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Comments welcome.

# Are Export Cartels Efficiency-Enhancing or Monopoly-Promoting?

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## Abstract

This paper seeks to distinguish between monopoly and efficiency explanations for export cartels by studying the evidence on *Webb-Pomerene* associations in the United States between 1918 and 1970. I estimate reduced form export supply and world export demand equations for 16 commodities over this period. The regression results are used to determine whether industry prices and outputs during cartel episodes differed significantly from those when firms exported independently.

Export cooperation is found to have lowered prices and increased export volumes for 6 of the 16 commodities. On average, these products' export prices were 9.8% lower during cartel episodes, and their export volumes were 106.4% larger. Evidence on these cartels' stability and their role in coordinating and centralizing common services suggests that five are best explained as successful efforts to reduce firms' costs of selling overseas. The sixth cartel appears to have attempted unsuccessfully to cartelize foreign markets for monopoly gain.

For three other commodities, export cooperation led to higher prices and smaller export volumes. On average, export prices were 7.6% higher and export quantities 11.7% smaller during cartel episodes. These three cartels' persistence and their focus on price-setting and market-allocation roles provide confirming evidence that they were successful monopoly cartels.

Finally, the remaining seven commodities displayed no net price or quantity impact from cartel activity. The short lifespans of six of these cartels suggests that they were unable either to lower members' costs or to exploit any industry market power. The persistence of the seventh cartel suggests that it had exactly offsetting cost-reduction and market-power effects on export prices and quantities.

## I. Introduction

The apparent inability to reconcile various empirical phenomena in international trade with a model of perfect competition led to the application of theories of imperfect competition to international economics. Similarly, the competitive model's perceived weakness as a framework for trade policy analysis has provided the impetus behind much of the recent work in the international trade policy literature. When one departs from perfect competition, profits need not be driven to zero. In this case, trade policy can acquire a "strategic" value by redirecting those profits towards domestic producers. Examples of "strategic trade policies" identified in the literature include export restraint agreements, capital subsidies, loan guarantees and import quotas.[1] A well-developed theory of strategic trade policies now exists. However, to date there have been relatively few attempts to test the theory's predictions.[2] In addition, this literature has largely overlooked the strategic value of antitrust policy.[3] Its potential to alter international trade flows by changing the legal environment and constraints under which domestic and foreign firms compete, however, makes it conducive to empirical analysis.

The purpose of this paper is to analyze empirically the effects of a particular strategic trade policy: the antitrust exemption for export cartels. The *Webb–Pomerene Export Trade Act* permits firms in the United States to cartelize their export operations with immunity from

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1 See Helpman and Krugman (1989) and (1985), respectively, for summaries of the strategic trade policy and new international economics literatures.

2 A representative sample of existing empirical work appears in Baldwin (1988), Feenstra (1988) and Helpman and Krugman (1989). Many past studies have been forced to rely upon proxies for firm-level data and subjective estimates for unobservable variables (eg., conjectural variations parameters), despite the models' acknowledged sensitivity to firms' characteristics. This paper avoids these problems by requiring only industry level export price and volume data and by allowing the data, rather than modeling assumptions, to describe firm behavior. Furthermore, unlike many past studies which performed numerical simulations of hypothetical commercial policies, this paper tests the impact of a strategic trade policy that has actually been implemented. Finally, the paper provides empirical results for a broad cross-section of industries. Its findings therefore have wider relevance than previous industry case studies.

3 Two recent exceptions are Dixit (1984) and Ordover and Willig (1983) who consider the relationship between merger policy and international trade performance.

the antitrust laws. Under the Act, firms may set a common industry export price, establish export quotas for members and assign exclusive trading areas overseas. Cartel associations also may centralize sales-related functions that members previously had performed individually such as market research and development, negotiation of shipping rates and credit terms, and the operation of overseas sales agencies.

According to strategic trade policy theory, the *Webb-Pomerene* exemption's strategic value lies in facilitating the exercise of market power by exporting firms. If a country enjoys market power abroad, domestic producers impose a negative externality upon one another if they act perfectly competitively, failing to take account of the fact that a "large" country faces a downward-sloping export demand schedule. Collectively, competitive firms will export more than a monopolist would, leading to less favorable external terms-of-trade and a lower industry rate of return. A policy permitting export cartels enables firms to internalize this negative externality and thereby exploit the industry's national monopoly power.[4] According to this theory, cartel operation should be associated with a reduced export volume and a higher export price.

An alternative explanation for export cartels stresses the efficiency gains from reducing firms' costs of selling in foreign markets. By centralizing common sales activities, cartels allow members to avoid costly duplication of services. Additionally, if many of these sales functions involve fixed expenditures, coordination among firms will allow economies of scale to be exploited. In a competitive market, these lower costs will be passed on to buyers in the form of lower prices. If this efficiency explanation is correct, therefore, cartel

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[4] Exporters might have been acting in concert covertly prior to the antitrust exemption. In this case, the policy's benefit would lie in permitting firms to adopt more efficient means of enforcement previously rejected because of their visibility to antitrust enforcers.

The externality could also be internalized by means of an optimal export tax. Export taxes, however, are prohibited in the United States by Article I, Section 9 of the Constitution. See Eaton and Grossman (1986) for a theoretical treatment of export taxes and subsidies in imperfectly-competitive markets.

operation should be associated with an increase in the rate of export and a fall in the price of those exports.

These monopoly and efficiency explanations need not be mutually exclusive. An export cartel may allow members both to lower their costs of operation and to exploit collective overseas market power. In such cases, the net impact on export prices and volumes will depend upon the relative magnitude of these two effects.

In the empirical international trade literature, export cartels have received scarce attention. Only three papers appear to have addressed the topic directly.[5] Larson (1970) offers a historical account of the organization, membership composition and primary functions of *Webb–Pomerene* associations. While he characterizes the associations' conduct as "anti-competitive," Larson offers no empirical test of cartels' impact on export prices or quantities to support his claim. Amecher *et. al.* (1978) provide a simple graphical analysis of *Webb–Pomerene* cartels' impact on export prices for several commodities, but several fatal flaws in their analysis prevent us from drawing conclusions from their results.[6] Finally, Jacquemin *et. al.* (1981) provide a theoretical and empirical analysis of stability among Japanese export cartels. However, by implicitly assuming that the pursuit of monopoly returns is the sole objective of export cartels, their choice of empirical methodologies narrows the range of questions which their results can answer. In particular, their results do not allow a clear test of the monopoly power and efficiency hypotheses.

The evidence on cartel behavior from the industrial organization literature is mixed. Audretsch (1989, pp. 593, 597) reports that for West Germany, where many cartels are

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[5] Three very early discussions of the *Webb–Pomerene* exemption appear in the *American Economic Review*. Notz (1929), Fournier (1932) and an American Economic Association (1947) committee report provide descriptive summaries of the Act's objectives and its use by particular United States exporters.

[6] Most importantly, the authors make no attempt to control for shifts in export supply and demand schedules unrelated to cartel activity. Amecher *et. al.* do not offer a structural model of export price determination. Instead, actual commodity export prices are simply compared graphically with predicted prices from a simple least squares regression with time as a trend variable.

legal, prices rose more rapidly during cartel episodes for cartelized products than for the industry as a whole, and rose less rapidly before and after the cartel period. The opposite was true for production of cartelized goods. While Audretsch's results are suggestive of successful monopoly cartels, their interpretation is hindered by a failure to control for factors unrelated to cartel activity that might have been responsible for these relative price and output movements.

In an important paper, Asch and Seneca (1976) compared the relative profit rates of non-colluding firms and firms that were found guilty of (or did not contest) price-fixing or market-division offenses under the Sherman Act. After controlling for several industry and firm characteristics, the authors found that colluding firms earned significantly *lower* rates of return than did non-colluders.[7] Asch and Seneca themselves note the difficulty of drawing conclusions from their results given the possibility of reverse causality: low profitability may have been the stimulus for rather than the result of cartelization. Their findings are consistent, however, with the hypothesis that the cartels operated predominantly in competitive industries and were designed to assure that firms used the most efficient method of organization.

The current paper seeks to provide the first general econometric study of export cartels in the United States. To determine whether the monopoly or efficiency theory better explains the empirical evidence, I analyze firms' use of the *Webb-Pomerene* exemption over a fifty-year period. I estimate the cartels' impact on export prices and quantities for sixteen different commodities.[8] Smaller export volumes and higher export prices during periods of cartel

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[7] Asch and Seneca (1976, p. 4) controlled for industry concentration, the industry's advertising to sale ratio, the level and annual growth rate of the firm's sales, a measure of the riskiness of the firm's environment, the type of product (consumer good or producer good) and a dummy variable for the colluding firms.

[8] The commodities included in the sample are abrasives, animal feed, canned milk, carbon black, cotton linters, crude sulphur, dried fruit, metal laths, milled rice, paperboard, pebble phosphate, potash, soybeans, soybean oil, wheat flour and wooden doors.

In the absence of data on cartel members' costs and profits, export price and quantity data offer the most direct evidence with which to test the two theories.

operation will be consistent with the monopoly explanation. Larger export volumes and lower prices, however, can be consistent either with the efficiency explanation or with cartels' failure to exploit overseas market power. A supplementary test is therefore required to distinguish between these latter two hypotheses. Evidence on cartel stability provides such a test. Cartels that fail to achieve their objective of raising the price of their exports will soon dissolve. By contrast, competition will ensure that cartels that are successful in reducing firms' costs, and in turn the export price, will persist. Finally, a finding that export prices and volumes were unaffected could indicate either that a cartel was unsuccessful in lowering firms' costs or exploiting its monopoly position, or that there were exactly offsetting effects from cost reductions and the exercise of market power.

Empirically, I find that export cooperation led to lower prices and larger export volumes for 6 of the 16 commodities. On average, these products' export prices were 9.8% lower during cartel episodes, and their export quantities were 106.4% larger. Evidence on the cartels' stability suggests that five are best explained as successful efforts to reduce firms' costs of selling overseas. The sixth cartel appears to have attempted unsuccessfully to cartelize foreign markets for monopoly gain. For three other commodities, export cooperation led to higher prices and smaller export volumes. On average, their export prices were 7.6% higher and export quantities 11.7% smaller during cartel episodes. These three cartels' persistence provides confirming evidence that they were successful monopoly cartels. Finally, the remaining seven commodities displayed no net price or quantity impact from cartel activity. The short lifespans of six of these cartels suggest that they were unable either to lower members' costs or to exploit industry market power. The persistence of the seventh cartel suggests that it succeeded at both goals, but that the cost-reduction and monopoly effects on prices and quantities were exactly offsetting.

