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Economic Impact of USDA Export Market Development Programs

Prepared for:
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Foreward

Scope
This study evaluates the impacts of the United States Department of Agriculture (USDA)'s Market Access Program (MAP) and Foreign Market Development (FMD) program using guidelines contained in the Office of Management and Budget (OMB) *Circular A-94.*

Sponsor
This study was prepared for U.S. Wheat Associates, USA Poultry and Egg Export Council and Pear Bureau Northwest and the Foreign Agriculture Service of the United States Department of Agriculture; the views expressed herein are strictly those of the authors.

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Glossary

Computable General Equilibrium (CGE) Model: a model based on economic theory that uses actual economic data to estimate how an economy might react to the changes in a policy or program, or how the economy would differ in the absence of a policy or program.

Economic Welfare: a measure of economic well-being that accounts for changes in the size of the economy, such as GDP, as well as changes in the prices that people pay for goods and services.

Elasticity: a measure of responsiveness. In the context of this study, the relative change in demand due to a relative change in price or promotion expenditures. Higher elasticity indicates more responsive demand.

Employment: total full- and part-time jobs resulting from direct spending.

Excess Demand (Supply): the difference between the quantity demanded (supplied) in the U.S. and the quantity supplied (demanded) in the U.S.

Full-Employment Model: model assuming the aggregate labor supply is fixed, labor is mobile across economic sectors and the prices of labor as well as all goods and services are flexible (required by OMB).

IMPLAN: (IMpact Analysis for PLANning) input-output model, data and software used to analyze economics under the less than full employment scenarios.

Labor Income: employee compensation and proprietor income resulting from direct spending.

Less-Than-Full-Employment Model: model assuming that unemployment exists in the economy so that an increase in economic activity resulting from additional exports generated through USDA Export Market Development Programs can generate additional labor by drawing labor from the ranks of the unemployed at a constant wage.

Output: overall economic activity (sales) in the region resulting from direct spending.

Value-Added: contribution to regional gross domestic product (GDP) through wages, profits, interest, and indirect business taxes resulting from direct spending.

USDA Export Market Development Programs: the total of USDA foreign market development (FMD) program funding, USDA Market Access Program (MAP) funding, and industry market promotion contributions.

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I. EXECUTIVE SUMMARY

A. Introduction

The purpose of this study is to measure the economic impact of USDA's Foreign Market Development Program (FMD) and Market Access Program (MAP), and industry market promotion contributions (referred to in this report jointly as the USDA Export Market Development Programs) on U.S. agricultural exports and the broader effects on the farm economy and the overall macro economy. The study's goals are to:

- Evaluate the effectiveness of the USDA Export Market Development Programs on increasing U.S. agricultural exports.

- Analyze the benefits this market promotion funding provides to the U.S. farm economy and the overall U.S. macro economy.

- Determine whether the benefits of the USDA Export Market Development Programs outweigh their costs by calculating benefit-cost ratios (BCRs).

- Conduct future market promotion funding scenarios to provide guidance on the implications of maintaining, increasing, or eliminating funding for the USDA Export Market Development Programs.

1. Differences in Methodology

- This is the third cost-benefit analysis study of the USDA Export Market Development Programs. The two prior studies employed an econometric model that measured market share effects. This 2016 study, however, employed a different approach through export demand analysis to measure the impact of market development programs. Undertaking the analysis with a completely different methodology ensures that the results are not influenced by using the same analytical method repeatedly and establishes a new baseline of direct returns on export value, farm income and assets, and general economic indicators from the market development programs.

- This study also takes price effects into account since it is likely that market promotion funding not only impacts exports but also influences prices.
  - This study interfaces the results of the export demand function model with a global model of agriculture known as the Global Agricultural Sector Model (GASM) to generate price-responsive simulations of the impact of the USDA Export Market Development Programs.

- As in the prior studies, this study utilizes a computable general equilibrium (CGE) model to measure the economic impacts on the farm economy and the macro economy under a full employment assumption. But this study also uses an IMPLAN model to measure the economic impacts on the farm economy and the macro economy under a less than full employment assumption.
  - Using both a CGE model and an IMPLAN model to analyze the national economic effects of the market promotion programs limits the possibility that a result could be driven by particular modeling assumptions. Together the two approaches better approximate the range of possible outcomes.
  - The IMPLAN model also provides geographic regional impacts, based on production and processing differences across the United States, which the CGE model cannot provide.

2. GAO Concerns Addressed

The GAO review of the previous study was critical that the market share model omitted important variables such as commodity prices, foreign production and foreign competition. To address those concerns, the econometric models in this study included:

- An export unit price variable; and

- Foreign production (non-U.S. countries) variable.

The study took into account the effect of foreign competition on export demand, price, and revenue through the use of the Global Agricultural Sector Model (GASM) which includes the agricultural sectors and trade of 30 foreign countries across a wide range of primary crops, processed products, bioenergy products, and livestock.

3. Extensive Sensitivity Analyses Conducted

This study conducted extensive sensitivity analyses to comply with OMB guidelines and to test the stability of the models and key parameters to provide increased confidence in the study results[1].

4. Literature Review and Market Development Participant Interviews

An extensive review of the literature was conducted to build on past studies and evaluate prior empirical work about the effectiveness of market development activities.

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[1] The study used the guidelines contained in the office of Management and Budget (OMB) Circular A-94. For summary of sensitivity tests conducted see pages 10 and 11 in Background chapter.

Forty personal interviews of recipients of market development funds were conducted to understand their views about the effectiveness of USDA market promotion efforts. The interviewees accounted for 78% of participants in FMD programs and 52% of participants in MAP. Interview questions focused on the effectiveness of market development programs and what would be the impact on their market promotion activities if government promotion expenditures were ended or increased. The interviews supported the future funding scenario findings.

B. Major Findings

1. Conclusions

- Regardless of whether an export demand function model or market share model is used, or whether a CGS or IMPLAN model is used, or different time periods are used (1977-2014 or 2002-2014), the results of this study and previous studies all demonstrate the importance and effectiveness of market promotion funding on exports, the farm economy and the overall macro economy.

- There is overwhelming evidence that export promotion has a positive and statistically significant impact on increasing demand for U.S. exports even though other demand factors such as price and exchange rates have a greater impact.

- USDA Export Market Development programs continue to achieve what Congress intended when they were created to:
  - Boost agricultural export revenue and volume;
  - Support farm income; and
  - Enhance the overall U.S. economy.

- The USDA Export Market Development Programs generate high benefit-cost ratios (BCRs).
  - The standard method of determining whether export promotion has been beneficial is to calculate a benefit-cost ratio (BCR) in terms of additional gains that the promotion program has generated per dollar spent over time.
  - This study determined that the U.S. agricultural export value increased by $24 (2002-2014) and $28 (1977-2014) for every dollar invested in export market development.
  - The previous study was also updated and the BCR was found to be $32, somewhat below the 2010 study's result of $35 and still above the 2007 study's result of $25. Appendix A provides a thorough discussion of the previous study's methodology and the updated findings.
  - All of the above BCRs are well above the average of about $11 BCR reported by individual commodity promotion program studies in the literature review.
  - A common error is to assume that a high BCR implies a high impact and a low BCR implies a low impact of the program. Just because a BCR is lower for the

more recent time period than for an earlier time period does not mean the program is less effective. The lower BCR simply reflects an increase in funding.
  - Although such high BCRs indicate the programs are very effective; they also suggest the programs are underfunded.
    - For example, a BCR of 24 to 1 indicates $24 in additional agricultural export revenue is forfeited for every dollar not allocated to the USDA Export Market Development Programs[2].

- However, multiple measures are needed to provide a comprehensive evaluation of USDA export market development program effectiveness.
  - While BCRs are commonly used to determine the effectiveness of programs, they do not consider the overall scale of a program's impact.
  - Analyzing other measures, such as changes in export revenues, farm income, GDP, etc., in conjunction with BCRs provides a more comprehensive understanding of the full impact of market development programs.

- In addition to a high BCR, the new report indicates that the USDA Export Market Development Programs:
  - Boost export revenues and volumes.
    - To calculate the historical benefits of market promotion funding on U.S. exports under the USDA Export Market Development Programs, the study linked the two U.S. agricultural export demand analysis models (for bulk/intermediate and high value products) to the Global Agricultural Sector Model (GASM). The objective of linking the models was to generate price-responsive simulations of the impact of the USDA Export Market Development Programs.
    - The results show the programs sharply increased revenues by:
      - Adding $12.5 billion on average annually to export value from 2002-2014 and adding $8.15 billion on average annually, to export value from 1977-2014.
      - Adding $162.5 billion, 14.3 percent, in agricultural export revenues over the entire 2002-2014 period and a total of $309.7 billion more, 15.3 percent over the 1977-2014 period than would have been generated without the programs.
  - Contribute substantially to the farm economy.
    - The national economic analyses of the impacts of the USDA Export Market Development Programs demonstrate that the effects of the programs go well beyond generating additional exports. These impacts were measured under two different assumptions of full employment (CGE model as required by OMB) and less than full employment (IMPLAN model).
    - The results show that the programs benefitted the farm economy by:

[2] See pages 58 and 59 for additional detail.

        - Adding $8.7 billion to farm cash receipts, $1.1 billion to farm income and $1.0 billion to farm assets on average annually assuming full employment (2002-2014).
        - Adding $8.4 billion to farm cash receipts, $2.1 billion to farm income and $1.1 billion to farm assets on average annually assuming less than full employment (2002-2014).
  - Benefit the macro economy.
    - The simulation results of the impact of the USDA Export Market Development Programs on U.S. agricultural exports during the 2002-2014 period were also used to measure the impacts of the programs on the larger macro economy under both the full employment (CGE model as required by OMB) and less than full employment (IMPLAN model) assumptions.
    - The results show that the programs benefitted the macro economy by:
      - Adding $7.1 billion in economic output, $4.4 billion in GDP and $1.7 billion in labor income in each year assuming full employment, and
      - Adding $39.3 billion in economic output, $16.9 billion in GDP and $9.8 billion in labor income assuming less than full-employment (2002-2014).
  - Create jobs.
    - The USDA Export Market Development Programs also contributed to employment across the entire economy under the less than full employment assumption.
    - The results show that the programs benefitted employment by:
      - Adding up to 239,800 full and part-time jobs across the entire economy assuming less than full employment (2002-2014).
      - Reducing unemployment by up to 3%.

