined. Further, an important issue is the role of direct and indirect investments. Along these latter lines, one should see Soltvedt (1998) who includes financial flows in analyzing civil and interstate war in the Third World or Gartzke and Li (2001).
trade gains are important, and even if not measured directly, one can make inferences about how the underlying factors affecting trade gains have the most impact in international relations. For example, one can assess how greater trade in strategic commodities might lead one to higher pacific levels. One might also look for large country/small country effects, and the impact of third parties arising in tri-lateral trade relations.

All this leads me to believe that the theory underlying the liberal hypothesis has merit, but is still too underdeveloped and too under-tested. Rather than abandon an approach with a long history, one should expand the model to tease out precise testable implications.

3) Empirical Testing

The past two decades witnessed a burgeoning literature assessing the theory’s validity. Two avenues are explored: (1) to test the underlying assumptions that conflict leads to diminished trade, and (2) to test the prediction that trade enhances cooperative type activities. Of course both effects reinforce each other.

Brian Pollins was probably the first to empirically look at how conflict affects trade. In two key articles (1989a, 1989b), he investigated the effect of bilateral diplomatic relations upon imports. In the first paper (1989a), he employs a gravity-type model with 1955-1978 import demand data finding that “contemporaneous and lagged measures of the relative cooperativeness of diplomatic relations between trading nations [are] positively associated with the level of imports (474).” In the second paper, he finds similar results when “tracking the trade flows between 25 nations during the years 1960 to 1975 (750).” Others look at the impact more systemically. For example, based on the time period 1850-1965, Mansfield (1994) finds a strong negative association between warfare (using Levy’s data) and the annual level of global exports as a percentage of total production. One should also note that Mansfield uses war data while Pollins uses cooperation measured from COPDAB. Whereas Barbieri and Levy (1999) question these results by finding historical situations among seven dyads where war does not reduce trade, Anderton and Carter (forthcoming) traces out detailed time paths indicating how trade falls dramatically with war but at least in some cases partially rebounds afterwards.

Now for the other relation: Does trade increase cooperation and decrease conflict? On this question, I believe there is a great deal more research. But because much of this literature has been very competently surveyed recently in McMillan (1997), Barbieri and Schneider (1999) and Reuvany (1999-2000). I refrain from repeating their discussion. However, let me note that a portion of my own work on this adopted a two-prong approach. First, I embedded the question of how conflict affects trade, and how trade affects conflict within a cross-sectional two equation framework Polachek (1980, 1992). One equation looked at how trade affects conflict, and the other at how conflict impinges on trade. The second adopted a time-series Granger causality scheme (Gasiorowski and Polachek (1982)). Each method has pitfalls (as do single equation models). Cross-sectional simultaneous systems rely on variables chosen more or less in an ad hoc manner.
to identify each equation. In time-series Granger causality one “leading” variable “causes” a “succeeding” variable if the leading variable proceeds the succeeding variable. The approach assumes away the possibility that expectations regarding the proceeding variable might be causing the succeeding variable to change.

My cross-sectional analysis illustrates causality going in both directions, with prevalence from trade to conflict. My time-series results with Gasiorowski on a limited number of countries (the former Eastern Block and the US) implies causality running primarily from trade to conflict. Rather important new research using more comprehensive data covering more years and a wider array of countries (Reuvany and Kang, 1996) find that “Granger causality between bilateral conflict/cooperation and international trade … tends to be reciprocal (1998, 943).” Further, Reuvany and Kang (1996) find that “the causal relationship between conflict/cooperation and trade is dyad dependent (1964).” Finally, in an interesting followup article using UN trade data Reuvany and Kang (1998) find that the strength of the conflict-trade relation also depends on the specific commodities being traded. Their results are consistent with gains from trade differing by commodity and market. As Reuvany and Kang recommend, more research is warranted in this area, as well.

VI. Where Do We Go From Here

I cannot think of any social science theory (except maybe the certainty of death and taxes) that evidence overwhelmingly supports 100% of the time. Thus, that there are significant variations in support for the conflict-trade model is not surprising. Empirical testing has only gone on a relatively short time, and it is not obvious the testing has been carried out under ideal circumstances. Thus, I advocate more work – more work refining the theory, and more work testing the model.