The remainder of the paper is organized as follows. Section II explains in more detail the *Webb-Pomerene* antitrust exemption. In Section III, I discuss the extent and pattern of export cartelization in the United States. Section IV provides evidence that the *Webb-*

*Pomerene* exemption offers firms significant potential benefit from cooperation. In Section V, I explain the method used to estimate cartels' price and volume effects. The regression results are presented and interpreted within the monopoly and efficiency frameworks. Section VI brings evidence on the sample cartels' stability to bear on the competing theories. An alternative explanation of cartel formation is considered briefly in Section VII. Finally, Section VIII summarizes the results and discusses their welfare implications.

## II. The Legal Status of Export Cartels

Countries whose antitrust laws are hostile towards collusion in the domestic market typically treat more leniently cooperation among firms in their export markets. In particular, virtually all countries that engage in substantial international trade activity exempt export cartels from their antitrust laws (OECD (1974)). Export cartels offer the benefits of inter-firm cooperation — whether these take the form of lower average selling costs or increased rates of return on export sales — without the costs: any potential anti-competitive price effects will be borne by foreign rather than domestic consumers. From exporting firms' standpoint, the cartel exemption provides an alternative means of securing some of the benefits of cooperation when more comprehensive methods, including horizontal merger, are precluded by political constraints.

In the United States, export cartels are exempted from the antitrust laws by the *Webb-Pomerene Export Trade Act of 1918.*[9] Essentially, the Act permits firms to establish export trading associations or cartels by exempting them from the *Sherman Act's* prohibition against contracts, combinations and conspiracies in restraint of trade, and from the merger provisions of Section 7 of the *Clayton Act.* The exemption allows exporters to organize

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[9] The exemption is codified as 15 U.S.C. §§ 61-65 (1918). A 1982 amendment to the Act (15 U.S.C. §§4011-21 (1982)) extended its provisions to apply to trade in services as well as in goods. However, the amendment also significantly raised compliance costs and therefore attention is restricted here to the period prior to 1982.

their foreign trade in ways precluded for domestic commerce. Export trade associations seeking a *Webb-Pomerene* exemption simply file their articles of agreement, list of members and annual reports with the Federal Trade Commission (FTC). No pre-formation approval is required, and no detailed reporting requirements exist.

The scope of permissible activities for *Webb-Pomerene* associations is extremely broad. For example, a cartel can require that all export sales of members be made through the association, establish a common transaction price, standardize other terms of sale, designate exclusive trading areas and assign export quotas. Export associations may set prices for members' exports and leave the mechanics of selling abroad to individual firms. Alternatively, they may centralize sales functions that members previously had carried out independently.

In a sample of twenty-three active *Webb-Pomerene* cartels in 1962, the most frequently performed functions were price-setting and market allocation (U.S. Federal Trade Commission (1967), Table III-10 and (1978), Table 1). Eleven cartels listed these as their primary function, while for eight others the associations' role as overseas sales agent was primary. The next most common cartel activity was development and provision of foreign sales representation, followed by market research, collection and dissemination of trade information, freight rate and insurance negotiation, and advertising. Other commonly performed services include providing statistical, licensing and credit services, arranging overseas storage facilities, freight consolidation and lobbying of domestic and foreign governments.

The provisions of the *Webb-Pomerene Act* and its subsequent interpretation by the courts establish three general restrictions upon cartels' permissible activities.[10] First, the

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10 15 U.S.C. §62 (1918) and *United States v. Alkali Export Association* 86 F.Supp. 59 (S.D.N.Y. 1949). See also U.S. Department of Commerce, International Trade Administration, *Guidelines for the Issuance of Export Trade Certificates of Review (Second Edition)*, 50 Fed. Reg. 1786 (January 11, 1985) for an elaboration.

associations are prohibited from restraining trade within the United States or artificially influencing their product's domestic market price. Second, associations may not restrain the export trade of a domestic competitor of the cartel, although they *may* restrict members' ability to withdraw over a "reasonable" time horizon. Finally, participation in export cartels involving firms from other nations is prohibited. In each case, the restriction is motivated by concerns that unrestricted cooperation among exporters could adversely affect domestic competition. The *Webb–Pomerene Act* is an example of how potential conflict between producer and consumer welfare objectives constrains international trade policy. Despite these restrictions, however, the wide scope of permissible activities under the Act is sufficient to allow exporting firms cartel powers in foreign markets.

## III. The Pattern of Export Cartelization in the United States

This section provides a brief background on the frequency of export cartel operation in the United States and the cartels' characteristics. More extensive descriptions of cartels' membership, product coverage and other characteristics may be found in surveys by Larson (1970) and the U.S. Federal Trade Commission (1967).

During the first fifty years of the *Webb–Pomerene* exemption, a total of 263 export trade associations representing 2,883 firms existed in the United States at one time or another. However, forty–nine percent of these, or 129 associations comprising 557 member firms, never engaged in any export–related activities (Weiner and Parzych (1972), p. 120). These cartels are best classified as "inactive," although they were registered with the FTC. Table 1 summarizes the pattern of export cartel participation in the United States since 1918. During the past twenty years, the number of registered *Webb–Pomerene* associations has never exceeded 36, and the number of active cartels has not exceeded 29. Currently, 24 export cartels comprising 249 firms are registered with the FTC. Relative to all manufacturing sector exporters, *Webb–Pomerene* firms historically have not been numerically significant.

INSERT TABLE 1 ABOUT HERE

These aggregate participation rates hide the fact that *Webb–Pomerene* associations have tended to concentrate in specific sectors. Exporters of relatively unprocessed and homogeneous commodities are far more likely to establish export cartels than are producers of differentiated manufactured goods.[11] For example, of 184 *Webb–Pomerene* cartels that were active sometime between 1918 and 1965 and whose product coverage could be established, 52 (28.3%) were in the agricultural and food products industries (U.S. Federal Trade Commission (1967), Appendix C–2). Another 61 cartels (33.2%) exported raw or semi–refined industrial products (lumber, phosphate, sulphur, copper). Relatively unprocessed manufactures (pencils, buttons) accounted for a further 10.3%. In total, 132 of the 184 active *Webb–Pomerene* associations were involved in the export of standardized, relatively unprocessed commodities. By contrast, only 6.0% (11 cartels) exported machinery and another 22.3% (41 cartels) covered processed manufactured goods such as freight cars, paints, books and motion pictures.

This pattern is consistent with either the monopoly hypothesis or the efficiency explanation for cartels. Product homogeneity lessens the scope for non–price competition among cartel members seeking to enforce a minimum export price, and also may be associated with smaller inter–firm differences in technologies and costs. Both considerations enhance the stability of a cartel seeking to earn monopoly profits.[12] Product homogeneity also increases the commonality of interests among firms in a cartel that seeks to lower members' average selling costs. Producers of similar commodities are more likely to agree

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11 By contrast, United States exports in general have tended to be concentrated among differentiated manufactured products. For a further comparison of the product composition of total U.S. exports and Webb–assisted exports, see U.S. Federal Trade Commission (1967), Table III–2.

12 For some direct empirical evidence, see Fraas and Greer (1977) and Hay and Kelley (1974).

## Table 1

### Registered and Active Export Trade Associations in the United States

| Year | Registered | Active | |
|---|---|---|---|
| 1918 | 53 | 4 | |
| 1920 | 49 | 27 | |
| 1925 | 55 | 35 | |
| 1930 | 62 | 42 | |
| 1935 | 46 | 29 | |
| 1940 | 45 | 30 | |
| 1945 | 53 | 28 | |
| 1950 | 49 | 32 | |
| 1955 | 45 | 31 | |
| 1960 | 40 | 26 | |
| 1965 | 32 | 29 | |
| 1970 | 35 | n.a. | |
| 1975 | 34 | n.a. | |
| 1977 | 27 | 23 | (estimate) |
| 1978 | 32 | 29 | |
| 1980 | 36 | n.a. | |
| 1989 | 24 | n.a. | |

*Sources:* Compiled from (i) U.S. Federal Trade Commission (1967), Appendix C-1, (ii) U.S. Federal Trade Commission (1978), p. 6, (iii) Data supplied to the author by the U.S. Federal Trade Commission, (iv) U.S. Department of Commerce, *Foreign Business Practices: Materials on Practical Aspects of Exporting, International Licensing and Investing,* various years, and (v) United Nations Conference on Trade and Development (1971), p. 36.

*Notes:* An active association is defined by the Federal Trade Commission as one that reports having provided some form of assistance to its members during the year.
n.a. denotes data not available.

on the allocation of pooled resources for market research and promotional activities and the establishment of joint sales offices overseas than are firms manufacturing heterogeneous products.

At the aggregate level, Webb–assisted products historically have not accounted for a large portion of total U.S. exports. For the Act's first fifty years of operation, cartelized exports represented 2.5% of total American exports. As recently as 1976 they accounted for just 1.5% of the total (U.S. Federal Trade Commission (1967), p. 36 and (1978), p. 15). However, these aggregate statistics again conceal significant variation across industries in usage of the cartel exemption. Table 2 reports the share of total U.S. exports that were Webb–assisted in 1939 and 1962 for a variety of products. It illustrates the variance in industries' participation in the trade policy.[13] For example, in 1939 a very high proportion of rubber, phosphate, abrasives, carbon black and redwood lumber exports were Webb–assisted. In 1962, the sulphur, motion picture and carbon black cartels assisted over half of the total U.S. exports of these three products. By contrast, in industries such as powdered milk, fresh fruit and certain types of lumber, Webb–assisted exports have constituted a very small share of total U.S. exports of these products.

**INSERT TABLE 2 ABOUT HERE**

Many export cartels dissolve relatively quickly after their creation. Exactly one–half of all active *Webb–Pomerene* associations had lifespans of not more than five years, and almost two–thirds of active cartels operated for ten years or less (U.S. Federal Trade Commission (1967), p. 26). However, the cartels' longevity varies significantly and systematically across industries. For example, while over half of all food product and non–

[13] The commodities reported in Table 2 represent those for which data were available and, as such, may not be a random sample. They are meant to be illustrative of the inter–industry variation in participation rates.