- Substantial impacts occur with changes in future market promotion funding.
  - The study analyzed the possible effects of varying levels of future program funding over the 2015-2030 period to provide a clearer picture of the potential impact of increased or decreased funding on U.S. exports and the farm and macro economy. The future funding scenarios conducted included:
    - *Flat Funding Scenario*: Flat funding beginning in 2015 with full annual program expenditures for the FMD and MAP programs ($234.5 million) plus 2014 cooperator contributions ($468.7 million) through 2030.
    - *Increased Funding Scenario*: A 50% increase in 2015 budgeted program expenditures for FMD and MAP programs (from $234.5 million to $351.75 million) with cooperator contributions remaining at 2014 level through 2030 (a 17.4% increase in funding from the Flat Funding scenario).
    - *Reduced Funding Scenario*: Elimination of government funding for FMD and MAP programs with a 50% reduction in 2014 current cooperator contributions (from $468.7 million to $234.35 million) through 2030 (a 65.5% reduction in funding from the Flat Funding Scenario).

- The results for the increased funding scenario relative to the flat funding scenario show that the programs would benefit exports, the farm economy and macro economy by:
  - Adding on average annually $3.5 billion to exports.
  - Adding annually $1.7 billion to farm cash receipts, $0.6 billion to net cash farm income and $0.2 billion to farm assets assuming full employment, while adding $2.4 billion to farm cash receipts, $0.6 billion to farm income and $0.3 billion farm assets assuming less than full employment.
  - Adding annually $0.9 billion to output, $0.6 billion to GDP and $0.2 billion to labor income assuming full employment, while adding annually $10.8 billion to output, $4.7 billion to GDP and $2.7 billion to labor income assuming less than full employment.
- On the other hand, the results for the reduced funding scenario relative to the flat funding scenario show that the reductions would substantially adversely impact exports, the farm economy and macro economy by:
  - Decreasing exports $14.7 billion on average annually.
  - Reducing farm cash receipts annually by $7.0 billion, net cash farm income by $2.4 billion and farm assets by $0.7 billion assuming full employment, while lowering cash receipts annually by $9.9 billion, farm income by $2.5 billion and farm assets by $1.3 billion assuming less than full employment.
  - Lowering output annually by $3.6 billion, GDP by $2.6 billion and labor income by $0.9 billion assuming full employment, while decreasing output annually by $45.3 billion, GDP by $19.5 billion and labor income by $11.3 billion assuming less than full employment.
- Industry interviews were consistent with the above future funding scenario findings.

- The market development programs provided substantial impacts on all major regions (2002-2014).
  - In the Midwest the average annual impact of the USDA Export Market Development Programs was up to $13.5 billion in output, $5.4 billion in GDP, $3.1 billion in labor income, and 79,100 full- and part-time additional jobs.
  - In the South, the Programs contributed an annual average of $7.7 billion in output, $3.0 billion in GDP and 55,300 full- and part-time additional jobs.
  - In the West, the Programs contributed an annual average of $6.2 billion in output, $2.9 billion in GDP and 39,900 full- and part-time additional jobs.
  - In the East, the Programs contributed an annual average of $1.8 billion in output, $0.8 billion in GDP and 9,500 full- and part-time additional jobs.

- Study Interviewees view the MAP and FMD programs as vital to their industry because they:
  - Are necessary to remain competitive in world markets.
  - Are important in opening new markets and responding to trade disruptions.
    - Resolving market access issues is becoming a more important focus because of volatile world trade where animal diseases or changes in regulatory

requirements can disrupt imports at any time or make it nearly impossible to enter a new market.

- Encourage the government and private sector to work together, thereby increasing investment and synergies.
- Allow smaller industries to conduct market promotion activities that they could not do alone because of limited funding or knowledge of market promotion.
- Encourage individual groups within an industry to work together with one voice rather than competing with each other.
- Encourage industries to work across sectors in doing joint promotions and create benefits from a halo effect.

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II. BACKGROUND

The purpose of this study is to measure the impact of USDA's Foreign Market Development Program (FMD) and Market Access Program (MAP) and industry market promotion contributions (referred to in this report jointly as the USDA Export Market Development Programs) on U.S. agricultural exports and to estimate the general equilibrium effects on the farm and U.S. macro economy. The study's focus is to:

- Evaluate the effectiveness of the USDA Export Market Development Programs on U.S. agricultural exports.
- Analyze the benefits this market promotion funding provides to the U.S. farm economy and the overall U.S. macro economy.
- Determine whether the benefits of the USDA Export Market Development Programs outweigh their cost by calculating benefit-cost ratios (BCRs).
- Analyze future market promotion funding scenarios to provide guidance on the implications of maintaining, increasing, or eliminating funding for the USDA Export Market Development Programs.

This is the third cost-benefit analysis study of the USDA Export Market Development Programs. However, there are major differences in the methodology used in this study compared with the previous studies conducted by Global Insight in 2006 and 2010.

- The econometric models used are different.
  - This study uses an export demand function model to measure the impacts of the USDA Export Market Development Programs on exports while the Global Insight studies used an Armington-type market-share model.
  - Using a different econometric model for this study provides a form of sensitivity analysis because it ensures that the results of the study are not influenced by using only one method of analysis.
    - The advantage of using an export demand function model is that it is comprehensive since it measures the impact of export promotion programs directly on total U.S. exports.
    - In addition, the majority of cost-benefit studies conducted use either an export demand function or an import demand function model to measure the impact of export promotion programs on U.S. exports.

- This study takes price effects into account since it is likely that market promotion funding not only impacts exports but also influences prices.
  - This study interfaces the results of the export demand function model with a global model of agriculture known as the Global Agricultural Sector model (GASM) to generate price-responsive simulations of the impact of the USDA Export Market Development Programs.

- Both the Global Insight study and this study use a general equilibrium analysis that utilizes a computable general equilibrium (CGE) model to measure the economic impacts on the farm economy and the macro economy under a full employment assumption. But this study also uses an IMPLAN model to measure the economic impacts on the farm economy and the macro economy under a less than full employment assumption.
  - The dual method of using both a CGE model and an IMPLAN model to analyze the national economic effects of the market promotion programs limits the possibility that a result could be driven by particular modeling assumptions. Together the two approaches better approximate the range of possible outcomes.
  - The IMPLAN model also provides geographic regional impacts which the CGE model cannot provide.
    - The regional models capture regional impacts based on production and processing differences across the United States.

The GAO review of the 2010 Global Insight study was critical that the market-share model used in that study did not include any price, production, or foreign competition variables. To address those concerns, this study included:

- A unit price value variable for both the bulk and high-value product models and

- Bulk and high-value foreign production (rest of world) variables.

The effect of foreign competition on export demand, price, and revenue was taken into account in our analysis through the use of the Global Agricultural Sector Model (GASM).

This study conducted extensive sensitivity analyses to be in compliance with OMB guidelines for conducting benefit-cost analyses and to test the stability of the models and key parameters to provide a measure of confidence regarding the results of this study's analysis. Some of the major sensitivity analyses conducted included:

Numerous tests of the robustness of the export demand model results were conducted, including:

- Statistical test of the econometric results.
- Ex-post simulation of the export demand model to determine how well the export demand models track actual history and the responsiveness of the models to the level of the promotion response.
- A test of the halo analysis results to changes in assumptions on the share of exports that are promoted.

A sensitivity analysis of the funding scenarios results in a range of export promotion effectiveness.

Two well-established yet distinct models (IMPLAN and CGE) were employed to analyzing the broader economic impacts of the USDA Export Market Development Programs to limit the possibility that a result could be driven by particular modeling assumptions.

A range of U.S. economic impacts representing full employment and less than full employment was calculated and compared. This test provides a more realistic approximation of the range of possible outcomes.

The sensitivity of the discounted BCRs to the discount rate chosen was tested by using a range of nominal Treasury interest rates of different maturities of 3 to 30 years.

A. USDA Export Market Development Programs

The Market Access Program (MAP) and Foreign Market Development program (FMD) are the U.S. Department of Agriculture's (USDA) primary export promotion programs. These programs are public-private partnerships between FAS and nonprofit U.S. agricultural trade associations, farmer cooperatives, nonprofit state-regional trade groups and small businesses to conduct overseas marketing and promotional activities. The USDA MAP and FMD programs along with the contributions of industry cooperators are referred to jointly in this report as the USDA Export Market Development Programs. The Foreign Agricultural Service (FAS) administers these programs within the USDA.

MAP promotes U.S. agricultural product exports by focusing on consumer promotion, market research, trade shows, and trade servicing. This program does both generic and some brand promotion and is used by organizations promoting exports of processed products, fruits, vegetables, nuts and bulk and intermediate products. The MAP program began in 1985. MAP currently provides funding to more than 62 non-profits and cooperatives.

The FMD program focuses on trade servicing and trade capacity building by opening, expanding and maintaining long term markets for U.S. agricultural products. FAS partners with U.S. agricultural producers and processors represented by non-profit commodity or trade associations called cooperators. The FMD program was first established in 1956 under authority of Public Law 480 and then reauthorized by Title VII of the Agricultural Trade Act of 1978. The FMD program currently provides funding to 23 agricultural trade organizations for generic promotion of U.S. agricultural exports.

MAP and FMD are currently funded under the 2014 Farm Bill respectively at $200 million and $34.5 million. However, these programs are subject to sequestration reductions. Sequestration was set at 6.8 percent for FY 2016. As result, MAP and FMD funding in fiscal year 2016 are respectively $186.4 million and $32.2 million. Sequestration has impacted funding for these programs since it was used in the Budget Control Act of 2011.

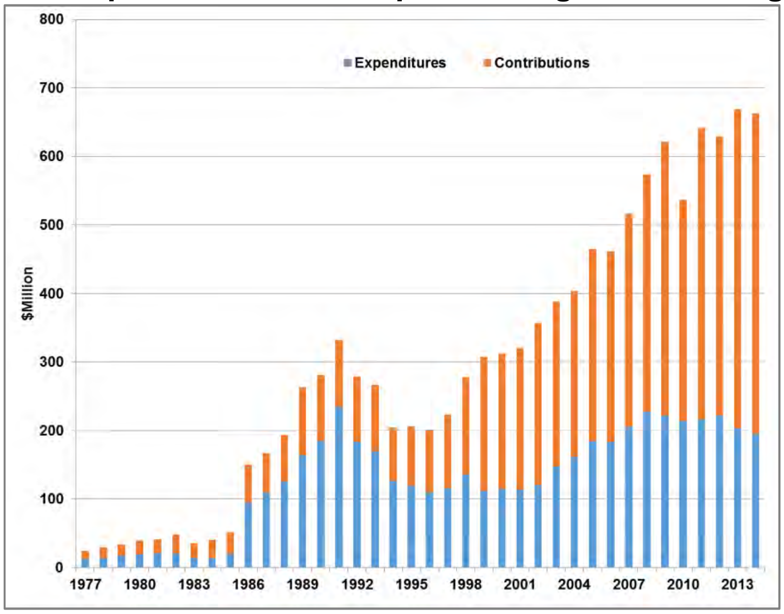
Total annual spending on export market development and promotion by the U.S. government and its industry partners has been increasing sharply, reaching record and near-record levels in 2013 and 2014 (Exhibit 1 and Exhibit 2). This increase is due to increasing contributions by the industry partners.