I see expanding the theory in several major directions. First, we need more sophistication in analyzing a complex economic system with multiple buyers and sellers trading a large number of different products with numerous countries. We need sophistication in analyzing how competition affects trade gains. Clearly gains from trade consumer and producer surpluses might not be “large” if alternative avenues from trade emerge. Similarly, the expectation of new trading partners, or the propagation of technology over time affects the present value of trade gains. Thus the analysis needs to include foreign investments.

Second, the distribution of actual and expected gains from trade should be introduced. Part of the theory claims that countries cooperate more and fight less to protect gains from trade. But how these gains from trade are distributed between countries must matter. If the trade process results in an asymmetric division of gains, will the degree of cooperation also be asymmetric? Will one side have a greater stake in protecting trade? If so, how does this asymmetry manifest itself in determining conflict and cooperation?
Perhaps this is where game theory fits in, but applying game theory is tricky because long-term repeated games often have very different solutions than games played only once in one time period.

On the empirical side, the field definitely needs to measure gains from trade better. Currently social scientists test the theory almost exclusively using trade levels rather than trade gains. We need measures of the present value of trade gains for each commodity country i trades with country j compared to the gains from trade that would be achieved from country i trading with the next best alternative. In a sense, this type trade gain is subsumed in specific commodity import and export demand and supply functions. But we don’t have estimates for these functions either. My one experiment introducing detailed bilateral import demand elasticities strengthened the conflict-trade model.\footnote{Because, as is well known, gains from trade are inversely related to these elasticities, one should find a negative correlation between cooperation and trade elasticity (and a positive correlation between conflict and trade elasticity). When Judith McDonald and I introduced these elasticities not only did we find these predicted correlations, but the inverse trade-conflict relation strengthened in statistical significance.}

Getting these measures right might require more sophisticated analysis using better data. But I think it is possible. For example, the UN keeps records of commodity by commodity trade flows along with price data. I believe using these bilateral commodity by commodity trade and prices along with appropriate cooperation and conflict measures is the prescription needed to definitively assess the conflict-trade model.

VII. Conclusion

I began this address on an autobiographical note. I illustrated how my own interest in conflict and trade emerged from an attempt to address a nagging question in labor economics. To conclude, I return to the original labor economics question to see how the international relations literature sheds light on the original problem.

Recall the trade-conflict model claims that two parties protect gains from trade by enhancing cooperation and decreasing conflict. Now let me apply to labor economics what I learned from international relations. As one would expect, all employers trade with employees; workers provide a service and corporations respond with cash, fringes and job amenities. But often trade involves more than a simple fee for services rendered. Often firms provide an atmosphere where at least some employees receive training to boost their skills and enhance their future wages. Indeed some occupations are more amenable to training than others, as are some industries. Often this training is what labor economists call “specific” because it augments skills in the firm or industry more than throughout the economy “generally.” With specific training, employees and employers share the costs and benefits. For this reason, all else constant, it is not unreasonable to suspect greater employer-employee trade the greater the amount of specific training. If the theory of trade and conflict is applicable, workers receiving the most specific training should be less unionized and strike the least.
Just as political scientists find international relations data difficult to come by, labor economists find themselves with no direct measures of specific training. However, one proxy relates specific training to the rate workers wages rise over their work life. The more quickly earnings rise, the greater the training; and the greater the training, the lower union membership and strike activity. As such, union membership and strike activity should then be inversely correlated with this earnings-work years gradient. With this in mind, I examined earnings gradients for each occupation. Using these gradients, I then estimated a logit model predicting unionization. The proportion of intra-occupation union differences predicted by these gradients is given in Table 4. As can be seen, worker-firm trade explains 10% or more of the union membership differences in 23 of the possible 28 inter-occupational categories.

I have now come full circle. I began with labor conflict and continued to international conflict, and now finally returned to labor. In both cases the trade model explained a significant portion of conflictual behavior. But in both cases the results leave room for improvement. To me, the empirical work does not question the models applicability, but rather how the conflict-trade model should be tested and applied. I look forward to next year’s Peace Science Society Meetings in Atlanta, as well as subsequent PSS conferences to assess the progress we are making.
Figure 1
Gains From Trade: The Two-Country Case
Figure 2: Conflict versus Trade

Figure 3
Country Specific Trade-Conflict Relationships: U.S. as Actor
Table 1
U.S. Union Membership and Strike Activity