## Table 2

### Webb-Assisted Exports as a Percentage of Total United States Exports, by Product

#### 1939

| Product | Webb-assisted / Total exports |
|---|---|
| Rubber | 100% |
| Phosphate | 91-94 |
| Abrasives | 80-97 |
| Carbon black | 71-77 |
| Redwood lumber | 70-77 |
| Textiles | 70 |
| Alkali | 64 |
| Dried fruit | 46 |
| Douglas fir lumber | 27 |
| Hardwood | 18 |
| Potash | 14-22 |
| Walnut lumber | 10 |
| Fresh fruit | 2 |
| Powdered milk | 1 |

#### 1962

| Product | Webb-assisted / Total exports | |
|---|---|---|
| Sulphur | 86.1% | |
| Motion pictures & TV films | 80 + | (estimate) |
| Carbon black | 69.8 | |
| Phosphate | 44.7 | |
| Potash | 24.0 | |
| Pulp, paper & paperboard | 14.3 | |
| Rice | 13.8 | |
| Soybean oil | 8.4 | |
| Machine tools | 4.6 | |
| Milled flour products | 3.4 | |
| Powdered milk | 1.0 | |
| Lumber | 0.2 | |
| All industries | 2.3 | |

*Sources:* For 1939, U.S. Senate (1946), Table B, Part I.
For 1962, U.S. Federal Trade Commission (1967), Table III-5.

metallic mineral products cartels dissolved within five years of their creation, over forty percent of all cartels for chemicals and over twenty-five percent of all wood and paper products cartels operated for more than twenty years. Metals and textile cartels' median lifespan lay between these two groups (U.S. Federal Trade Commission (1967), p. 32). In Section VI, I discuss in detail the stability of the sampled *Webb–Pomerene* cartels and use this evidence to distinguish between the monopoly and efficiency hypotheses.

## IV. Four Determinants of Export Cartels' Potential Value

The nature and extent of the *Webb–Pomerene* exemption's value will depend upon the characteristics of firms' domestic and foreign markets. Data on a cartel's world market share, the organization of its buyers, the types of costs incurred in selling overseas and firms' individual scales of operations offer a preliminary appraisal of whether a cartel was intended to capture monopoly profits or to increase exporting efficiency. The monopoly hypothesis is a more plausible explanation for export cartels that have a large share of the world market and face relatively unorganized buyers. The efficiency explanation, by contrast, is most likely to be relevant when firms incur large fixed costs to serve export markets and are small relative to the size of the total market. The available data indicate that the sample includes both types of cartels.

A cartel's share of total output in its market is one determinant of its ability to raise prices.[14] The United States accounted for a large fraction of the total world supply for some cartelized products, including carbon black (a minimum of 80% of world production in 1963), crude sulphur (50%) and phosphate (45%).[15] For these products, it is possible that monopoly returns were the cartel's primary objective. By contrast, U.S. production was

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14 Clearly, cartel members' initial market share provides an upper estimate of their ability to influence the world price because of the positive foreign supply response that will accompany any price increase.

15 Data in this paragraph are taken from Larson (1970), p. 481, Statistical Abstract of the United States (1958), p. 647, and U.S. Department of Commerce (1969), p. 4.

much less significant among several other *Webb–Pomerene* products, including milled rice (1.1% of 1957 world output), paperboard (13.0% of 1968 world exports), and canned milk (8.0% of 1968 world exports). The presence of close substitutes for an export commodity also severely constrains a cartel's potential market power. Thus, while the United States accounted for 78.8% of total world soybean oil exports in 1957, its exports represented only 3.5% of total world exports of edible vegetable oils. The situation for animal feed, cotton linter, dried fruit and wheat flour exports was similar. Cartels covering these products are less likely to have been motivated by the pursuit of monopoly profits.

Cooperation among purchasers can also reduce the potential value of cartelizing a market for monopoly profit. The existence of organized purchasers with monopsony power will constrain an export cartel's ability to exercise power over the market price.[16] Coordination among importers also reduces the potential gains for efficiency–seeking cartels by lowering firms' costs of identifying and serving buyers. Both theories therefore predict that, all else equal, export cartels will be discouraged in industries where there are a few large importers. The theories differ, however, in their predictions about the importers' *response* to cartelization among their suppliers. The efficiency theory predicts no change in importers' organizational structure following the formation of an export cartel. By contrast, if export cartels are successful in raising prices, importers may respond by coordinating their purchases so as to form a countervailing import cartel. One example of such a response is found in the crude sulphur industry. In the early 1960's, sulphur importers in Australia, New Zealand and the United Kingdom established a joint purchasing cartel in reaction to price increases by the American export cartel Sulexco.[17]

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16 Alternatively, Stigler (1964) has argued that if buyers are atomistic, price cuts to individual customers will be relatively unprofitable and therefore cheating will pose less of a threat to the cartel's success.

17 Larson (1970, p. 481) and United Nations Conference on Trade and Development (1971, p. 6) offer more complete accounts of the sulphur import cartel. There have been few other instances in which foreign import cartels have arisen in response to *Webb–Pomerene* cartels' activities.

The type of costs incurred by exporting firms and their scale of operations determine the potential savings from coordinating overseas selling to exploit economies of scale. Many of the activities that export associations may perform primarily involve fixed costs. These include market research and development, negotiation of shipping rates with carriers, providing common overseas sales agencies, consolidating freight orders, and providing credit and information collection and statistical services. The principal advantage of centralizing these functions lies in the cartel's ability to spread fixed costs over a large rate of export sales. Doing so reduces the average cost of exporting which, under competition, will lead to a fall in the export price.

Cartels whose primary role was to consolidate common sales services include cotton linters, dried fruit, milled rice, paperboard, soybean oil and wheat flour (U.S. Federal Trade Commission (1967), pp. 48-56 and U.S. Senate (1946), Exhibit 5). These industries were also relatively unconcentrated, implying that the scale of individual firms' operations was small relative to the market. This further increased firms' potential average cost savings from export cooperation. By contrast, cartels such as carbon black, crude sulphur and phosphate had as their primary functions the setting of common export prices and allocation of markets among members (*ibid.*). These cartels performed relatively few cost-saving services. Moreover, average firm size in these industries was significantly larger, suggesting that the firms would have been able to exhaust internally most economies of scale in distribution, promotion and sales activities. These latter cartels therefore appear better explained by the monopoly theory.

The evidence presented in this section indicates that the *Webb-Pomerene* exemption offered exporters significant benefit from cooperation. In some industries such as carbon black, crude sulphur and phosphate, the potential benefit appears to have been the opportunity to exploit foreign market power. For other industries including animal feeds, canned milk, cotton linters, dried fruit, milled rice, paperboard, soybean oil and wheat flour, increased efficiency from exploiting economies of scale appears to have been the source of

the potential benefit. The next section presents econometric evidence consistent with these conclusions.

## V. The Price and Quantity Effects of *Webb-Pomerene* Cartels

This section estimates the export price and quantity effects of sixteen *Webb-Pomerene* cartels between 1919 and 1970. I compare the commodities' export prices and volumes in and out of cartel episodes, controlling for factors unrelated to cartel activity that may have led to shifts in the export supply and world export demand schedules. The estimation procedure and data set are explained in Part A. Part B reports the regression results and interprets them within the context of the monopoly power and efficiency theories. The results are then compared with the existing empirical literatures on cartels in industrial organization and international trade.[18]

### A. The Data and Estimation Methodology

The cartelized products chosen for the sample are abrasives, animal feed, canned milk, carbon black, cotton linters, crude sulphur, dried fruit, metal laths, milled rice, paperboard, pebble phosphate, potash, soybeans, soybean oil, wheat flour and wooden doors. These 16 commodities were chosen on the basis of data availability and are representative of *Webb-Pomerene* cartels' product coverage. The commodities are homogeneous and relatively unprocessed, and their quality has remained essentially constant over the sample period. These attributes allow us to focus on industry-level price and quantity data and to avoid the

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[18] Estimating cartels' ability to price discriminate across markets would provide an alternative test of the monopoly power theory. However, the lack of market-specific data for many of the relevant variables precludes such a test. Some descriptive evidence on price discrimination by export cartels is reported in Temporary National Economic Committee (1940, chs. V and VI). While interpretation of the available evidence is difficult, it appears that for only 9 out of 76 sampled products did export and domestic prices differ systematically.

usual problems associated with changes in product quality and production technology over time.

The lifespan of the sample cartels ranges from one year to thirty seven years, although many products had multiple (and sometimes coexisting) cartels over the sample period. Appendix A summarizes the export cartels in the sample and identifies their product coverage and dates of operation. The years during which no export association operated in a particular industry provide a natural control period for estimating *Webb–Pomerene* cartels' price and volume effects. (Issues related to the endogeneity of cartel operation are dealt with in detail in Section VI. For the present, these decisions are treated as exogenous to the model.)

To estimate the price and volume effects of *Webb–Pomerene* cartels, I construct structural export supply and world export demand equations for each commodity. Reduced form equations for export prices and quantities are then derived and estimated over the sample period 1919 to 1970 using annual data. The simultaneous equation methodology used to estimate the cartels' price and quantity effects follows closely the approach developed in Goldstein and Khan (1978).[19] A detailed description of the data sample and sources is provided in Appendix C.

The Export Supply Schedule. The quantity of commodity *i* supplied in year *t* by United States exporters is a function of its relative price, the political setting (wartime or peacetime) and the presence or absence of an active cartel association.[20] Using a log–linear specification,

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19 See Goldstein and Khan (1985) for a thorough treatment of several methodological issues related to the simultaneous estimation approach.

20 Input prices might also be expected to enter the regression supply equation. However, consistent commodity–level data were unavailable for the long sample period considered in the paper. Wholesale price data were only available at a highly aggregated level (2 digit SIC) and wage rate data were restricted to the sectoral level (agriculture, mining and manufacturing). In early estimations, I included the sectoral wage rate variable, but its presence did not affect the results. I report the regression estimates without this variable.

$$(1) \quad \log Q^{s}_{i,t} = \alpha_0 + \alpha_1 \log P_{i,t} + \alpha_2 \log P^{D}_{I,t} + \alpha_3 \log P^{E}_{I,t} + \alpha_4 WW2_t + \alpha_5 WP_{i,t} + \eta_{i,t}$$

where $Q^{S}_{i,t}$ is the quantity of commodity *i* exports supplied in year *t*, $P_{i,t}$ is the price of those exports, $P^{D}_{I,t}$ is the domestic wholesale price for the corresponding product group *I*, $P^{E}_{I,t}$ is the group export price, $WW2_t$ is a dummy for World War II and $WP_{i,t}$ is a dummy for years in which a *Webb–Pomerene* cartel was active.