- Industry contributions were a record 71 percent of the total USDA Export Market Development Programs in 2014 compared with 59 percent in 2009 and 61 percent in 2004.

- In terms of the cost share of the market promotion, the industries contributed a record average 240 percent in 2014 compared with 171 percent in 2009 and 158 percent in 2004.

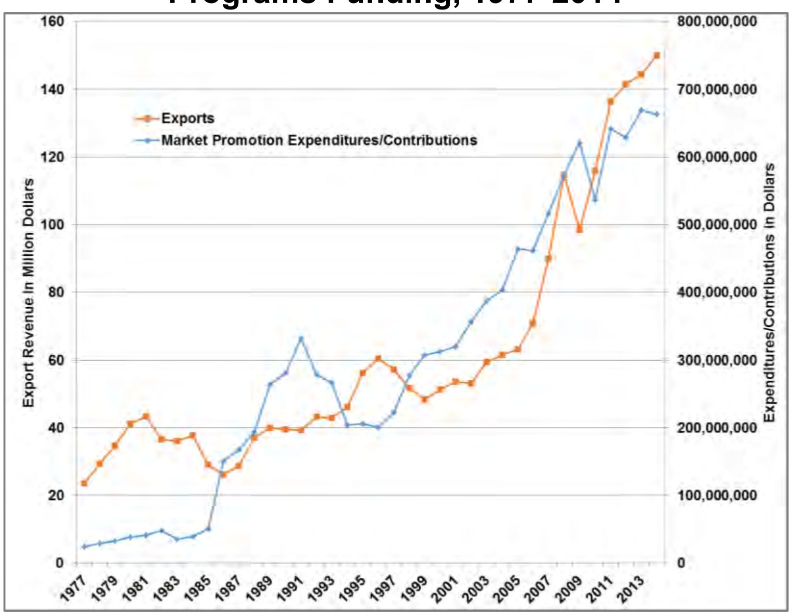
The growth in industry contributions demonstrates that the industry recognizes the success of the MAP and FMD programs in opening, expanding and maintaining export markets. Exhibit 2 shows that the increase in market promotion funding parallels the increase in U.S. exports.

Exhibit 1: USDA Export Market Development Programs Funding[3], 1977-2014



Note: All data has been converted to a calendar year basis.
Source: FAS/USDA

Exhibit 2: U.S. Agricultural Exports and USDA Export Market Development Programs Funding, 1977-2014



Note: All data has been converted to a calendar year basis.
Source: FAS/USDA

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[3] Includes government expenditures on market promotion through the FMD and MAP Programs and industry contributions.

B. Commodity Breakouts and Export Trends

This study developed two separate trade models, similar to what was done in the past, including bulk and intermediate products combined and high-value products. These categories are terms used by the Foreign Agricultural Service of the USDA and are defined as follows:

- Bulk agricultural products include those commodities which have received little or no processing, such as wheat, corn, soybeans, and cotton. Tropical products, such as green coffee, cocoa, raw sugar, and natural rubber, are also included in this category but are excluded from the analysis conducted is this study because they are not promoted commodities.

- Intermediate agricultural products generally include agricultural products that have a higher per-unit value than bulk commodities. They are often partly processed but not necessarily ready for the consumers. Examples include soybean meal, wheat flour, vegetable oils, feeds and fodders, animal fats, hides and skins, and live animals.

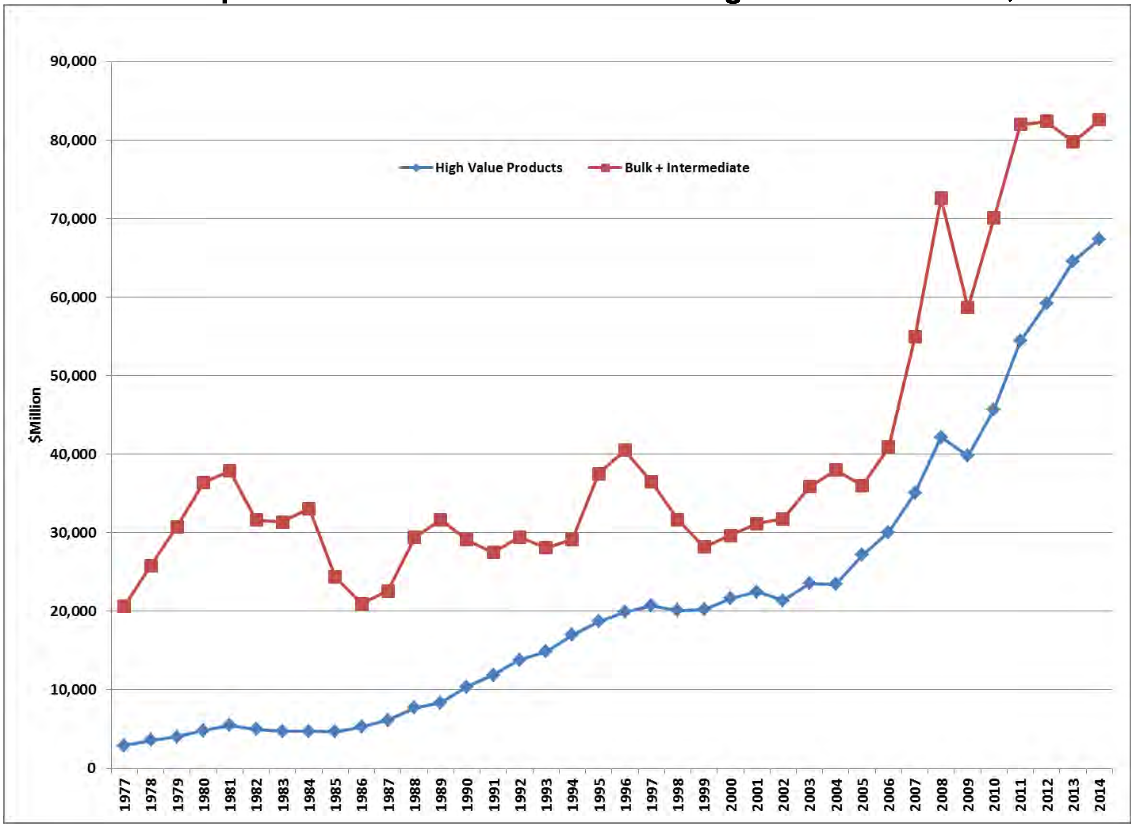
- High value products are usually (but not always) ready, or easily made ready, for immediate use by consumers. Examples include snack foods, breakfast cereals, bakery mixes, eggs and products, dairy products, fresh or processed red meats and poultry meats, fresh or processed fruits and vegetables, tree nuts, pet foods, wine, etc.

U.S. exports of agricultural products were a record $150 billion in calendar year 2014. Exports had been steadily increasing since 2009.

- Both bulk/intermediate and high value product exports were a record in 2014 respectively at $82.6 billion and $67.4 billion (Exhibit 3).

- The value of bulk/intermediate product exports continues to be higher than high value products.

Exhibit 3: U.S. Exports of Bulk/Intermediate and High-Value Products, 1977-2014



Source: FAS/USDA

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III. ENVIRONMENTAL SCAN

A. Literature Review

This section reviews the literature regarding the economic impacts and effectiveness of U.S. export promotion programs. Appendix C includes a more detailed summary of some of the studies.

Twenty-seven studies were reviewed that evaluate the economic impacts and effectiveness of U.S. export promotion programs. Because of vastly different methods/models and data sets used in the many studies conducted on the impact of export promotion, it is difficult to make accurate comparisons among studies. This is especially true in trying to compare specific promotion elasticity estimates and Benefit Cost Ratios (BCRs) among studies. Nevertheless, it is still possible to draw general conclusions from these studies.

Most studies have been commodity and individual country specific and almost always partial equilibrium models. The objective of these studies has been to analyze the effects of export promotion on a specific commodity industry. Two studies that considered the broader economic impacts of export promotion were conducted by Global Insight in 2006 and 2010. Those were the two studies of the USDA Export Market Development Programs that preceded this study. They conducted both partial and general equilibrium analyses of the USDA Export Market Development Programs. The use of a general equilibrium model is important when the objective is to measure the effects of export promotion on the general economy. On the other hand, partial equilibrium models usually provide more details on the industry that is being investigated. The Global Insight studies were the only two of the 27 studies reviewed that conducted a general equilibrium analysis. Most of the studies reviewed (18) have either estimated export or import demand functions to measure the effect of export promotion on U.S. trade.

The bottom line measure that is common to almost all studies is the calculation of a benefit-cost ratio (BCR) or return on investment. Indeed, the U.S. Department of Agriculture requires that all independent evaluations of federal checkoff programs include an estimated BCR. There are two main types of BCR that have been computed: marginal and average BCR.

- A marginal benefit-cost ratio (MBCR) is based on a small, marginal increase or decrease in export promotion and the resulting incremental benefits and costs accruing from the change in promotion. This is computed by simulating the estimated demand model for alternative export promotion expenditure levels. As mentioned early, some studies account for the supply side as well. MBCRs are primarily used in determining optimal levels of export promotion since they measure the incremental benefits from an additional dollar of promotion. However, they are also used as a measure of effectiveness of the program.

- Some studies compute an average benefit-cost ratio (ABCR), which compares benefits and costs with and without export promotion. Benefits are measured as the change in producer surplus (or other measures of profitability) accruing as a result of the export promotion, which are then divided by the total cost of the promotion. Average BCRs (ABCRs) are the best measure for evaluating the overall profitability of export promotion since it gives the average return per dollar invested.

The benefits of market promotion as reported in the studies reviewed are very large relative to their costs. The average and median average benefit cost ratio (ABCR) from the 10 studies that computed one in Exhibit 4 are 10.81 and 9.52. Not a single study computed an ABCR less than 1. The lowest ABCR was 3.5, i.e. the net benefits of export promotion were 3.5 times more than their costs. The highest ABCR was 25.7, i.e. the net benefits of export promotion were 25.7 times more than their costs.