<table>
<thead>
<tr>
<th>% Union</th>
<th>% Occup Striking</th>
<th>Hours Struck</th>
<th>Weeks Struck</th>
<th>% Union Members That Struck</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977 CPS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional</td>
<td>14</td>
<td>.53</td>
<td>92.6</td>
<td>2.45</td>
</tr>
<tr>
<td>Managerial</td>
<td>17</td>
<td>.22</td>
<td>75.3</td>
<td>1.83</td>
</tr>
<tr>
<td>Clerical/Sales</td>
<td>20</td>
<td>.66</td>
<td>107.5</td>
<td>2.95</td>
</tr>
<tr>
<td>Craftspeople</td>
<td>40</td>
<td>1.96</td>
<td>156.6</td>
<td>4.01</td>
</tr>
<tr>
<td>Operative</td>
<td>44</td>
<td>2.15</td>
<td>229.1</td>
<td>5.59</td>
</tr>
<tr>
<td>Laborers</td>
<td>30</td>
<td>1.10</td>
<td>123.4</td>
<td>3.28</td>
</tr>
<tr>
<td>Service</td>
<td>22</td>
<td>.76</td>
<td>130.5</td>
<td>3.48</td>
</tr>
</tbody>
</table>

Table 2
Unionization Rates by Level of Education

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Unionization Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>College Graduate</td>
<td>.193</td>
</tr>
<tr>
<td>Some College</td>
<td>.200</td>
</tr>
<tr>
<td>High School Graduate</td>
<td>.268</td>
</tr>
<tr>
<td>Grades 9-11</td>
<td>.305</td>
</tr>
<tr>
<td>8th grade or Less</td>
<td>.321</td>
</tr>
</tbody>
</table>

Table 3
Selected Dyadic Conflict and Cooperation

<table>
<thead>
<tr>
<th>Target</th>
<th>US</th>
<th>Soviet Union</th>
<th>UK</th>
<th>Egypt</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>--</td>
<td>714</td>
<td>-304</td>
<td>-53</td>
</tr>
<tr>
<td>Soviet Union</td>
<td>476</td>
<td>--</td>
<td>286</td>
<td>-277</td>
</tr>
<tr>
<td>Canada</td>
<td>-112</td>
<td>-22</td>
<td>-68</td>
<td>-3</td>
</tr>
<tr>
<td>UK</td>
<td>-373</td>
<td>254</td>
<td>--</td>
<td>307</td>
</tr>
<tr>
<td>W. Germany</td>
<td>-259</td>
<td>113</td>
<td>-142</td>
<td>-27</td>
</tr>
<tr>
<td>E. Germany</td>
<td>54</td>
<td>-128</td>
<td>25</td>
<td>-39</td>
</tr>
<tr>
<td>Egypt</td>
<td>-63</td>
<td>-277</td>
<td>307</td>
<td>--</td>
</tr>
<tr>
<td>Israel</td>
<td>-216</td>
<td>108</td>
<td>16</td>
<td>2317</td>
</tr>
<tr>
<td>China</td>
<td>240</td>
<td>93</td>
<td>56</td>
<td>-64</td>
</tr>
<tr>
<td>Japan</td>
<td>-175</td>
<td>-47</td>
<td>-34</td>
<td>-17</td>
</tr>
</tbody>
</table>

### Table 4
Proportion Inter-Occupational Unionization Differences Explained By Trade

<table>
<thead>
<tr>
<th></th>
<th>Manager</th>
<th>Sales</th>
<th>Service</th>
<th>Clerical</th>
<th>Craft</th>
<th>Laborer</th>
<th>Operative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional</td>
<td>10%</td>
<td>0%</td>
<td>100%</td>
<td>100%</td>
<td>46%</td>
<td>81%</td>
<td>43%</td>
</tr>
<tr>
<td>Manager</td>
<td>0%</td>
<td>100%</td>
<td>100%</td>
<td>52%</td>
<td>92%</td>
<td>48%</td>
<td></td>
</tr>
<tr>
<td>Sales</td>
<td>21%</td>
<td>35%</td>
<td>22%</td>
<td>33%</td>
<td>22%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service</td>
<td>0%</td>
<td>22%</td>
<td>63%</td>
<td>23%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clerical</td>
<td>10%</td>
<td>30%</td>
<td>13%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Craft</td>
<td>0%</td>
<td>25%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laborer</td>
<td>1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix: Gains From Trade

Figure 1 contains graphs for country A and country B superimposed upon each other. Country A’s graph has the origin $0_A$, and the axes $X_A$ and $Y_A$, representing the two commodities each country produces and consumes. Country B’s graph has the origin $0_B$ (in the north-east corner), and axes $X_B$ and $Y_B$. For each country, I look at the autarky and trade equilibria. Beginning with autarky, I depict (1) a production possibility frontier defining all possible X-Y production levels, and (2) a country’s social welfare function indicating overall country welfare emanating from each X-Y combination. From these I derive the equilibrium production and consumption as the tangency between the two curves. Next, I move to trade.