To capture exporting firms' relative supply opportunities and to control for cost disturbances in the domestic and export markets, I include two aggregate price indices in the export supply function.[21] The first index ($P^{E}_{I,t}$) is the average export price for the commodity's product group.[22] This index assigns each of the 16 commodities to one of five broad categories: crude foods, manufactured foods, crude materials, semi-finished manufactures and finished manufactures. The second index ($P^{D}_{I,t}$) is the domestic wholesale price for commodity *i*'s product group. The U.S. wholesale price index (WPI) was available for seven product groups: farm products, foods, chemicals, non-metallic minerals, metals and metal products, wood products and industrial goods.[23] If these variables reflect primarily exporters' relative supply alternatives, we expect them to enter (1) negatively. Alternatively, if they capture sectoral cost disturbances, a positive relationship is predicted.

Two dummy variables are also included in the export supply equation. The first is $WW2_t$ which takes on the value one for 1939 to 1945. This dummy is designed to control for the effects of wartime price and production controls and possible political pressures on U.S.

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[21] To avoid the problem that prices and quantities of direct substitutes for commodity *i*'s exports will be indirectly influenced by cartel activity in that industry, I use sectoral price indices. In this way, all price and quantity effects from cartel operation are isolated in the *Webb–Pomerene* dummy.

[22] While this index is a volume–weighted average of all component commodity prices in product group *I*, the weight received by any single export price $P_{i,t}$ is small enough to avoid problems of multicollinearity.

[23] Appendix C indicates the product groups to which each of the 16 sample commodities were assigned.

exporters selling in Allied nations' markets.[24] If firms in *Webb–Pomerene* cartels increased domestic production at the expense of export sales during this period, $WW2_t$ is expected to enter negatively. Conversely, if the cartels increased exports of essential commodities to Allied nations during the war, $\alpha_4 > 0$ is predicted.

The final independent variable is a dummy that distinguishes years in which a *Webb–Pomerene* cartel was active in the industry ($WP_{i,t} = 1$) from those in which firms exported independently ($WP_{i,t} = 0$).[25] If the monopoly theory is correct, cartels will restrict their exports to exploit the industry's market power overseas, implying $\alpha_5 < 0$. If the efficiency theory is correct, cooperation will lead to lower average selling costs and thus an increased volume of exports, implying $\alpha_5 > 0$.

The World Export Demand Schedule. World export demand for commodity $i$ in year $t$ is expressed in log-linear form as:

$$(2) \qquad \log Q^{*D}_{i,t} = \beta_0 + \beta_1 \log P_{i,t} + \beta_2 \log P^*_t + \beta_3 \log Y^*_t + \beta_4 \text{trend}_t + \varepsilon_{i,t}$$

where $Q^{D*}_{i,t}$ is the quantity of commodity $i$ exports demanded in year $t$, $P_{i,t}$ is the export price of commodity $i$, $P^*_t$ measures the foreign price level, $Y^*_t$ measures foreign real income, and $trend_t$ is a time trend.

The variables $P^*_t$ and $Y^*_t$ control for shifts in export demand due to changes in relative prices and foreign real income, respectively. Increases in importing countries' average price level or real income are expected to shift outward the world demand schedule for United States exports. Both of these variables are therefore expected to enter positively. Magee (1975) has noted, however, that increases in foreign real income could be equally consistent with a *decline* in export demand, even if the good were superior in consumption. Because a

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24 Almost half of all Webb-assisted export earnings were made in Western European markets, with higher percentages for industrial raw material and non-food consumer product exports (U.S. Federal Trade Commission (1967), Tables III-3a and 3b).

25 I define a cartel to be active in any given year if it operated for at least six consecutive months.

country's exports are simply the residual demand of its trading partners, increases in foreign real income can lead to reduced exports if foreign production grows faster than foreign consumption in response to an increase in income. By a similar argument, increases in the foreign price level could lead to a positive foreign supply response that exceeds the growth in consumption demand.

Empirically, Magee (1975) reports that relatively few studies have found significant negative coefficients on the foreign income variable. Magee also argues that failure to distinguish between cyclical and secular income effects and to capture the effects of trade liberalization are primarily responsible for these empirical results. To correct for both of these potential biases, therefore, a time trend variable is included in the world export demand equation. If this time trend captures secular income movements, then the coefficient on $trend_t$ is expected to be negative.[26] Conversely, if the dominant secular trend has been trade liberalization, the expected sign for $trend_t$ is positive. Even after controlling for these two effects, however, it is still possible that the foreign real income and price level variables may assume either sign in (2).

I use two alternative measures for foreign real income and prices. The first set of data emphasize geographic breadth at the expense of industry detail. I construct weighted averages of aggregate real GNP and the wholesale price index for five of the United States' six largest trading partners: Canada, France, Japan, Mexico and the United Kingdom.[27] The weights used for these series reflect the relative importance of each country to total United States exports in that year. The second set of foreign real income and price level variables

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[26] The empirical evidence summarized in Goldstein and Khan (1985, p. 1084) suggests a negative coefficient. Bazdarich (1979) found that cyclical increases in U.S. GNP led to deteriorations in its balance of payments, while increases in trend income had the opposite effect. Similar conclusions can be drawn from Geraci and Prewo (1980)'s finding that the United States' long-run export supply elasticity with respect to trend real income exceeded the corresponding import demand elasticity.

[27] Complete data for the sixth country in this group, Germany, were not available in several years. The constructed series therefore are restricted to the other five countries.

cover only Canada and the United Kingdom, the United States' two largest trading partners over the sample period.[28] Restricting attention to these two countries allowed a greater level of disaggregation in the data. I constructed export-share weighted averages of these countries' real food consumption, agricultural output and industrial production, their consumer price index for foods and their general wholesale price index.[29]

I estimated the regression equations using both measures of foreign real income and prices. A simple check against mis-specification or measurement error can be made by verifying that the coefficients on the *Webb-Pomerene* dummy take the opposite sign in the price and quantity regressions. It turns out that this criterion is satisfied for all 16 commodities when the sectoral British and Canadian real income and price data are used. The criterion is violated for five commodities (abrasives, animal feed, canned milk, cotton linters and soybeans) when using the alternative price and income series. Significantly, however, the sign, order of magnitude and level of significance of the *Webb-Pomerene* dummies are insensitive to the choice of data for the remaining eleven commodities. In Section V.B, I therefore report only the results using the British and Canadian series.

The reduced form equations for export prices and volumes can be derived from (1) and (2). They are:[30]

$$\log P_{I,t} = \gamma_0 + \gamma_1 \log Y_t^* + \gamma_2 \log P_t^* + \gamma_3 \log P_{I,t}^D + \gamma_4 \log P_{I,t}^E$$

$$+ \gamma_5 WW2_t + \gamma_6 \text{trend}_t + \gamma_7 WP_{I,t} + u_{I,t}. \qquad (3)$$

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28 Canada and the United Kingdom jointly accounted on average for 29% of total U.S. exports during the sample period, and in some years accounted for over 45% of the total. By contrast, on average France, Japan and Mexico collectively accounted for 14% of U.S. exports and never more than 18% (U.S. Department of Commerce, Bureau of the Census (1975) *Historical Statistics of the United States: Colonial Times to 1970*, p. 903).

29 Appendix C identifies the price and income series used for each commodity.

30 Expressed in terms of the underlying structural parameters, $\gamma_7 = \alpha_5/(\beta_1-\alpha_1)$ and $\delta_7 = \alpha_5\beta_1/(\beta_1-\alpha_1)$.

$$\log Q_{i,t} = \delta_0 + \delta_1 \log Y_t^* + \delta_2 \log P_t^* + \delta_3 \log P_{I,t}^D + \delta_4 \log P_{I,t}^E$$

$$+ \delta_5 WW2_t + \delta_6 trend_t + \delta_7 WP_{i,t} + v_{i,t}. \quad (4)$$

For the reasons given earlier, it is not possible *apriori* to sign definitively the coefficients for $Y_t^*$, $P_t^*$, $P_{I,t}^D$, $P_{I,t}^E$, $trend_t$ and $WW2_t$. Importantly, however, our interest lies in the impact of the *Webb–Pomerene* dummy. Under the monopoly hypothesis, the predicted signs are $\gamma_7 > 0$ and $\delta_7 < 0$. According to the efficiency explanation, we expect $\gamma_7 < 0$ and $\delta_7 > 0$.

## B. Estimation Results and Interpretation

The regression results for the reduced form price and quantity equations are reported in full in Appendix B. For most products, a significant portion of the total export price and volume variation is explained by the seven independent variables. The adjusted $R^2$ for the price regressions averages .78 and for the quantity regressions the average is .77. The results for individual regressors are mixed. Foreign real income is significant (at the 10% level or lower) in three of the quantity regressions and in three of the price regressions. In three cases, this variable enters positively (as the theory predicts in the absence of domestic production in the importing country), while in the remaining cases its negative coefficient is consistent with the residual foreign demand interpretation of exports. The foreign price level enters significantly in six of the price regressions and in seven of the quantity regressions. Again, the sign pattern across different commodities is mixed, illustrating the difficulty of predicting relative price effects in the presence of foreign production.

The domestic wholesale or export price index for a commodity's product group enters significantly in thirteen of the price regressions and in nine of the quantity regressions. Where significant the price indices enter positively in the price equations, with the exception of metal laths and potash. This suggests that the variables are primarily capturing the effects of sector-wide disturbances rather than changes in firms' relative supply opportunities.

The World War II dummy is rarely significant, indicating that export behavior during wartime did not differ greatly from that in the rest of the sample period. For a few products such as soybeans, however, the war did lead to large changes in export prices and volumes. Finally, the time trend enters significantly in nine of the quantity regressions and in six of the price regressions. Its predominantly positive impact on export quantities suggests that the time trend is primarily capturing the effects of trade liberalization over the sample period.

Table 3 reports the established coefficients for the *Webb–Pomerene* dummies in the export price and quantity regressions, together with their significant levels. The cartel dummy enters negatively in eleven of the sixteen price regressions and is significantly negative at the 20% level or lower for three commodities: dried fruit, milled rice and potash. The dummy enters positively in the remaining five price equations and is significant at the 20% level or lower for crude sulphur and pebble phosphate. The results for the quantity regressions mirror these findings, although the *Webb–Pomerene* dummy's significance level occasionally differs. Cartel operation has a positive and significant impact on five products' exports: canned milk, dried fruit, metal laths, milled rice and paperboard. By contrast, only carbon black exports were significantly lower when *Webb–Pomerene* cartels were active.