Exhibit 4: Selected Findings of Previous Export Promotion Studies

Study	Product	Model	Promotion Elasticities	Average BCR
Song and Kaiser (2015)	Dairy	Import Demand	0.273	15.78
Williams et. Al. (2014)	Soybeans	SOYMOD World Mkt Model	Avg - 0.033	34.8 (Gross)
Kaiser (2014)	Beef	Export Demand	0.167	14.2
Richards and Kaiser (2013)	Potatoes	Export Demand	0.063	None
Kaiser (2012)	Pork	Export Demand	0.302	None
Global Insight (2010)	All US Food Exports	Market Share (Armington Mod)	Avg - 0.189	14.6
Kaiser (2010)	Wheat	Export Demand	0.295	12.29
Kaiser (2010)	Raisins	Import Demand	0.204	3.49
Boonsaeng and Fletcher (2010)	Peanuts	Import Demand	-0.085	None
Rusmevichientong and Kaiser (2005)	Sorghum	Linear Aprox. Ideal Dem Sys	0.269	5.1
Rusmevichientong and Kaiser (2005)	Rice	Linear Aprox. Ideal Dem Sys	0.205	4.88
Rusmevichientong and Kaiser (2005)	Wheat	Linear Aprox. Ideal Dem Sys	0.616	25.71
Shahid and Gempesaw (2002)	Poultry	Export Demand	0.625	None
Onunko and Epperson (2000)	Pecans	Import Demand	Avg - 0.53	None
Le, Kaiser and Tomek (1998)	Red Meat	Import Demand	Avg - 0.165	None
Comeau, Mittelhammer and Wahl (1997)	Red Meat	Inverse Alm Ideal Dem Sys	0.11 to 0.128	None
Armah and Epperson (1997)	Orange Juice	Import demand	Avg - 0.0776	None
Lanclos, Devodoss and Guenther (1997)	Frozen Potatoes	Import demand	0.477	None
Alston et al. (1997)	Table Grapes	Export demand	0.21	Avg - 6.75
Weiss, Green and Havenner (1996)	Walnuts	Event Analysis	Not Specified	None
Dwyer (1995)	All US Food Exports	Market Share (Armington Mod)	Avg - 0.15	16.0
Haliburton and Henneberry (1995)	Almonds	Import Demand	Avg - 0.564	None
Solomon and Kinnucan (1993)	Cotton	Market Share (Armington Mod)	Avg - 0.092	None
Fuller, Bello and Capps (1992)	Grapefruit	Import demand	Avg - 0.165	None
Lee and Brown (1986)	Orange Juice	Import demand	Not given	None
Rosson, Hammig and Jones (1986)	Apples	Export demand	0.51	None
Richards, Ispelen, and Kagan (1986)	Apples	Import demand	Avg - 0.036	None

Source: Informa Economics Study Team

The estimated promotion elasticities from the studies in Exhibit 4 range from a low of -0.085 (not statistically significant) to a high of 0.625. The average and median from these studies is 0.256 and 0.205. Thus the overwhelming bulk of empirical evidence supports the notion that export promotion has a positive and statistically significant impact on increasing demand for U.S. exports.

From the relevant studies reviewed for this report, several general conclusions can be made (see Appendix C for full literature review):

- The intent of the USDA Export Market Development Programs to "develop, maintain, and expand foreign markets for agricultural products[4]" has clearly been satisfied.
- Export promotion elasticities are relatively small in magnitude, especially when compared with other demand factors such as price and exchange rates.
- The benefits of these programs are large relative to their costs.
- These programs are vastly underfunded relative to the economically optimal level of funding.

B. Industry Interviews

To provide some context to the statistical analysis of the USDA Export Market Development Programs, interviews with 40 industry participants in the MAP and FMD programs were conducted to discuss the benefits of those programs. The interviews accounted for 78% of FMD participants and 52% of MAP participants.

- The interview questions focused on:
  - The importance of the MAP and FMD programs.
  - The impact on participants' market promotion activities if USDA Export Market Development Programs were either eliminated or if funding for these programs was increased.

The purpose of the interviews was to obtain qualitative insight to see if they would support the findings of the future funding scenarios used in the study.

Interviewee market development activities include:

[4] GAO 1997, pg. 41

- Consumer advertising and in-store promotions.
- Market research to better understand customers, import requirements and export competition.
- Trade fairs and exhibits to meet and build relationships with foreign buyers.
- Trade missions to educate potential buyers.
- Trade servicing often including technical assistance regarding U.S. products.
- Resolving market access issues (considered by some to be part of trade servicing) such as:
  - Undertaking activities to restore trade from market disruptions due to non-tariff barriers or changes in regulatory requirements.
  - Undertaking activities to resolve non-tariff barriers to open new markets.

Resolving market access issues is becoming a more important focus because of volatile world trade where animal diseases, plant pests or changes in regulatory requirements can disrupt imports at any time or make it nearly impossible to enter a new market.

The interviewees view the MAP and FMD programs as vital to their exports because they:

- Encourage government and private sector to work together.
  - Government involvement makes market promotion activities more effective and higher profile in the eyes of potential customers.
  - The programs promote a USA focus on agricultural products.
- Allow smaller industries to conduct market promotion activities that they could not do alone because of limited funding or knowledge of market promotion.
- Encourage individual groups within an industry to work together with one voice rather than competing with each other.
- Encourage industries to work across sectors in doing joint promotions and benefit from a halo effect.
- Are vital to industries heavily dependent on exports.

- Are important in opening new markets and responding to trade disruptions.

Qualitative responses regarding the reduced funding scenario used in the study were as follows:

- None of the interviewees said they could make up for the loss of MAP and FMD funding.

- Most said they would reduce their market promotion contributions.
  - Some smaller industries with limited funding and knowledge of market promotion would stop all their market promotion activities.

- Without government participation and support, interviewees said they would be less effective in responding to overseas trade disruptions or opening new markets.

- Market focus would change to primarily the largest or fastest growing markets, putting future gains in smaller or new markets in jeopardy.

- Interviewees with overseas offices would reduce the size and number of those offices matching their change in market focus.

Qualitative responses regarding the increased funding scenario used in the study were as follows:

- Essentially all interviewees said they would expand their market promotion activities because of the effectiveness of their current activities.

- Some said they would expand their market promotion offices overseas.

The interviews support the findings of the future funding scenarios in the study.

All interviewees argue that the MAP and FMD programs are necessary to remain competitive in world markets.

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IV. ANALYTICAL METHODOLOGY

A. Export Demand Analysis

1. Export Demand Model

The primary objective of the USDA Export Market Development Programs over the years has been to shift out the foreign demand for U.S. agricultural products and, as a result, contribute positively to not only the profitability of U.S. agriculture but also the overall U.S. economy given the importance of the U.S. agricultural sector in the economy. The first relevant question for the research to address, then, is whether the USDA Export Market Development Programs have actually shifted out the foreign demand for U.S. agricultural products. If not, then the program has not generated returns to the agricultural or the general economy and may have inefficiently diverted funds that could have been used more productively elsewhere. However, if the answer is that the program has indeed impacted U.S. agricultural exports, then the next question to answer is whether or not the market-development-program-generated rightward shift in foreign demand for U.S. agricultural products has contributed to the profitability of the agricultural sector and the overall U.S. economy, and to what extent. To answer this question, various measures of impact and return are developed.

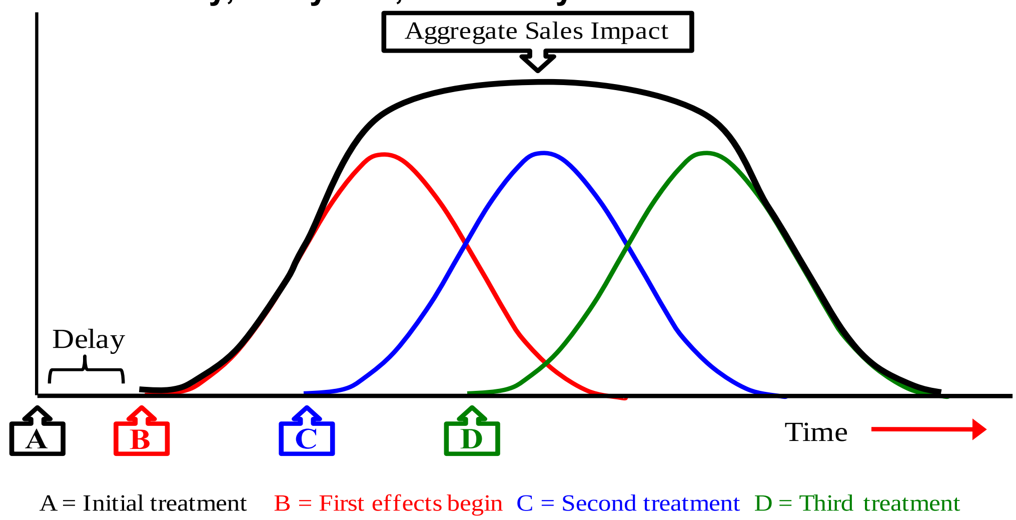
To answer the first question, we develop econometric models of U.S. agricultural export demand to measure the extent of the shift in U.S. agricultural exports generated by the USDA Export Market Development Programs. To avoid confounding of effects, all key drivers of agricultural export demand must be controlled for, isolating the effect of the USDA Export Market Development Programs on the foreign demand for U.S. agricultural products. Thus, the demand for U.S. agricultural exports at a given level of disaggregation (X) is specified as follows:

(1) $X_t = X(P_t, e_t, G_t, Z_t)$

where the t subscript refers to time, P is the price of U.S. agricultural exports at the given level of disaggregation, e is a measure of the value of U.S. currency (exchange rate), G_t is a "goodwill" stock of USDA Export Market Development Programs funding expenditures, and Z represents all other key factors that affect the demand for U.S. agricultural exports.

The long history of analysis of domestic and foreign market generic advertising and promotion programs has demonstrated rather conclusively that such promotion programs have carryover effects. That is, expenditures in a given year do not have their full effect in the year of expenditure but rather the effects are distributed over a number of years. Exhibit 5 illustrates a typical pattern of promotion effects on sales. Following the initial treatment (expenditure) at point A, there may be some delay before the expenditures begin having an effect on sales at point B. The maximum impact of the initial treatment in Exhibit 5 is eventually reached after which there is some decay in the sales effects. The decay from the initial treatment can be avoided and aggregate sales boosted if additional expenditures are made before the decay begins (point C).

Exhibit 5: Delay, Carryover, and Decay Effects of Demand Promotion



Continued promotion treatments (expenditures) (points C and D) can maintain the aggregate level of sales achieved with the first two treatments (dark black line in Exhibit 5). Higher and higher expenditures, however, can push sales to higher levels while a drop off in the level of promotion expenditures results in decay of the sales effects. If promotion activities are ended altogether, the level of sales will taper off toward the pre-promotion program level over time. Research suggests, however, that because promotion programs may achieve some permanent change in user behavior, sales may not drop all the way back to pre-program levels after a promotion campaign. Forker and Ward (1993) note that without the decay phenomenon, there would be no reason for continued expenditures on promotion activities after the initial effort.

