

and U.S. exports to EEC/UK without Kennedy Round unconditional reductions; a probability of 2/3 was placed on the "best" estimates and a probability of 1/6 on the "high" estimates of these variables.

Over 70% of the resulting estimates of the increase in United States chemical exports lie between \$99 and \$165 million. The average is \$132 million. If these figures are rounded, it seems reasonable to conclude that United States chemical exports will increase by \$100-\$160 million if the ASP Package is adopted, with a best estimate being \$130 million.

APPENDIX C

ADDITIONAL INDICATIONS OF IMPORTANCE OF RESEARCH AND DEVELOPMENT AND MARKET SIZE RATHER THAN WAGE RATES AS DETERMINANTS OF INTERNATIONAL TRADE

I. RESEARCH AND DEVELOPMENT

A recent study by Gruber, Mehta, and Vernon¹ indicates that a major difference between the five United States industries that account for the United States trade surplus² and fourteen other major industries is the amount of funds spent on research and development. The chemical industry is one of these five "export industries," and ranked second in net trade balance in 1966 (Table C-1). In terms of scientists and engineers as a percentage of total employment, these five industries spent 4.7 times as much as the fourteen other major industries; in the sales area, these five industries spent nine times as much on scientists and engineers as did the other fourteen industries. As scientists and engineers are often needed in the sales area for new products, this lends credence to the belief that a large R & D effort for new product development is a major cause of exports.

II. MARKET SIZE

To illustrate the point that market size is an important determinant of chemical exports, a tabulation of the relative rank of Gross National Product and chemical exports is shown below for 1965, for the six countries listed in a Manufacturing Chemists' Association memorandum.³ While it would be possible to select certain countries to show certain results of tests, this list of countries was used because it was selected by the Manufacturing Chemists' Association.

Country	Rank order of GNP	Rank order of chemical exports
United States.....	1	1
Germany, Federal Republic.....	2	2
United Kingdom.....	3	3
Japan.....	4	6
France.....	5	4
Italy.....	6	5

This tabulation indicates that the higher a country's GNP, the higher also are its chemical exports. A rank correlation of this relationship is significant at the 95% confidence level.⁴

¹ William Gruber, Dileep Mehta, and Raymond Vernon, "The R & D Factor in International Trade and International Investment of United States Industries," *Journal of Political Economy*, LXXV (February 1967), pp. 20-37.

² Trade surplus of these industries in 1966 was \$8.5 billion compared with a total for all United States manufacturing of \$5.0 billion (Table C-1).

³ See Table C-2 for data and for exact citation for Manufacturing Chemists' Association memorandum.

⁴ Spearman's rank correlation coefficient = 0.83.