INSERT TABLE 3 ABOUT HERE

The regression results may be summarized as follows. For six commodities, cooperation among exporting firms either led to a lower average price, a larger export volume, or both. For these commodities, the average price reduction in any given year attributable to the cartel's presence was 9.8% and the corresponding average increase in export quantities was 106.4%.[31] These findings are consistent with the efficiency theory or with unsuccessful

[31] For these six commodities, the percentage price difference between years in which the cartel was active and years in which it was inactive are as follows: canned milk (-9.9%), dried fruit (-14.9%), metal laths (-2.4%), milled rice (-8.0%), paperboard (-16.05%) and potash (-7.7%). The corresponding increases in export volumes for the same products are:

## Table 3

### The Price and Quantity Effects of Export Cartels
### (Coefficient on Webb–Pomerene Dummy Variable)

(t–statistics appear in parentheses)

| Commodity | WP Dummy in Price Regression | Signif. Level | WP Dummy in Quantity Regression | Signif. Level |
|---|---|---|---|---|
| Abrasives | –0.041<br>(–0.35) | 72.8% | 0.030<br>(0.24) | 81.4% |
| Animal Feed | –0.076<br>(–0.45) | 65.5% | 0.019<br>(0.08) | 94.3% |
| Canned Milk | –0.104<br>(–0.60) | 55.1% | 1.445<br>(1.61) | 11.4% |
| Carbon Black | 0.070<br>(1.09) | 28.1% | –0.221<br>(–1.82) | 7.8% |
| Cotton Linters | 0.045<br>(0.37) | 71.3% | –0.013<br>(–0.04) | 96.8% |
| Crude Sulphur | 0.061<br>(1.61) | 11.5% | –0.087<br>(–1.21) | 23.4% |
| Dried Fruit | –0.161<br>(–1.39) | 17.1% | 0.320<br>(1.85) | 7.1% |
| Metal Laths | –0.024<br>(–0.61) | 54.3% | 0.626<br>(2.58) | 1.5% |
| Milled Rice | –0.083<br>(–1.85) | 7.1% | 0.366<br>(1.42) | 16.3% |
| Paperboard | –0.174<br>(–0.88) | 38.4% | 0.756<br>(4.20) | 0.0% |
| Pebble Phosphate | 0.088<br>(1.36) | 18.2% | –0.073<br>(–0.42) | 67.5% |
| Potash | –0.080<br>(–1.68) | 10.1% | 0.282<br>(0.88) | 38.3% |
| Soybean Oil | –0.121<br>(–1.17) | 24.7% | 0.535<br>(0.93) | 35.7% |
| Soybeans | –0.066<br>(–1.11) | 27.8% | 0.187<br>(0.75) | 46.1% |
| Wheat Flour | –0.004<br>(–0.05) | 96.3% | 0.167<br>(0.96) | 34.2% |
| Wooden Doors | 0.103<br>(1.26) | 21.6% | –0.242<br>(–1.00) | 32.4% |

attempts to cartelize the export market for monopoly gain. For three other commodities, the consequence of cooperation among firms was to raise prices and / or lower export volumes relative to when firms exported independently. Here, the average annual price increase attributable to cartel activity was 7.6% and the decline in export volume was 11.7%.[32] These findings are consistent with the monopoly theory of cartel behavior. Finally, the remaining seven commodities displayed no net price or quantity impact from cartel operations.[33] Either these cartels were unable to reduce members' costs or exploit collective market power abroad, or cost reductions were exactly matched with price increases (quantity decreases) resulting from the successful exercise of market power.

These results provide little support for Larson (1970)'s conclusion that the pursuit of monopoly profits abroad guided cartel activity. Larson contended that small exporters rarely made use of the *Webb-Pomerene* exemption and therefore rejected the hypothesis that exploiting economies of scale and promoting efficiency in overseas markets motivated cooperation among firms. In fact, however, as Section IV indicated, many *Webb-Pomerene* cartels such as animal feeds, canned milk, dried fruit, milled rice, paperboard, soybean oil and wheat flour consisted of numerous small firms. Firms in these industries also accounted collectively for a very small fraction of total world production or exports. Finally, as Section IV also noted, these industries' cartels acted primarily to centralize sales-

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canned milk (324.2%), dried fruit (37.7%), metal laths (87.0%), milled rice (44.2%), paperboard (113.0%) and potash (32.6%). The relative magnitude of these price and volume effects imply that these *Webb-Pomerene* cartels faced relatively elastic foreign demand schedules, due in part to the many close substitutes available for each commodity.

32 For these six commodities, the percentage price difference between years in which the cartel was active and those in which it was inactive are as follows: carbon black (7.3%), crude sulphur (6.3%) and pebble phosphate (9.2%). The corresponding declines in export volumes are: carbon black (19.8%), crude sulphur (8.3%) and pebble phosphate (7.0%). In contrast to the first six commodities, the relative magnitudes of these price and quantity effects indicate that these three cartels faced relatively inelastic foreign demand schedules.

33 These seven commodities are abrasives, animal feeds, cotton linters, soybean oil, soybeans, wheat flour and wooden doors.

related services among member firms. These industry features are inconsistent with a monopoly explanation for cartels. The regression results in Table 3 confirm this and indicate that cost reductions led directly to lower export prices and larger export volumes in these industries.

In contrast, for only three industries does inter-firm cooperation appear to have had an anti-competitive impact. Additional evidence supporting the competitiveness of international commodity markets is provided by Eckbo (1976). Of the 51 international commodity cartels that Eckbo traced, only 19 achieved their stated objective of raising world prices. Furthermore, only 5 of these 19 cartels displayed significant price effects for ten years or longer (pp. 26, 41-42). Unfortunately, Eckbo does not report whether any of the 32 "unsuccessful" cartels led to lower commodity prices.

## VI. The Stability of Cartel Agreements

Thus far, a cartel's period of operation has been treated as exogenously determined. The theoretical literature on cartel stability, however, offers compelling reasons why the stability of collusive agreements should be sensitive to the economic environment in which firms operate. Stigler (1964), Telser (1988), Green and Porter (1984) and Rotemberg and Saloner (1986) identify the level and variance of industry demand, product homogeneity, industry concentration, stability of cost conditions and the size and organization of buyers as factors that are likely to affect cartel stability. Empirically, substantial evidence has been found to support these hypotheses.[34]

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[34] Jacquemin *et. al.* (1981)'s study of Japanese export cartels identified industry concentration, product 'newness' and the growth rate of industry demand as determinants of stability. Hay and Kelley (1974) and Fraas and Greer (1977) found that price-fixing agreements were more likely to arise and endure in concentrated industries with relatively few producers, when there was little inter-firm cost variation, when production technologies remained relatively constant over time and when the product was homogeneous. Suslow (1988) found that the probability of cartel survival was negatively correlated with economic downturns and the number of member firms, and positively correlated with the cartel's share of the world market.

The large variance in the sample cartels' periods of operation, from one year to 37 years, further underscores the importance of addressing cartel stability. A cartel's stability is expected to vary systematically according to its primary objective — reducing members' selling costs or earning monopoly profits — and its success or failure in attaining that goal. This fact and the evidence on *Webb–Pomerene* cartels' stability allow us to distinguish further between competing explanations for the regression results of Section V.

Export cartels that earn supra–competitive rates of return must be able to overcome the free–riding and internal chiseling problems that will accompany this success. Monopoly cartels that fail to detect and punish chiseling or that are unable to prevent entry or expansion by non–members will eventually dissolve.[35] Failed monopoly cartels will be identified either by no change in the industry's long–run equilibrium export price and quantity or, depending upon the acuteness of the free–riding, chiseling or entry, by a decline in the price level and increase in industry output. Monopoly cartels that overcome these threats to their stability will be identified by a sustained increase in export prices and a corresponding sustained reduction in export volumes.

Cartels that seek to lower members' average selling costs are expected to have relatively long lifespans if they are successful. These cartels will be associated with a lower export price and a higher rate of export production. Unlike successful monopoly cartels, these efficient cooperatives will not earn supra–competitive profits and therefore no free–riding or chiseling incentives will arise to threaten their stability. Moreover, if cooperation does lead to cost savings, competition will ensure that the firms continue to coordinate their export activities. This fact allows us to distinguish between unsuccessful monopoly cartels and successful efficient cartels. While cartels in either group may be associated with lower prices

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[35] In a survey by the Federal Trade Commission of *Webb–Pomerene* associations, the most often cited reason for cartel dissolution was inability to meet foreign price competition (U.S. Federal Trade Commission (1967), Table II–3).

and increased volumes of exports, unsuccessful monopoly cartels will on average be of shorter duration.

Finally, cartels may have no net impact on export prices and volumes. This finding could indicate an unsuccessful attempt to reduce members' costs or to exploit collective market power abroad. Alternatively, it could indicate that cartels had exactly offsetting cost-reduction and market-power effects on industry prices and quantities. Cartels of the first type are expected to dissolve quickly because they offer no benefits to members. Unless chiseling, free-riding and entry problems are solved, the second group of cartels will also tend to be unstable.

These implications may be used to classify the sample cartels. I consider first carbon black, crude sulphur and pebble phosphate, the three commodities whose export price increased and volume of exports decreased during cartel episodes. The first crude sulphur and pebble phosphate cartel agreements lasted for 29 and 31 years, respectively. Out of the 52 years in the sample period, United States sulphur exports were under cartel control for 42 years and pebble phosphate exports for 38 years. After an initial unsuccessful attempt to collude in 1929, a carbon black cartel operated continuously from 1934 through the early 1970's. These three commodities' cartels had the longest uninterrupted periods of operation in the sample group. As noted in Section IV, these cartels each controlled between 45% and 80% of total world production. Their primary function was to establish common export prices and allocate markets among member firms rather than to consolidate common services. Finally, the results in Section V.B indicated that these commodities' prices were on average 7.6% higher and their export volumes 11.7% lower during cartel episodes than when firms exported independently. Their significant stability offers further supporting evidence that they were successful monopoly cartels.

Among the six commodities for which export prices were lower and quantities were higher during cartel episodes, five appear best explained by the efficient cartel theory. Canned milk, dried fruit, milled rice, paperboard and potash each had *Webb-Pomerene*

associations that operated continuously for more than twenty years, although in several instances these were preceded by unsuccessful attempts at cooperation (see Appendix A). Section IV indicated that the United States accounted for an extremely small share of total world production or exports in these industries, and that the commodities had many close substitutes in demand. It was also noted that these cartels' primary function was to centralize and coordinate common services such as market research and development, credit and statistical services, consolidation of freight orders and operation of overseas sales agencies. The stability of these cartel organizations and their economically significant price reductions and output increases (Table 3) offer further compelling evidence that they were successful cost-saving cartels.