Thus, some form of distributed lag structure is necessary to capture these effects such as the goodwill stock of foreign market program expenditures (G) in equation (1). The goodwill variable (G) is constructed as:

(2) $$G_t = \sum_{i=0}^{m} w_i f[E_{t-i}]$$

where E_{t-i} refers to current and lagged promotion expenditures for i = 0, 1, …, m and f generally corresponds to natural logarithmic or other transformations to account for the diminishing returns to promotion expenditures. The promotion expenditures (E) in equation (2) spent in foreign markets must be deflated by foreign measures of inflation and must be converted to foreign currency values to properly account for the actual purchasing power of expenditures in foreign markets over time. The resulting structure of G in equation (2) allows for carryover effects of advertising on demand. To account for these carryover effects, we use the Almon polynomial distributed lag (PDL) formulation commonly used in the analysis of advertising effectiveness (see, for example, Global Insight 2007; Williams, Capps, and Bessler 2009; Williams, Capps, and Dang 2010; USDA 2012; and Ghosh and Williams 2014). Theory provides relatively little guidance as to the structure and length of these dynamic processes. Conventionally, researchers, through the use of statistical criteria like the Akaike Information Criterion (AIC) or the Schwarz Loss Criterion (SLC), allow the data to suggest the optimal number of lags to include in the specification. The use of the PDL formulation eliminates collinearity among the lagged advertising variables and saves degrees of freedom since only one parameter must be estimated. The PDL structure reveals the nature of the effect of the promotion expenditures on export demand.

An important issue is the aggregation level for X (agricultural exports) in equation (1). Given the available data, exports could be aggregated up to various categories such as the standard BICO (Bulk, Intermediate, Consumer-Oriented) aggregation or an aggregation based on geographical export destinations (e.g, Europe, Africa, Asia, Latin America, etc.) or by commodity groups (e.g., grains, fruits and vegetables, livestock and meat, etc.). Because the focus of this study is on total agricultural exports, two largely dissimilar categories of agricultural exports were used as defined by USDA: (1) bulk/intermediate products and (2) consumer-oriented products (often referred to as high value products (HVP)). Exhibit Appendix B1 provides a listing of the commodities and products aggregated into each group.

2. Simulation Analysis

After the parameters of the U.S. agricultural equations for bulk/intermediate (BULK) and consumer-oriented or high value products (HVP) are estimated, a simulation analysis of the USDA Export Market Development Programs is conducted. In this process, the two export demand equations developed are interfaced with a model of global agriculture known as the Global Agricultural Sector Model (GASM) to generate price-responsive simulations of the impact of the USDA Export Market Development Programs over the historical period (1977-2014)[5]. GASM is a price endogenous, mathematical programming model of U.S. and world agricultural markets developed and maintained by Dr. Bruce McCarl and associates at Texas A&M University. This model has been heavily peer-reviewed through publication and used in literally hundreds of refereed journal articles.

[5] The GASM model is also referred to as the Forest and Agricultural Sector Optimization Model with Greenhouse Gases (FASOMGHG). An overview of the model with details on its structure and recent applications can be found in Beach et al. (2010).

B. National Impact Analysis

The direct value of the additional agricultural export revenue generated is an important measure of the success of the USDA Export Market Development Programs. However, the additional direct revenue generated alone fails to capture the full economic contribution of the additional exports. When the agriculture industry makes an export sale, or any final demand sale, a portion of production expenses are paid to businesses' suppliers, and wages are paid to employees. These businesses and households in turn make purchases in the economy, stimulating additional economic activity. This *multiplier effect* recognizes that the total effect on output, employment, personal income, and government revenue in the region is greater than the initial dollar value of the added exports.

The national economic analysis captures these broader, economy-wide impacts of the additional export revenue generated by the USDA Export Market Development Programs under two alternative assumptions: (1) less than full employment and (2) full employment. The less-than-full-employment analysis is conducted with the IMPLAN model in which all prices are fixed, including wage rates. The full employment analysis is conducted with a computable general equilibrium (CGE) model in which the aggregate labor supply is fixed, labor is mobile across economic sectors, and the prices of labor as well as all goods and services are flexible. Sensitivity analyses are conducted to test the stability of the models and to provide a measure of confidence regarding the results of the analysis.

1. Less than Full Employment (IMPLAN Model)

The IMPLAN economic modeling tool and data (IMPLAN Group 2011) were used to analyze the effects of the increase in agricultural exports generated by the USDA Export Market Development Programs under the assumption of less than full employment in the economy. The additional agricultural export revenues, or *direct effects*, result in two types of multiplier effects in this analysis: (1) *indirect effects* from the purchase of inputs among local industries and (2) *induced effects* from the expenditures of institutions such as households and governments benefitting from the increased activity among local businesses.

Multipliers were first developed for the increase in agricultural exports as measured in the export demand analysis, accounting for relationships between each of 440 industry sectors as well as private households and governments. As a less-than-full-employment input-output model, IMPLAN assumes constant prices and no resource constraints. The model calculates multipliers based on the purchasing patterns of industries and institutions in the regional economy. Each industry and region combination has a unique spending pattern and a unique multiplier.

To apply industry-specific multipliers accurately, the additional bulk exports generated by the USDA Export Market Development Programs from the export demand analysis were proportioned according to IMPLAN sector sales across farm and processed agriculture sectors relevant to bulk commodities. Similarly, high value exports were proportioned across farm and processed agriculture sectors appropriate to high value products. This step approximated the breakdown of the additional export sales by industry, which was not done in previous analyses of the USDA Export Market Development Programs.

Under this less-than-full-employment scenario, the resources needed to produce additional output (including labor, capital, and purchased inputs) are assumed to be readily available in the economy. That is, the model assumes that labor is available from the ranks of the unemployed and that other resources are likewise underutilized. Thus, increased demand for these inputs does not raise their prices and resources do not have to be diverted from other industries to meet higher export demand.

In addition to the national level analysis, a regional impact analysis was also conducted. Separate IMPLAN models were created for each of the four U.S. census regions (see Exhibit Appendix B5) to consider how impacts varied in different parts of the country. Simulated exports were modeled for each region to estimate historical economic contributions and expected changes under various program funding scenarios. Each region's share of exports was estimated from 2010 IMPLAN data based on the region's share of national production of each commodity affected by the USDA Export Market Development Programs. Regions were expected to supply exports from their production of each relevant commodity. The methodology at the national level, as described above, was used in each regional model. The regional models capture regional impacts based on production and processing differences across the U.S.

Four types of multiplier effects are reported in the less-than-full employment analysis: (1) output or sales, (2) value-added, (3) labor income or personal income, and (4) employment. The o*utput or sales multipliers* measure the effect of direct spending (or loss) on overall economic activity in the United States and sub-regions. The output multiplier provides the largest economic impact value and, therefore, is reported in many studies; however, the output multiplier says nothing about how the event affects the welfare of households or the profitability of businesses.

The *value-added multiplier* is a more appropriate measure of regional welfare. The value-added multiplier measures the contribution of an event (increased agricultural exports, in this case) to regional gross domestic product (GDP). The regional GDP is the value added to the national (or regional) economy, or the return to resources used in the production of the event.

The *labor income or personal income multiplier* measures the effect of the additional exports on incomes of households in the nation or region, and is appropriate for discerning the benefit to residents. The *employment multiplier* measures the effect of the increased exports on national and regional employment in various economic sectors. Calculation of the employment multiplier assumes that existing employees are not fully occupied and thus assumes that any increase in agricultural exports increases employment without increasing wages. Further, the model does not distinguish between full-time and part-time workers.

2. Full Employment (CGE Model)

The full employment analysis relies on a general equilibrium approach which builds directly on the export demand econometric analysis and tracks the effects of the USDA Export Market Development Programs through transmission channels in the broader economy. These transmission channels include markets for goods and services, markets for productive factors including labor and capital, and government taxation and expenditure channels. This full employment analysis methodology which uses a computable general equilibrium (CGE) model differs from that of the less-than-full-employment analysis which relies on the IMPLAN model described previously by:

- Allowing for flexible prices and adaptive behavior among economic agents.
- Recognizing economy-wide constraints on resources and the associated opportunity costs of an investment.
- Accounting for the costs of the USDA Export Market Development Programs, including tax payments by U.S. citizens and expenses made by agri-food businesses.
- Relying extensively on economic theory to inform agents' behavioral responses.
- Facilitating calculation of macro-economic changes including household welfare, gross domestic product, agricultural labor demand, and farm cash receipts.

Employing two well-established yet distinct models (IMPLAN and CGE) to analyzing the broader economic impacts of the USDA Export Market Development Programs provides a form of sensitivity analysis. This dual method of analyzing the national economic effects of the program limits the possibility that a result could be driven by particular modeling assumptions. Together the two approaches better approximate the range of possible outcomes.

The full employment analysis using the CGE model starts from national-level IMPLAN (2011) data, which contain detailed information on consumer expenditures, household characteristics, production accounts, intermediate input use, taxes and transfers, and exports and imports. While IMPLAN data can be broken into as many as 440 sectors, these are aggregated for the full employment (CGE) analysis to the four categories in Exhibit Appendix B2. The two agricultural categories correspond to those used in the econometric analysis described above.

The IMPLAN data are used to create a Social Accounting Matrix (SAM) that represents the numerous economic transactions that take place within the U.S. economy, including those among firms, households, and the government. The SAM contains detailed information on consumer expenditures, household characteristics, production accounts, intermediate input use, taxes and transfers, and exports and imports.

The equilibrium represented in the SAM guided the development and calibration of the general equilibrium model. Based on well-established economic theory, the general equilibrium model consists of hundreds of equations that describe the behavior of optimizing producers, optimizing consumers, government actions, and links between these diverse agents. There is a single representative household in the model that consumes goods and services according to a budget constraint, and that has income derived from the earning power of labor and capital. Firms maximize profit, using labor and capital as inputs, as well as inputs from all other sectors of the economy. The model has many free parameters that are estimated such that the baseline values of the general equilibrium model match the observations in the SAM.

The assumption of economy-wide, full employment is maintained for all scenarios as required by OMB *Circular A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*. Despite the fact that labor is held in fixed supply in the overall economy, jobs can be lost and created in different sectors according to the price changes associated with the changes in agricultural exports and prices resulting from the USDA Export Market Development Programs. Wages are also flexible.

To investigate the economy-wide effects of the USDA Export Market Development Programs, the model (calibrated to the SAM) is shocked using the results of the econometric analysis to make a prediction regarding what the economy would be like without the USDA Export Market Development Programs in place for each of the individual scenarios described below in this document. Predicted values are then compared to the baseline SAM for the baseline of interest. In this way, the market development elasticities and funding provide different response estimates for bulk and high value agricultural products in this analysis. In particular, partial equilibrium demand shifts from the econometric analysis are converted to export demand preference shift variables in the general equilibrium model. The shift parameters in the export demand equations are calibrated to represent the exact value and quantity by which exports change due to the USDA Export Market Development Programs. Shocks are introduced that eliminate these enhanced demands from the baseline data so as to represent what would have occurred without the USDA Export Market Development Programs.
A separate, simultaneous set of shocks is used to represent the cost of increasing demand in markets across the rest of the world. The contributions of cooperators to the funding of USDA Export Market Development Programs are imposed on the associated firms by way of a calibrated shift in the cost curve of firms. Meanwhile, the cost of the U.S. government's expenditures is imposed on U.S. taxpayers by way of a calibrated tax

on the representative household. With these shocks introduced alongside the preference shifts, the welfare and market effects of the simulations can be approximated.