Begin with graphs for each country’s production. I assume each country produces only two commodities: X and Y. Country A’s production possibility frontier is given as a concave curvilinear function $Q_A^1Q_A^2$, and B’s as $Q_B^1Q_B^2$. A concave specification indicates diminishing marginal products (i.e., a country gives up smaller amounts of Y to achieve X at high Y levels of production, and vice versa), but is not necessary to get gains from trade measures. Each country’s social welfare function is denoted by a set of iso-welfare curves giving the combination of X and Y yielding a given level of welfare. In principle, there are an infinity of these curves, but for brevity I depict two for each country: $U_A^1$ and $U_A^2$ for country A, and $U_B^1$ and $U_B^2$ for country B. As was indicated, the tangency between the production possibility frontier and the iso-welfare curve yields optimal output under autarky. For country A, this is given as $Q_A^1$; and for country B as $Q_B^1$. Obviously, world output in a two-country world is: $Q_A^1 + Q_B^1$.

The question is whether each country can be made better off through trade, and as a result whether world output rises. By employing basic economic trade theory, one can easily answer affirmatively.

Assume country A moves production to $Q_A^2$ thereby producing more X but less Y than it consumed; and assume country B moves production to $Q_B^2$ to produce more Y but less X than it consumed. Now suppose country A exports $(Q_A^2 - Q_A^1)$ units of X and imports $(Q_A^C - Q_A^2)$ units of Y. Country A’s consumption is now $Q_A^C$ and B’s consumption is $Q_B^C$. Country A’s welfare will be $U_A^2$ and country B’s welfare $U_B^2$. At these new consumption levels ($Q_A^C$ and $Q_B^C$), each country’s welfare is higher. For A, the gain is $U_A^2 - U_A^1$, and for B it is $U_B^2 - U_B^1$. These are the gains from trade which arose from trade which was enhanced by more specialized production ($Q_A^2$ compared to $Q_A^1$ for A and $Q_B^2$ compared to $Q_B^1$ for B), but even if production remained at original levels $Q_A^1$ and $Q_B^1$, there still would have been gains from trade, albeit smaller.
References

Charles Anderton, and John Carter, “Another Look at the Impact of War on Trade,” 

Charles Anderton, Roxane Anderton, and John Carter, “Economic Activity in the Shadow 

Sir Norman Angell, The Great Illusion: A Study of the Relation of Military Power to 

Katherine Barbieri, “Economic Interdependence: A Path to Peace or a Source of 

Katherine Barbieri and Jack S. Levy, “Sleeping With the Enemy: The Impact of War on 

Katherine Barbieri and Gerald Schneider, “Globalization and Peace: Assessing New 
Directions in the Study of Trade and Conflict,” Journal of Peace Research, (July 1999) 

(July/August 1973) 81: 813-46.


Lee Benham, “Benefits of Women’s Education Within Marriage,” Journal of Political 

Richard Cobden, Speeches on Questions of Public Policy, (London), 1870.

Baron de Montesquieu, The Spirit of Laws, translated by Thomas Nugent, New York: 

Han Dourssen, Balance of Power Revisited: A Multi-Country Model of Trade and 

International Economy,” in Alternative Security: Living without Nuclear Deterence, 
(Burns H. Weston, ed.) (Boulder: Westview Press), 1990, pp. 137-75

Desiderius Erasmus, “Dulce Bellum Inexpertis” (circa 1512) in M.M. Phillips (ed.) 

Erik Gartzke and Quan Li, “War, Peace, and the Invisible Hand: Positive Externalities 

Mark Gasiorowski, “Economic Interdependence and International Conflict: Some Cross-

Mark Gasiorowski, and Solomon Polachek, “Conflict and Interdependence: East-West 
26:709-27.