Of this group of six cartels only the Metal Lath Export Association appears possibly indicative of an unsuccessful attempt to cartelize export markets for monopoly gain. Export prices were higher and output lower during cartel episodes, but the Association dissolved after 12 years' operation between 1929 and 1941. Had it been a successful efficient cartel, we would have expected it to continue operating for a longer period. Unfortunately, more detailed information on this cartel's activities and its share of the world market are not available.

Finally, among the seven commodities whose cartels displayed no significant net impact on export prices or volumes, cartels covering six products were of relatively short duration. The *Webb-Pomerene* associations for animal feeds, cotton linters, soybean oil, soybeans, wheat flour and wooden doors had average durations of 7.5 years. This evidence is potentially consistent with unsuccessful attempts to lower costs or raise prices, or with offsetting cost reductions and market power exploitation. It appears that the first two explanations are the most consistent with the data. The relatively small share of total world production accounted for by the United States in these industries (Section IV) would have hindered the exercise of national monopoly power. Section IV also indicated that several of these cartels sought primarily to coordinate common services among member firms, which is

consistent with an efficiency explanation. Had these associations been successful in reducing members' costs, however, we would have expected them to continue operating for a longer period of time.

For the final commodity, abrasives, its long cartel episodes (9 and 23 years) suggest that export cooperation did offer firms significant benefit, and that this benefit was divided between reductions in selling costs and exercise of overseas market power. Some supporting evidence for this conclusion is found in the list of activities performed by the Durex Abrasives cartel. Durex acted as the sole export agent for its members and negotiated exclusive arrangements with foreign distributors. These functions may have facilitated enforcement of a monopoly agreement. The cartel also offered several cost-saving services, however, such as cooperative purchasing of cargo space and establishing common quality standards for abrasives (U.S. Federal Trade Commission (1967), p. 57 and U.S. Senate (1946), pp. 36-37).

To summarize, the evidence for the 16 commodities on cartels' price and quantity effects, their functions, industry characteristics and stability suggest that five were successful efficient cartels, three were successful monopoly cartels, one had offsetting efficiency and monopoly effects on prices and outputs, one was an unsuccessful monopoly cartel, and six were unable either to lower firms' costs or to exploit industry market power.

## VII. An Alternative Explanation of Cartel Operation

The paper tests the hypothesis that export prices and volumes during cartel episodes differed significantly from those observed when firms exported independently. Underlying this test is the assumption that cartels form either to raise prices or to lower costs in absolute terms. Alternatively, cartels may seek to prevent prices from falling or costs from rising. According to this argument, cartels will operate only in periods when they expect the world price to be unusually low, or when they expect operating costs to be above normal.

Such behavior would be consistent with a political economy explanation of policy administration. Peltzman (1976) explains how policy-makers must trade off producer and consumer support when deciding what level of protection to supply to firms. If *Webb-Pomerene* cartels indirectly raised prices in the domestic market, policy-makers would have found granting antitrust immunity costly in terms of reduced consumer support. To compensate, policy-makers would reduce other advantages received by exporters. Recognizing this, firms would make selective use of the *Webb-Pomerene* exemption, using it only when the expected net gain exceeded the value of the political goodwill that they would forfeit. This implies that cartels will only be active when prices (costs) are expected to fall below (lie above) their trend or normal value.

The regression results presented in Table 3 do not allow a test of this hypothesis. The alternative behavioral hypothesis may be tested instead by examining changes in commodities' export prices immediately after a cartel dissolves. A cartel seeking to dampen price declines should not experience a fall in price immediately after it dissolves if members have rational expectations about future prices. Correspondingly, an efficiency-seeking cartel that strives to dampen cost (and hence price) increases should not experience a price rise immediately after dissolution.

The data necessary to perform this test are available for 14 of the 16 commodities.[36] I deflated the individual commodities' export prices by the United States aggregate export price level to construct real price indices. I then verified whether the real export price rose or fell after a cartel dissolved. For eight cartels the real export price fell after each dissolution, a finding that is inconsistent with the alternative monopoly hypothesis. (The eight industries in this group are carbon black, cotton linters, metal laths, milled rice, paperboard, pebble phosphate and soybeans.) For six cartels the real export price rose after each dissolution, a

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[36] The soybean oil cartel continued to operate after 1970, the end of the export price data series. The canned milk cartel dissolved in 1947 and export price data were unavailable for all commodities in that year.

finding that is inconsistent with the alternative efficiency hypothesis. (The six industries in this group are abrasives, animal feeds, crude sulphur, dried fruit, wheat flour and wooden doors.) Like the results reported in Table 3, these findings indicate a distribution of firm behavior. Importantly, efficiency-seeking *Webb-Pomerene* cartels are again more predominant than are cartels guided by the pursuit of monopoly returns.

## VIII. Conclusion

This paper has estimated the impact of export cartel operation on prices and volumes for a representative sample of the commodities that have been covered by *Webb-Pomerene* associations. More broadly, the paper sought to test two alternative theories of firm behavior in export markets. The historical pattern of export cartelization in the United States, the characteristics of those cartels' members, functions and product coverage suggested that monopoly and efficiency explanations both were necessary to fully account for export cartel behavior.

The regression results for the sample commodities confirm this. Export cooperation lowered prices and increased export volumes for 6 of the 16 sampled commodities. Evidence on the cartels' stability and primary functions suggests that five of these are best explained as successful efforts to reduce firms' costs of selling overseas. The sixth cartel appears to have attempted unsuccessfully to cartelize foreign markets for monopoly gain. For three other commodities, export cooperation led to higher prices and smaller export volumes. These three cartels' persistence and their focus on price-setting and market-allocation roles provides confirming evidence that they were successful monopoly cartels. Finally, the remaining seven commodities displayed no net price or quantity impact from cartel activity. The short lifespans of six of these cartels suggests that they were unable either to lower members' costs or to exploit any industry market power. The persistence of the seventh cartel suggests that it had exactly offsetting cost-reduction and market-power effects on prices and quantities.

Several conclusions can be drawn from this evidence about the domestic and international welfare consequences of *Webb–Pomerene* cartel activity. Foreign consumers benefitted in the six instances in which export prices declined, and were adversely affected by price increases for three commodities. United States producers benefited unambiguously in the nine industries where cartelization lowered costs and/or enabled successful exercise of foreign market power. Producer welfare apparently declined in one industry, metal laths, where a cartel attempted unsuccessfully to raise prices. Finally, the impact upon domestic consumer welfare is ambiguous. If international markets are not perfectly integrated, cost and price changes overseas may have had no effect in the United States domestic consumer market. In this case, aggregate domestic welfare would have risen in 9 out of the 16 industries as a result of the *Webb–Pomerene* policy. If these international commodity markets were well integrated, as some evidence suggests,[37] aggregate U.S. welfare would have risen unambiguously for the five industries with successful efficient cartels.

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[37] See footnote 18, supra and Temporary National Economic Committee (1940, chs. V and VI).

## Appendix A

### Webb-Pomerene Export Associations Included in Sample

| Commodity | Cartel(s) | Period(s) of Active Operation |
|---|---|---|
| Abrasives | American Surface Abrasives Export Co. | 1923-31 |
| | Durex Abrasives Corp. | 1929-52 |
| Animal Feeds | American Assoc. of Feed Exporters | 1958-63 |
| Canned Milk | General Milk Co. | 1919-47 |
| Carbon Black | Carbon Black Export Assoc. | 1929-32 |
| | Carbon Black Export Inc. | 1934-end of sample |
| Cotton Linters | Producers Linter Export Co. | 1924, 1926-31 |
| Crude sulphur | Sulexco | 1923-51, 1958-end of sample |
| Dried Fruit | California Dried Fruit Export Assoc. | 1925-41, 1946-end of sample |
| | Pacific Coast Agricultural Export Assoc. | 1963-end of sample |
| | Northwest Dried Fruit Export Assoc. | 1927-42, 1951-65 |
| Metal Laths | Metal Lath Export Assoc. | 1929-41 |
| Milled Rice | California Rice Export Assoc. | 1939-42, 1948-end of sample |
| | American Rice Export Co. | 1927-28 |
| | Rice Export Assoc. | 1937 |
| | Rice Export Co. | 1929-31 |
| | Southern Rice Export Assoc. | 1955-60 |
| | Tri-States Rice Export Co. | 1960 |
| Paperboard | American Paper Exporters Inc. | 1918-41 |
| Pebble Phosphate | Phosphate Export Association | 1919-49, 1961-67 |
| | Florida Pebble Phosphate Export Assoc. | 1919-33 |
| | (the two associations merged in 1933) | |
| Potash | Potash Export Assoc. | 1939, 1941-61, 1964-end of sample |
| Soybean Oil | Vegetable Oil Export Co. | 1958-end of sample |
| Soybeans | American Assoc. of Feed Exporters | 1958-63 |

| | | |
|---|---|---|
| Wheat Flour | Flour Millers Export Assoc. | 1943–51, 1955–end of sample |
| | American Soft Wheat Millers Export Assoc. | 1927–29 |
| | Pacific Flour Export Co. | 1924–26 |
| Wooden Doors | American Export Door Assoc. | 1927–29 |
| | Door Export Co. | 1944–58 |

*Sources*: U.S. Federal Trade Commission (1967), U.S. Senate (1946) and (1967), United Nations Conference on Trade and Development (1971), Larson (1970), and U.S. Department of Commerce, Bureau of Foreign and Domestic Commerce (various years).

*Notes*: Cotton linters are cotton fibres. Metal laths are thin strips of metal. Only full years of active operation are reported. A cartel is deemed "active" only if it provided services to member firms for at least six consecutive months in that year.