V. HISTORICAL ANALYSIS OF THE USDA EXPORT MARKET DEVELOPMENT PROGRAMS

In this section of the report, the historical impacts of the USDA Export Market Development Programs are analyzed. The analysis is divided into two parts: (1) export demand analysis and (2) national impact analysis. In the first part, two export demand equations representing U.S. bulk/intermediate exports and HVP exports over 1977-2014 are developed through econometric analysis. Then a simulation analysis of the USDA Export Market Development Programs over the historical period is conducted using the two export demand equations linked to the GASM. In the second part of this section, the impact of the USDA Export Market Development Programs on the overall U.S. economy is analyzed in a national impact analysis using the simulation results from the export demand analysis.

A. Export Demand Analysis

Like any scientific experiment, in order to measure the impact of one factor on some variable of interest, all other factors that may impact that variable must be controlled. Econometric analysis allows the researcher to observe the impact of one economic factor like promotion expenditures on some variable like agricultural exports by statistically accounting for the influence of other key factors that may influence exports. This process essentially isolates the impact of the factor of interest from those of all other hypothesized impact factors on the changes in the variable being studied. Accordingly, two equations representing U.S. agricultural export demand for two aggregate categories of exports were estimated – one for bulk and intermediate products (BULK) and the other for consumer-oriented or high value products (HVP).

1. Bulk Export Demand Analysis

The BULK export demand equation specification was based on equations (1) and (2) above as:

(3) $BULK_t = f(UBP_t, RGDP_t, XUSTW_t, WGDEF_t, RBPROD_t, RPOP_t, BULK_{t-1}, GBULK_t, ZB_t)$

where BULK is U.S. bulk and intermediate agricultural exports (1,000 mt), UBP is the BULK export price ($/mt unit value), RGDP is foreign real GDP ($US billion), XUSTW is the U.S. agricultural trade-weighted exchange rate index, WGDEF is the world GDP deflator, RBPROD is the production of bulk commodities by the rest of the world (1,000 mt), RPOP is the population of non-U.S. countries (the rest of the world or ROW) (millions), GBULK is the “goodwill” stock of USDA Export Market Development Programs funding to promote exports of U.S. bulk and intermediate commodities ($US million), and

ZB represents specific other factors and events affecting the demand for U.S. bulk and intermediate agricultural exports and can be found listed in Exhibit Appendix B4.

In estimating the parameters of equation (3), RPOP was found to be correlated with other variables. Thus, to account for any effect that world population growth may have on U.S. bulk and intermediate exports, equation (3) was estimated in per capita form by dividing both sides of equation (3) by RPOP. This procedure essentially removes any trend in the data resulting from population growth. Also, to account for changes in the purchasing power of foreign currency over time, the price (per unit value) of U.S. bulk exports (UBP) and the USDA Export Market Development Programs promotion expenditures in GBULK were inflation-adjusted using the world GDP deflator (WGDEF) and exchange-rate-adjusted using the U.S. agricultural trade-weighted exchange rate index (XUSTW). Thus, export demand equation (3) as estimated became the following where all variables are assumed to be subscripted with t representing the current time period except as noted:

(3') BULK/RPOP = *f*(UBP*XUSTW/WGDEF, RGDP/RPOP, RBPROD/RPOP, $(BULK/RPOP)_{t-1}$, GBULKP, Z)

GBULKP is total deflated, exchange-rate-adjusted, per capita expenditures for the promotion of bulk and intermediate U.S. agricultural commodities. GBULKP is constructed as BULKTOT/RPOP*XUSTW/WGDEF and BULKTOT is total USDA Export Market Development Programs promotion funding for BULK exports which includes both contributions by cooperators and FMD/FAS expenditures to promote bulk and intermediate commodities.

Exhibit 6 provides the econometric estimation results for equation (3') where all variables are in natural log form (i.e., double log). Exhibit Appendix B3 provides detailed definitions and sources of the variables in the equation. The parameters of the equation are estimated over the 1975-2014 sample period[6]. As suggested by Office of Management and Budget (OMB) guidelines for conducting benefit-cost analyses (OMB 1992), we conducted a sensitivity analysis of the estimated model, comparing the actual historical data for BULK exports to the model-generated values of the historical levels of those exports (Exhibit 7). As indicated by the R^2 statistic, the model explains over 95% of the annual variations in bulk and intermediate exports meaning that the model predictions are an excellent fit of the actual values of BULK exports over the sample period. All parameters are statistically significant and their signs and magnitudes are all consistent with *a priori* expectations. The Durbin Watson and Durbin-h statistics indicate no evidence of autocorrelation.

The estimated parameter (elasticity) of the real, exchange-rate-adjusted price (UBPR) in equation (3') (Exhibit 6) is negative as expected and highly statistically significant. The estimated elasticity of -0.2761 indicates that per capita U.S. bulk agricultural export

[6] In the simulation analysis to follow, the simulation is conducted over the 1977-2014 period because two observations are lost given the two-year estimated lag in promotion expenditures.

demand is inelastic with respect to changes in its price. That is, a 10% increase in the price of bulk exports results in a smaller 2.76% decline in per capita bulk exports, holding all else constant. This result is consistent with the usual expectation that the demand for bulk agricultural commodities is inelastic with respect to its own price.

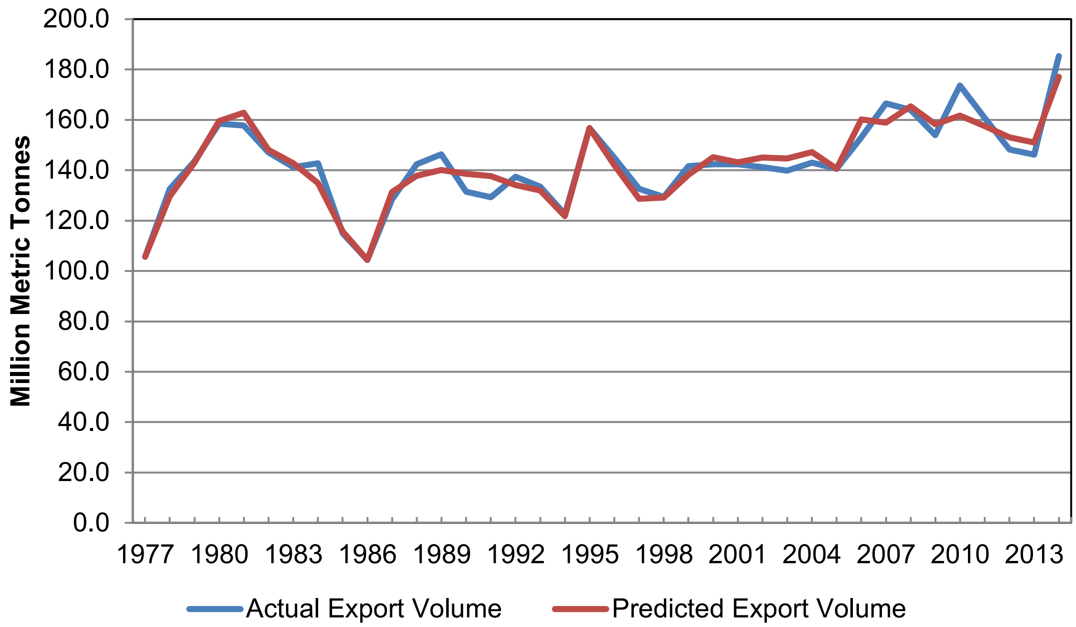
Exhibit 6: Econometric Equation for Bulk Agricultural Export Demand*

Parameter Estimates				
Variables (in natural logs except indicator variables)	**Estimate**	**Standard Error**	**t Value**	**P-Value**
Intercept	1.6653	1.4317	1.16	0.2557
Real exchange-rate-adjusted bulk export price (UBPR)	-0.2761	0.0877	-3.15	0.0042
Foreign real per capita GDP (RGDPP)	0.5275	0.1185	4.45	0.0002
Foreign bulk commodity production per capita (RBPRODP)	-0.4659	0.0956	-4.87	<.0001
Lagged dependent variable $(BULKP)_{t-1}$	0.2383	0.0985	2.42	0.0232
WTO agreement indicator variable (1994 to present) (DT2)	0.1818	0.0543	3.35	0.0026
Hurricane Katrina indicator variable (2005) (DW1)	-0.1073	0.0406	-2.64	0.014
Severe U.S. drought & Chernobyl indicator variable (1986) (DW10)	-0.1826	0.0456	-4.01	0.0005
Chinese corn & soybean trade policy indicator variable (1995) (DT6)	0.091	0.0514	1.77	0.0888
Droughts in Asia and Europe indicator variable (1977) (DE6)	0.0833	0.023	3.63	0.0013
World economic conditions indicator variable (various years) (DE4)	-0.18	0.0451	-3.99	0.0005
U.S. Export Enhancement Program indicator variable (1986-1996) (DF4)	0.082	0.0281	2.92	0.0073
Goodwill Variable of Bulk Promotion Expenditures (GBULKP)				
Real, exchange-rate-adjusted per capita bulk promotion expenditures in current period ($GBULKP_t$)	0.033853	0.004243	7.98	<.0001
Real, exchange-rate-adjusted per capita bulk promotion expenditures lagged one period ($GBULKP_{t-1}$)	0.045138	0.005657	7.98	<.0001
Real, exchange-rate-adjusted per capita bulk promotion expenditures lagged two periods ($GBULKP_{t-2}$)	0.033853	0.004243	7.98	<.0001
Regression statistics: Adj. R^2 = 0.9537 DW = 2.02967 Durbin-h = -0.0767				

*See Exhibit Appendix B3 for more specific definitions of variables

Changes in foreign (non-U.S.) real per capita income (RGDPP) in equation (3') in Exhibit 6 are estimated to have a positive impact on per capita bulk exports. Not surprisingly, the relationship is inelastic such that a 10% increase in foreign real per capita income increases bulk per capita commodity exports by a smaller 5.3%, holding all else constant. This result is consistent with the long-held expectation that the demand for bulk agricultural commodities is inelastic with respect to changes in income (see, for example, World Bank 1994).

Exhibit 7: Bulk Exports – Actual and Predicted Values, 1977-2014



Also as expected, increases in per capita foreign bulk commodity production (RBPRODP) are estimated to have a negative, inelastic impact on U.S. per capita bulk exports (Exhibit 6). A 10% increase in foreign bulk production reduces U.S. bulk exports by 4.7%, holding all else constant.

Export demand equations are normally estimated with lagged exports as an explanatory variable in what is referred to as a partial adjustment model. Rigidities in a system like international trade due to adjustment costs and incomplete information imply that the adjustment of exports to changes in the explanatory variables is not instantaneous but rather takes time. Thus, changes in exports in one year are positively related to changes in those exports in the previous year. In the estimated equation (3') in Exhibit 6, per capita bulk exports in the current year (BULKP) are found to be positively and significantly related to those exports in the previous period as expected. A 10% increase in per capita bulk exports in the previous year ($BULKP_{t-1}$) increase per capita bulk exports in the current year by 2.4%.

U.S. per capita bulk agricultural exports are also likely impacted by many events from year to year (ZB in equation (3')). While income, population, inflation, prices, and other variables largely explain the longer term trends in the export data, various events account for much of the deviation of exports around the trend from year to year. To determine what events have impacted exports, we hypothesized that a large number of events potentially affected the level of exports over time. Exhibit Appendix B4 provides a listing of those events which we treat as indicator variables. An indicator variable takes on the value of 1 in the year of the event and 0 in other years. We sequentially tested the significance of each of the 46 hypothesized events listed in Exhibit Appendix B4 to determine the significance of each in impacting aggregate bulk and intermediate agricultural exports. Of those 46 identified events, we found that seven had statistically significant effects on net across all commodities in the bulk and intermediate export group over the sample period. That does not mean, of course, that other events had no effects on exports. Indeed, many other factors have likely affected exports of many of the individual commodities in the aggregate bulk and intermediate export group over the years. Some events have offsetting effects, however, increasing exports of one commodity while reducing those of another resulting in little net effect on aggregate exports. At the same time, events that may impact the trade volume for one commodity may not have a statistically significant effect with respect to the aggregate category of bulk and intermediate exports.

Of the seven events found to impact bulk and intermediate exports, four positively impacted trade and the other three negatively impacted trade (Exhibit 6). The four events with statistically significant positive effects on U.S. per capita bulk and intermediate agricultural exports include: (1) the WTO agreement (DT2 in Exhibit Appendix B4) beginning in 1995 through 2014; (2) the Chinese ban on their corn exports and the opening of Chinese markets to soybean imports in 1995 (DT6 in Exhibit Appendix B4); (3) droughts across Europe and Asia in 1977 (DE6 in Exhibit Appendix B4); and (4) the U.S. Export Enhancement Program in 1986 through 1996 (DF4 in Exhibit Appendix B4). The three events with statistically significant negative effects on U.S. bulk and intermediate agricultural exports include: (1) Hurricane Katrina in 2005 (DW1 in Exhibit Appendix B4); (2) a severe U.S. drought and the Chernobyl incident in 1986 (DW10 in Exhibit Appendix B4); and (3) negative world economic conditions which affected confidence in the global banking system and the extension of credit in 1980, 1981, 2008, and 2014 (DE4 in Exhibit Appendix B4).

To capture diminishing marginal returns to the export promotion expenditures over time, we use a logarithmic transformation of GBULKP as is commonly done in other studies of domestic and export promotion (see, for example, Kaiser 2010, Williams et al. 2011, and Global Insight 2007 and 2010). Also, as indicated earlier, we follow the common procedure of using the Almon polynomial distributed lag (PDL) formulation to account for the time lag in the impact of the promotion investments on U.S. exports of bulk and intermediate commodities. The search for the pattern, polynomial degree, and time period over which the promotion expenditures influence U.S. exports of bulk and intermediate agricultural commodities involved a series of nested OLS regressions. Lags of up to 10 years and up to fourth degree polynomials with alternative choices of head and tail restrictions were considered. Based on a composite set of criteria, including the

Akaike Information Criterion (AIC), the Schwarz statistic, and heuristic measures[7] (e.g., significance and signs of the estimated parameters in the equation), a second order PDL of the current period and two lags with head and tail restrictions was selected. As indicated earlier, before being transformed in this way to create the estimated form of GBULKP, BULKTOT was first deflated, exchange rate adjusted, and divided by rest-of-the-world population (RPOP).

The estimated parameters (elasticities) of the goodwill variable (GBULKP) in equation (3') indicate that total USDA Export Market Development Programs promotion spending to promote bulk and intermediate agricultural exports had a highly statistically significant and positive effect on those exports over time. The promotion elasticity, normally referred to as the long-run promotion elasticity, is estimated at 0.11284 and is calculated as the sum of the elasticities in the current and two past periods (see Exhibit 6). This estimated long-run elasticity is consistent with such elasticities estimated for other export demand promotion programs as discussed in the environmental scan of previous literature. This long-run elasticity is a *static* measure of promotion impact and assumes that all else is held constant when expenditures change.

Given the lag in the dependent variable in equation (3'), a *dynamic* long-run elasticity can be calculated which assumes other variables change as expenditures change. The *dynamic* long-run elasticity is calculated by dividing the *static* long-run promotion elasticity by one minus the estimated coefficient of the lagged bulk exports per capita ($BULKP_{t-1}$). The result is a *dynamic* long-run elasticity of 0.14815 which is similar to the (dynamic) long-run promotion elasticity reported by the previous analysis of USDA Export Market Development Programs of 0.193 by Global Insight (2010). Our bulk export promotion elasticity and the one reported by Global Insight (2010) are not strictly comparable, however. Our estimated promotion elasticity is estimated with respect to the volume of bulk and intermediate agricultural exports while the promotion elasticity reported by Global Insight (2010) is estimated with respect to the U.S. share of global bulk and intermediate agricultural exports. Nevertheless, the similarity of the two promotion elasticity estimates implies some robustness in the estimated impact of USDA Export Market Development Programs promotion on U.S. bulk and intermediate agricultural exports.

To test the robustness of the estimated BULK export demand promotion elasticity, we conducted a sensitivity analysis in conformance with OMB guidelines for conducting benefit-cost analyses (OMB 1992). Confidence intervals at the one percent level were computed for the BULK long-run market development elasticity. This is the interval over which true promotion elasticity would be expected to fall 99% of the time. The 99% confidence intervals for the BULK long-run elasticity are 0.134 and 0.162.

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[7] The heuristic aspect of the composite criteria may be viewed as *ad hoc* but is equivalent to restricting the class of models to be only those consistent with underlying theory. This procedure is commonly encountered in the literature, especially in analyses where equilibrium displacement models are used and only parameter values consistent with theory are utilized.

2. High Value Product (HVP) Export Demand Analysis

The HVP export demand equation specification was also based on equations (1) and (2) above:

(4) $HVP_t = f(UHP_t, RGDP_t, XUSTW_t, WGDEF_t, RHPROD_t, RPOP_t, HVP_{t-1}, GHVP_t, ZH_t)$

where HVP is U.S. HVP exports, UHP is the HVP export price (unit value), RGDP is foreign real GDP, XUSTW is the U.S. agricultural trade-weighted exchange rate index, WGDEF is the world GDP deflator, RHPROD is the production of high value products by the rest of the world, RPOP is the population of non-U.S. countries (the rest of the world or ROW), GHVP is the "goodwill" stock of USDA Export Market Development Programs expenditures to promote U.S. HVP exports, and ZH represents specific other forces and events affecting the demand for U.S. HVP exports.

As with the BULK export equation, RPOP was found to be correlated with other variables. Thus, to account for any effect that world population growth may have on U.S. HVP exports, equation (4) was also estimated in per capita form as done with BULK exports by dividing both sides of equation (4) by RPOP. Again, this procedure essentially removes any trend in the data resulting from population growth. Also, to account for changes in the purchasing power of foreign currency over time, the prices (per unit value) of U.S. HVP exports (UHP) and the USDA Export Market Demand Programs promotion expenditures in GHVP were also inflation-adjusted using the world GDP deflator (WGDEF) and exchange-rate-adjusted using the U.S. agricultural trade-weighted exchange rate index (XUSTW). Thus, HVP export demand equation (4) as estimated became the following where all variables are assumed to be subscripted with t representing the current time period except as noted:

(4') $HVP/RPOP = f(UHP*XUSTW/WGDEF, RGDP/RPOP, RHPROD/RPOP, (HVP/RPOP)_{t-1}, GHVPP, ZH)$

where GHVPP is total deflated, exchange-rate-adjusted, per capita expenditures for the promotion of U.S. high value product exports and is constructed as HVPTOT/RPOP*XUSTW/WGDEF. HVPTOT is total USDA Export Market Development Programs promotion funding which includes both contributions by cooperators and FMD/MAP expenditures to promote HVP exports.

Exhibit 8 provides the econometric estimation results for equation (4') where all variables are in natural log form (i.e., double log). Exhibit Appendix B3 provides detailed definitions and sources of the variables in the equation. As with the BULK export demand equation, the parameters of the HVP export demand equation are estimated over the 1975-2014 sample period[8]. As suggested by OMB guidelines for conducting benefit-cost analyses (OMB 1992), we conducted a sensitivity analysis of this estimated model, comparing the actual historical data for HVP exports to the model-generated values of the historical levels of those exports (Exhibit 9). As indicated by the R^2 statistic, the model explains over 99% of the annual variations in bulk and intermediate exports meaning that the model predictions are an excellent fit of the actual values of HVP exports over the sample period. All parameters are statistically significant and their signs and magnitudes are all consistent with *a priori* expectations. The Durbin Watson and Durbin-h statistics indicate no evidence of autocorrelation.

Exhibit 8: Econometric Equation for HVP Agricultural Export Demand*

Parameter Estimates				
Variables (in natural logs except indicator variables)	**Estimate**	**Standard Error**	**t Value**	**P-Value**
Intercept	-3.9158	1.2226	-3.52	0.0015
Real exchange-rate-adjusted HVP export price (UHPR)	-0.5549	0.1399	-3.97	0.0005
Foreign real per capita GDP (RGDPP)	1.7448	0.3369	5.18	<.0001
Foreign HVP commodity production per capita (RHPRODP)	-1.6144	0.3751	-4.30	0.0002
Lagged dependent variable $(HVPP)_{t-1}$	0.7389	0.0591	12.50	<.0001
U.S. animal disease issues indicator variable (various years) (DA7)	-0.0466	0.0221	-2.11	0.0444
Severe California Medfly attack indicator variable (1989) (DA8)	-0.1037	0.0483	-2.15	0.0410
Significant California droughts indicator variable (various years) (DW11)	-0.0713	0.0303	-2.36	0.0260
Recession indicator variable (2009, 2010) (DE2)	-0.0770	0.0363	-2.12	0.0432
Australian drought (increased Australian beef exports) indicator variable (2007) (DW7)	-0.0944	0.0362	-2.60	0.0148
Goodwill Variable of HVP Promotion Expenditures (GHVPP):				
Real, exchange-rate-adjusted per capita HVP promotion expenditures in current period $(GHVPP_t)$	0.013895	0.005058	2.75	0.0106
Real, exchange-rate-adjusted per capita HVP promotion expenditures lagged one period $(GHVPP_{t-1})$	0.018527	0.006745	2.75	0.0106
Real, exchange-rate-adjusted per capita HVP promotion expenditures lagged one period $(GHVPP_{t-2})$	0.013895	0.005058	2.75	0.0106
Regression statistics: Adj. R^2 = 0.9944 DW = 2.1986 Durbin-h = -0.54218				