## Appendix B

## Export Price Regression Results

### Dependent variable: commodity export price

Notes: • All variables except the cartel and WW2 dummies and the time trend are expressed in logarithms.
• Foreign price and real income data by product group for Canada and the United Kingdom.
• t-statistics appear in parentheses.
• *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.
• Results corrected for first-order autocorrelation where necessary. Crude sulphur regression estimated using first differences.

| Commodity | Cartel Dummy | Foreign Real Income | Foreign Price Level | U.S. Group Wholesale Price | U.S. Group Export Price | WW2 Dummy | Time Trend | No Obs. | Adjusted $R^2$ |
|---|---|---|---|---|---|---|---|---|---|
| Abrasives | –0.041<br>(–0.35) | 0.586**<br>(2.32) | 0.921<br>(1.66) | 0.071<br>(0.07) | –0.654<br>(–1.22) | –0.196*<br>(–1.76) | –0.029*<br>(–1.91) | 46 | .57 |
| Animal Feed | –0.076<br>(–0.45) | –0.448<br>(–0.79) | –0.670<br>(–0.91) | 0.097<br>(0.13) | 0.955<br>(1.45) | 0.355<br>(1.01) | 0.026**<br>(2.43) | 47 | .49 |
| Canned Milk | –0.104<br>(–0.60) | –0.495<br>(–1.45) | 0.680***<br>(3.66) | –0.552<br>(–1.27) | 0.653**<br>(2.06) | –0.224***<br>(–3.29) | 0.105*<br>(1.85) | 51 | .88 |
| Carbon Black | 0.070<br>(1.09) | –0.272<br>(–1.55) | 0.168<br>(0.56) | 0.799*<br>(1.76) | 0.531***<br>(2.84) | 0.005<br>(0.06) | –0.016<br>(–1.54) | 46 | .93 |
| Cotton Linters | 0.045<br>(0.37) | 0.314<br>(0.85) | –1.372***<br>(–3.32) | 1.264***<br>(3.13) | 0.750<br>(1.63) | –0.121<br>(–0.66) | 0.006<br>(0.50) | 49 | .65 |
| Crude Sulphur | 0.061<br>(1.61) | 0.034<br>(0.26) | –0.710**<br>(–2.36) | 0.955**<br>(2.42) | –0.026<br>(–0.19) | –0.013<br>(–0.31) | 0.002*<br>(1.68) | 48 | .16 |
| Dried Fruit | –0.161<br>(–1.39) | 0.558<br>(1.31) | 0.704*<br>(1.86) | –0.086<br>(–0.20) | 0.552*<br>(1.71) | –0.010<br>(–0.08) | 0.010<br>(1.29) | 51 | .90 |

## Appendix B continued

## Export Quantity Regression Results

## Dependent variable: commodity export quantity

Notes: • All variables except the cartel and WW2 dummies and the time trend are expressed in logarithms.
• Foreign price and real income data by product group for Canada and the United Kingdom.
• t–statistics appear in parentheses.
• *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.
• Results corrected for first–order autocorrelation where necessary. Crude sulphur regression estimated using first differences.

| Commodity | Cartel Dummy | Foreign Real Income | Foreign Price Level | U.S. Group Wholesale Price | U.S. Group Export Price | WW2 Dummy | Time Trend | No Obs. | Adjusted $R^2$ |
|---|---|---|---|---|---|---|---|---|---|
| Abrasives | 0.030<br>(0.24) | 0.416<br>(1.53) | –0.472<br>(–0.77) | 0.451<br>(0.43) | 1.119**<br>(2.07) | 0.187<br>(1.51) | 0.029**<br>(2.20) | 46 | .97 |
| Animal Feed | 0.019<br>(0.08) | –0.277<br>(–0.31) | 1.152<br>(1.17) | –0.162<br>(–0.14) | 0.997<br>(1.00) | –0.222<br>(–0.40) | 0.056***<br>(3.36) | 47 | .82 |
| Canned Milk | 1.445<br>(1.61) | 0.059<br>(0.04) | 1.928<br>(1.53) | 0.669<br>(0.42) | –0.358<br>(–0.25) | –0.097<br>(–0.26) | –0.002<br>(–0.03) | 51 | .74 |
| Carbon Black | –0.221*<br>(–1.82) | –0.282<br>(–0.89) | 0.301<br>(0.53) | –0.427<br>(–0.41) | 0.335<br>(1.02) | –0.110<br>(–0.77) | –0.012<br>(–0.35) | 46 | .94 |
| Cotton Linters | –0.013<br>(–0.04) | –0.276<br>(–0.28) | 1.617<br>(1.22) | –1.033<br>(–0.82) | –0.286<br>(–0.23) | –0.074<br>(–0.16) | –0.045<br>(–1.00) | 49 | .50 |
| Crude Sulphur | –0.087<br>(–1.21) | –0.341<br>(–1.29) | 2.303***<br>(4.10) | –2.366***<br>(–3.16) | 0.746***<br>(2.83) | –0.017<br>(–0.21) | –0.004*<br>(–1.95) | 48 | .46 |
| Dried Fruit | 0.320*<br>(1.85) | –0.066<br>(–0.09) | –1.008**<br>(–2.33) | –1.042<br>(–1.52) | 1.010**<br>(2.07) | –0.037<br>(–0.25) | 0.008<br>(0.76) | 51 | .32 |

## Export Quantity Regression Results Continued

| Commodity | Cartel Dummy | Foreign Real Income | Foreign Price Level | U.S. Group Wholesale Price | U.S. Group Export Price | WW2 Dummy | Time Trend | No Obs. | Adjusted $R^2$ |
|---|---|---|---|---|---|---|---|---|---|
| Metal Laths | 0.626** (2.58) | -0.835 (-1.33) | 2.934** (2.53) | -3.077*** (-2.25) | 2.281* (1.84) | 0.125 (0.44) | -0.063** (-2.17) | 41 | .76 |
| Milled Rice | 0.366 (1.42) | 0.296 (0.18) | 0.748 (0.56) | 1.724 (0.89) | -1.909 (-1.13) | -0.110 (-0.25) | 0.051 (1.57) | 51 | .83 |
| Paperboard | 0.756*** (4.20) | 0.675** (2.07) | 1.729*** (3.43) | -1.443*** (-3.49) | 0.452 (0.82) | -0.047 (-0.27) | 0.048*** (4.55) | 48 | .90 |
| Pebble Phosphate | -0.073 (-0.42) | -2.747*** (-5.72) | 2.910** (2.60) | -3.832*** (-2.81) | 0.543 (0.94) | 0.326 (0.97) | 0.034** (2.18) | 50 | .86 |
| Potash | 0.282 (0.88) | -1.262 (-1.61) | -4.140** (-2.47) | -6.030** (-2.32) | 5.306*** (4.35) | 0.690 (1.41) | 0.185*** (7.14) | 41 | .71 |
| Soybean Oil | 0.535 (0.93) | 2.771 (1.48) | 0.040 (0.03) | 6.142*** (2.75) | -2.610 (-1.37) | 0.716 (1.50) | 0.055 (1.50) | 51 | .94 |
| Soybeans | 0.187 (0.75) | -1.631 (-1.07) | -10.891*** (-3.64) | 1.743 (0.90) | -2.145 (-1.41) | -0.933** (-2.20) | 0.397*** (6.65) | 33 | .91 |
| Wheat Flour | 0.167 (0.96) | 0.075 (0.08) | 0.130 (0.14) | -1.040 (-1.21) | 0.834 (1.22) | -0.164 (-0.60) | 0.035 (1.32) | 48 | .77 |
| Wooden Doors | -0.242* (-1.00) | -2.323*** (-2.53) | 2.351 (1.59) | -5.704*** (-5.62) | 4.000*** (4.30) | -0.540 (-1.16) | 0.048** (2.03) | 46 | .88 |

## Appendix C

## Description of the Data and Data Sources

The Sample Period. The sample's starting year, 1919, was dictated by the *Webb–Pomerene Act's* passage in April 1918. The ending date, 1970, was determined by data availability. For individual products, the sample period varies slightly. Data for soybeans were not available prior to 1937, for potash prior to 1929, for wooden doors prior to 1924, for animal feed prior to 1923, and for abrasives, carbon black and paperboard prior to 1922. Data for metal laths were available only from 1923 to 1964. For crude sulphur and wheat flour, 1969 was the end of the sample period, and for potash it was 1963. Finally, price and quantity data were unavailable for 1947 for all commodities.

Export Prices and Quantities by Commodity. Export price and volume data for the 16 sample commodities were taken from the Department of Commerce's *Foreign Commerce and Navigation of the United States* (for 1919 to 1946) and *U.S. Exports* (for 1948 to 1970). Export prices were measured as average unit revenue.

Export Prices and Quantities by Product Group. Data on commodity group export prices were taken from the U.S. Department of Commerce's *Indexes of U.S. Exports and Imports by Economic Class: 1919 to 1971.* The export price index assigns each of the 16 commodities to one of five broad categories: crude foods, manufactured foods, crude materials, semi-finished manufactures and finished manufactures. The sample products were classified as follows: (1) crude foods: animal feeds, dried fruit, and soybeans, (2) manufactured food: canned milk, milled rice, soybean oil and wheat flour, (3) crude materials: carbon black, cotton linters, crude sulphur, pebble phosphate and potash, (4) semi-finished manufactures: abrasives, metal laths and paperboard, and (5) finished manufactures: wooden doors.

U.S. Wholesale Price Index (WPI) by Product Group. Data on U.S. wholesale prices were taken from the Department of Commerce's *Historical Statistics of the United States:*

*Colonial Times to 1970.* The U.S. WPI was available for farm products, foods, chemicals, non-metallic minerals, metals and metal products, wood products and industrial goods. The sample products were classified as follows: (1) farm products: animal feeds, cotton linters and soybeans, (2) foods: canned milk, dried fruit, milled rice and soybean oil, (3) chemicals: carbon black, (4) non-metallic minerals: crude sulphur, pebble phosphate and potash, (5) metals and metal products: metal laths, (6) wood products: paperboard and wooden doors, and (7) industrial products: abrasives.

Wholesale prices for industrial products, chemicals, farm products, and metal and metal products were reported for the entire sample period. The food products index was available only for 1919 to 1951. This index was extended through 1970 using the fitted values from a regression of the food price index on its lagged value and the contemporaneous and lagged values of the farm products WPI. The non-metallic minerals and wood products indices were available from 1926 to 1970. Values for prior years were estimated by regressing each index on the WPI for all industrial products between 1926 and 1970.

Real GNP by Country. Data on real GNP were taken from Liesner, ed. (1985) *Economic Statistics: 1900 - 1983* for the U.K., from Mitchell, ed. (1983) *International Historical Statistics: The Americas and Australasia* for Mexico, from Leacy, ed. (1983) *Historical Statistics of Canada* for Canada, from Liesner, ed. *op.cit.* and Mitchell, ed. (1982) *International Historical Statistics: Africa and Asia* for Japan, and from Liesner, ed. *op.cit.* and Mitchell, ed. (1980) *European Historical Statistics* for France.

General Price Level by Country. The WPI series for the U.K. France and Japan were taken from Liesner, ed. (1985) *Economic Statistics: 1900 - 1983.* For Canada the series was taken from Leacy, ed. (1983) *Historical Statistics of Canada.* The Mexican WPI series was taken from Instituto Nacional de Estadística Geografia E Informatica (1985), *Estadísticas Históricas de México* and Mitchell, ed. (1983) *International Historical Statistics: The Americas and Australasia.* An alternative deflator for U.S. export prices would be a weighted-average of the export prices of its trading partners, as suggested by

Goldstein and Khan (1978). Such data were unavailable, however, and the use of the foreign wholesale price index is a justifiable substitute.

Canadian and British Real Food Consumption, Agricultural Output and Industrial Production. Data for the U.K. were taken from Mitchell, ed. (1988) *British Historical Statistics* and Mitchell, ed. (1980) *European Historical Statistics.* For Canada, real agricultural and industrial output data were taken from Mitchell, ed. (1983) *International Historical Statistics: The Americas and Australasia* and Leacy, ed. (1983) *Historical Statistics of Canada.* Canadian real food consumption was taken from Hassan, ed. (1975) *Handbook of Food Expenditures, Prices and Consumption* and Leacy, ed. (1983) *Historical Statistics of Canada.* Foreign real food consumption was used in the six food products regressions. Foreign real agricultural output was used in the animal feeds, crude sulphur, pebble phosphate and potash regressions (the last three commodities being used primarily for fertilizer production). Foreign real industrial production was used in the abrasives, carbon black, copper, cotton linters, metal laths, paperboard and wooden door regressions.

Canadian and British Food Products CPI and General WPI. The U.K. price data were taken from Liesner, ed. (1985) *Economic Statistics: 1900 - 1983*, Mitchell, ed. (1988) *British Historical Statistics.* For Canada, the data were taken from Leacy, ed. (1983) *Historical Statistics of Canada* and Mitchell, ed. (1983) *International Historical Statistics: The Americas and Australasia.* The food CPI index was used for the six foodstuffs and animal feeds, and the WPI index for the remaining nine commodities.

U.S. Export Trade Weights. The data on U.S. export trade shares used to construct the country weights for the both sets of foreign real income and price level series were taken from Mitchell, ed. (1983) *International Historical Statistics: The Americas and Australasia.*

## References


Amacher, Ryan C., Richard James Sweeney and Robert D. Tollison (1978). "A Note on the Webb–Pomerene Law and the Webb–Cartels." *Antitrust Bulletin,* Vol. 32, No. 2 (Summer), pp. 371–87.

Asch, Peter and Joseph J. Seneca. (1976) "Is Collusion Profitable?" *Review of Economics and Statistics,* Vol. 58 (February), pp. 1–12.

Audretsch, David B. (1989). "Legalized Cartels in West Germany," *Antitrust Bulletin,* Vol. 34, No. 3 (Fall), pp. 579–600.

Baldwin, Robert E., ed. (1988). *Trade Policy Issues and Empirical Analysis.* National Bureau of Economic Research. Chicago: University of Chicago Press.

Bazdarich, M. (1979). "Has a Strong U.S. economy Meant a Weak Dollar?" *Federal Reserve Bank of San Francisco Economic Review* (Spring), pp. 35–46.

American Economic Association (1947). "Consensus Report on the Webb–Pomerene Law," *American Economic Review,* Vol. 37, No. 5 (December), pp. 848–63.

Dixit, Avinash K. (1984). "International Trade Policy for Oligopolistic Industries." *Economic Journal,* Vol. 94, supp., pp. 1–16.

Eaton, Jonathan and Gene M. Grossman (1986). "Optimal Trade and Industrial Policy Under Oligopoly." *Quarterly Journal of Economics,* Vol. 101, No. 2 (May), pp. 383–406.

Eckbo, Paul L. (1976). *The Future of World Oil.* Cambridge: Ballinger.

Feenstra, Robert C., ed. (1988). *Empirical Methods for International Trade.* Chicago: University of Chicago Press.

Fournier, Leslie T. (1932). "The Purposes and Results of the Webb–Pomerene Law," *American Economic Review,* Vol. 22, No. 1 (March), pp. 18–33.

Fraas, Arthur G. and Douglas F. Greer (1977). "Market Structure and Price Collusion: An Empirical Analysis." *Journal of Industrial Economics,* Vol. 26, No. 1 (September), pp. 21–44.

Fugate, Wilbur L. (1982). "The Export Trade Exception to the Antitrust Laws: The Old Webb–Pomerene Act and the New Export Trading Company Act." *Vanderbilt Journal of Transnational Law,* Vol. 15, No. 4 (Winter), pp. 673–707.

Geraci, V. J. and W. Prewo (1980). "An Empirical Demand and Supply Model of Multilateral Trade." Unpublished, University of Texas.

Goldstein, Morris and Mohsin S. Khan (1985). "Income and Price Effects in Foreign Trade," in Ronald W. Jones and Peter B. Kenen, eds. *Handbook of International Economics,* Vol. II. Amsterdam: North Holland, pp. 1041–1105.

_____ (1978). "The Supply and Demand for Exports: A Simultaneous Approach." *Review of Economics and Statistics*, Vol. 60, No. 2 (May), pp. 275–86.

Green, E. J. and Robert H. Porter (1984). "Noncooperative Collusion Under Imperfect Price Information," *Econometrica*, Vol. 52, No. 1 (January), pp. 87–100.

Gribbin, J.D. (1974). "Review of 'Export Cartels' — Report of the Committee of Experts on Restrictive Business Practices, OECD 1974." *Antitrust Bulletin*, Vol. 12, No. 1 (Summer), pp. 341–50.

Hassan, Zuhar A. (1975). *Handbook of Food Expenditures, Prices and Consumption.* Ottawa: Agriculture Canada.

Hay, George A. and Daniel Kelley (1974). "An Empirical Survey of Price Fixing Conspiracies." *Journal of Law and Economics*, Vol. 27, No. 1 (April), pp. 13–38.

Helpman, Elhanan and Paul R. Krugman (1989). *Trade Policy and Market Structure.* Cambridge: The MIT Press.

_____ (1985). *Market Structure and Foreign Trade.* Cambridge: The MIT Press.

Instituto Nacional de Estadística Geografía E Informatica (1985). *Estadísticas Históricas de México.* México, D.F.: Instituto Nacional de Estadística Geografía E Informatica.

Jacquemin, Alexis, Tsuruhiko Nambu and Isabelle Dewez. (1981) "A Dynamic Analysis of Export Cartels: The Japanese Case." *Economic Journal*, Vol. 91 (September), pp. 685–96.

Larson, David A. (1970). "An Economic Analysis of the Webb–Pomerene Act." *Journal of Law and Economics*, Vol. 13, No. 1 (April), pp. 461–500.

Leacy, F. H., ed. (1983) *Historical Statistics of Canada.* Ottawa: Statistics Canada.

Liesner, Thelma, ed. (1985) *Economic Statistics: 1900–1983.* New York: Facts on File.

Magee, Stephen P. (1975). "Prices, Incomes, and Foreign Trade" in Peter B. Kenen, ed. *International Trade and Finance: Frontiers for Research.* Cambridge: Cambridge University Press, pp. 175–252.

Mitchell, Brian R. (1988). *British Historical Statistics.* Cambridge: Cambridge University Press.

_____ (1983). *International Historical Statistics: The Americas and Australasia.* Detroit: Gale Research Co.

_____ (1982) *International Historical Statistics: Africa and Asia.* New York: New York University Press.

_____ (1980). *European Historical Statistics: 1750–1975.* 2nd rev. ed. New York: Facts on File, Inc.

Notz, William (1929). "Ten Years' Operation of the Webb Law." *American Economic Review,* Vol. 19, No. 1 (March), pp. 9–19.

Ordover, Janusz A. and Robert D. Willig (1983). "Perspectives on Mergers and World Competition." Discussion paper, Princeton University.

Organization for Economic Cooperation and Development (1974). *Export Cartels: Report of the Committee of Experts on Restrictive Business Practices.* Paris: OECD.

Peltzman, Sam (1976). "Toward a More General Theory of Regulation," *Journal of Law and Economics,* Vol. 19, No. 2 (August), pp. 211–40.

Rotemberg, Julio and Garth Saloner (1986). "A Supergame–Theoretic Model of Price Wars During Booms," *American Economic Review,* Vol. 76, No. 3 (June), pp. 390–407.

Stigler, George J. (1964) "A Theory of Oligopoly," *Journal of Political Economy,* Vol. 72, No. 1 (February), pp. 44–61.

Suslow, Valerie Y. (1988) *Stability in International Cartels: An Empirical Survey.* Working Paper No. E–88–7, Hoover Institution, Stanford University.

Telser, Lester G. (1988). *Theories of Competition.* New York: North–Holland.

Temporary National Economic Committee (1940). *Export Prices and Export Cartels (Webb–Pomerene Associations).* Monograph No. 6. Washington: U.S. Government Printing Office.

United Nations Conference on Trade and Development (1971). *Restrictive Business Practices: Interim Report by the UNCTAD Secretariat.* New York: UNCTAD.

U.S. Department of Commerce, Bureau of Foreign and Domestic Commerce. *Foreign Business Practices: Materials on Practical Aspects of Exporting, International Licensing and Investing.* Washington, D.C.: U.S. Government Printing Office, various years.

_____. *Foreign Commerce and Navigation of the United States.* Washington, D.C.: U.S. Government Printing Office, various years.

U.S. Department of Commerce (1975). *Historical Statistics of the United States: Colonial Times to 1970.* Washington: U.S. Government Printing Office.

_____ (1972). *Indexes of U.S. Exports and Imports by Economic Class: 1919 to 1971.* Washington, D.C.: U.S. Government Printing Office.

_____ (1969). *The Position of United States in World Commodity Exports in 1968.* Technical Paper 23. Washington: U.S. Government Printing Office.

_____. *U.S. Exports.* Washington: U.S. Government Printing Office, various years.

_____. *Statistical Abstract of the United States.* Washington: U.S. Government Printing Office, various years.

U.S. Federal Trade Commission (1967). "Webb-Pomerene Associations: A 50-Year Review." Washington: U.S. Government Printing Office.

_____ (1978). "Webb-Pomerene Associations: Ten Years Later." mimeo.

U.S. Senate (1967). *Review of the Webb-Pomerene Act of 1918.* Hearings before the Subcommittee on Antitrust and Monopoly of the Committee on the Judiciary. (June 23-30, 1967).

_____ (1946). *Small Business and the Webb-Pomerene Act.* Report of the Foreign Trade Subcommittee of the Special Committee to Study Problems of American Small Business. (August 21, 1946).

Weiner, Paul and Kenneth M. Parzych (1972). "The Webb-Pomerene Export Trade Act: A U.S. Antitrust Exemption." *Journal of World Trade Law,* Vol. 6, No. 1 (January / February), pp. 119-27.