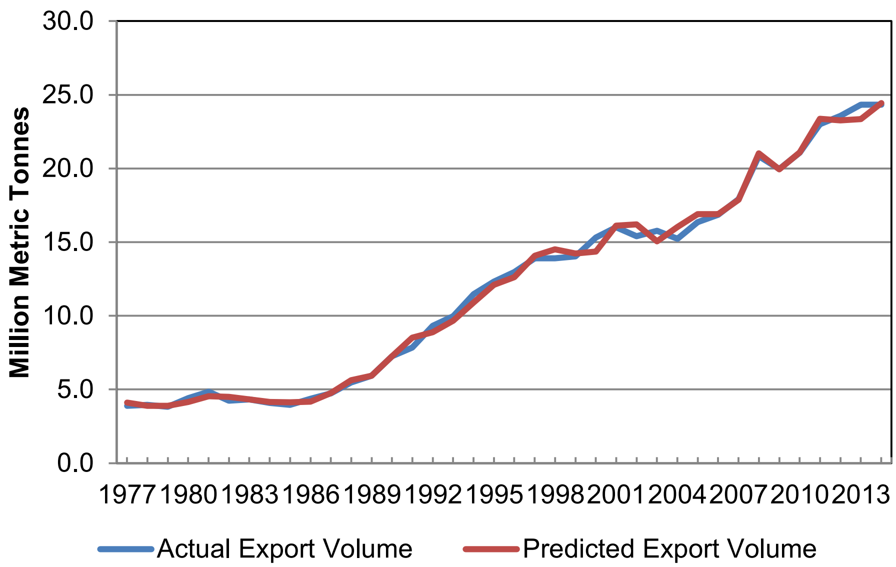
*See Exhibit Appendix B3 for more specific definitions of variables

[8] Again, in the simulation analysis to follow, the simulation is conducted over the 1977-2014 period because two observations are lost given the two-year estimated lag in promotion expenditures.

The estimated parameter (elasticity) of the real, exchange rate adjusted price of HVP exports (UHPR) in equation (4') (Exhibit 8) is negative as expected and highly significant. The estimated elasticity of -0.5549 indicates that U.S. per capita HVP export demand is inelastic with respect to changes in its own price but less so than per capita BULK exports. A 10% increase in the price of HVP exports results in a 5.55% decline in per capita HVP exports, holding all else constant. This result is consistent with the usual expectation that the demand for HVP agricultural commodities is inelastic with respect to its own price but less so than is the case for BULK exports.

Changes in foreign (non-U.S.) real per capita income (RGDPP) in equation (4') in Exhibit 8 are estimated to have a positive impact on per capita HVP exports. In contrast to the estimated income inelasticity of BULK exports, HVP exports are found to be elastic with respect to income. A 10% increase in foreign real income increases per capita HVP commodity exports by a larger 17.45%, holding all else constant. This result is also consistent with the long-held expectation that the income elasticity of demand for high value goods exceeds one.

Exhibit 9: HVP Exports – Actual and Predicted Valued, 1977-2014



Also as expected, increases in per capita foreign HVP production (RHPRODP) are estimated to have a negative, elastic impact on U.S. per capita HVP exports (Exhibit 8). A 10% increase in foreign per capita HVP production reduces U.S. per capita bulk exports by 16.1%, holding all else constant.

Similar to the BULK per capita export demand equation, the HVP per capita export equation is estimated with lagged HVP per capita exports as an explanatory variable in a partial adjustment model. In the estimated equation (4') in Exhibit 8, per capita HVP exports in the current year (HVPP) are found to be positively and significantly related to those exports in the previous period as expected. The estimated coefficient of 0.739 for lagged HVPP exports reflects the strong upward trend in HVPP exports over the period of estimation.

As with U.S. per capita bulk agricultural exports, U.S. HVP per capita exports are also likely impacted by many events from year to year but likely those more related to global HVP markets. While income, population, inflation, prices, and other variables largely also explain trends in the HVPP export data, these events account for much of the deviation of HVPP exports around their long-term trend from year to year. To determine what events have impacted HVPP exports, we again hypothesized that a large number of events potentially affected the level of HVPP exports over time. As indicated earlier, Exhibit Appendix B4 provides a listing of those events which again are treated as indicator variables. We sequentially tested the significance of each of the 46 hypothesized events listed in Exhibit Appendix B4 to determine the significance of each in impacting aggregate HVPP exports. Of those 46 identified events, we found that five had statistically significant effects on net across all commodities in the HVP export group over the sample period. Again, many other factors have likely affected exports of many of the individual commodities in the HVP export group over the years. Some events have offsetting effects, however, increasing exports of one commodity while reducing those of another resulting in little net effect on aggregate exports. The five indicator variables included in equation (4’) in Exhibit 8 are simply those that were statistically significant with respect to the aggregate category of HVP exports.

All five events were found to have statistically significant, negative effects on U.S. per capita HVP exports (Exhibit 8): (1) U.S. animal disease issues in various years, including EU hoof and mouth disease in 2001, the U.S. BSE events in 2003 and 2004, a swine flu outbreak in 2009, a PEDv outbreak in 2013 and 2014, and an avian influenza outbreak in 2014 (DA7 in Exhibit Appendix B4); (2) a severe California Medfly attack in 1989 (DA8 in Exhibit Appendix B4); (3) significant California droughts in 1977 and again in 2013 and 2014 (DA11 in Exhibit Appendix B4); (4) U.S. recession in 2009 and 2010 (DE2 in Exhibit Appendix B4); and (5) a severe Australian drought in 2007 that led to increased Australian exports of beef as producers liquidated herds (DW7 in Exhibit Appendix B4).

As with the bulk export demand equation, we use a logarithmic transformation of GHVPP to capture diminishing marginal returns to the export promotion expenditures over time as is commonly done in other studies of domestic and export promotion. We also used the Almon polynomial distributed lag (PDL) formulation to account for the time lag in the impact of the promotion investments on U.S. HVP exports. The search for the pattern, polynomial degree, and time period over which promotion expenditures influence U.S. HVP exports also involved a series of nested OLS regressions. Lags of up to 10 years and up to fourth degree polynomials with alternative choices of head and tail restrictions were considered. Based on a composite set of criteria, including the Akaike Information Criterion (AIC), the Schwarz statistic, and heuristic measures as before, a second order PDL of the current period and two lags with head and tail restrictions was also selected for the HVP goodwill stock variable. As indicated earlier, before being transformed in this way to create the estimated form of GHVPP, HVPTOT was first deflated, exchange-rate adjusted, and divided by rest-of-the-world population (RPOP).

The estimated parameters (elasticities) of the goodwill variable (GHVPP) in equation (4') indicate that HVPTOT (USDA Export Market Development Programs promotion funding) had a statistically significant and positive effect on U.S. per capita HVP exports over time. The *static* long-run promotion elasticity is estimated at 0.04631 and is also calculated as the sum of the elasticities in the current and two past periods (see Exhibit 8). This estimated *static* long-run elasticity is consistent with such elasticities estimated for other export demand promotion programs as discussed in the environmental scan of previous literature. The *dynamic* long-run elasticity, calculated by dividing the *static* long-run promotion elasticity by one minus the estimated coefficient of the lagged HVPP exports per capita is 0.1774 which is similar to the (dynamic) HVP promotion elasticity reported by the previous analysis of the USDA Export Market Development Programs of 0.188 by Global Insight (2010). Again, the dynamic long-run elasticities we estimate and that reported by Global Insight (2010) are not strictly comparable. Our estimated HVP promotion elasticity is estimated with respect to the volume of HVP exports while the promotion elasticity reported by Global Insight (2010) is estimated with respect to the U.S. share of global HVP exports. Nevertheless, the similarity of the two promotion elasticity estimates again implies some robustness in the estimated impact of USDA Export Market Development Programs promotion on U.S. HVP exports.

To test the robustness of the estimated HVP export demand promotion elasticity, we conducted a sensitivity analysis in conformance with OMB guidelines for conducting benefit-cost analyses (OMB 1992). Confidence intervals at the one percent level were computed for the HVP long-run market development elasticity. This is the interval over which true promotion elasticity would be expected to fall 99% of the time. The 99% confidence intervals for the HVP long-run elasticity are 0.161 and 0.194.

3. Halo or Indirect Effects Analysis

In promoting agricultural products at any market level, the promotion effects may spill over to impact the demand for other commodities. The spillover effects may be either negative or positive. That is, the promotion of one commodity may increase the demand not only for the target commodities but also closely related, complementary products. In this case, there would be a so-called "halo effect" since promotion has a more generalized positive effect on agricultural product consumption than might be measured in an analysis of the promotion effect on simply the target product. On the other hand, promotion of one commodity may lead consumers to not only purchase more of the target commodity but also reduce their consumption of other commodities because either the two commodities are substitutes or because income constraints force consumers to reduce the consumption of some other product if they increase their consumption of the target product due to advertising. The latter substitution effect is referred to as "beggar thy neighbor advertising" (Alston, Freebairn, and James 2001). When this type of advertising effect occurs, profits from advertising by one group often come partly at the expense of other groups producing closely related commodities.

For promotion related to aggregate groups of products, such as bulk and intermediate products and HVP products, there are likely both complementary and substitution effects among the products in the group from promotion. Thus, in theory, promoting some products within a group of products could have positive or negative effects on other products within that group, so the expected net effects of the promotion could be either negative or positive. In the foregoing analysis, however, we demonstrate that the impact of promoting a subgroup of products has a positive effect on the BULK agricultural product category, indicating that the promotion has had a complementary net positive or "halo" effect on those products in the BULK category that have not been specifically targeted for promotion. We demonstrate the same result for HVP products. That is, promotion of some BULK and HVP product exports tends to increase the demand for the entire aggregate category of BULK and HVP product exports.

To determine whether simultaneous promotion of BULK and HVP exports has a complementary ("halo") or substitution ("beggar thy neighbor") effect on each other, we added the goodwill variable for HVP products (GHVPP) to the per capita BULK export demand equation (3') and the goodwill variable for BULK products (GBULKP) to the per capita HVP export demand equation (4') and re-estimated the parameters of both equations. In both cases, we found that the promotion expenditures of one group of commodities had no statistically significant effect on the export demand of the other commodity. In other words, we found that, on net, the promotion of BULK exports neither helps nor hurts HVP export demand and vice versa. This result is not surprising because the "consumers" of bulk and intermediate products are manufacturers while "consumers" of high value products are likely more downstream towards retail markets so that the BULK and HVP products are not considered either substitutes or complements by the respective consuming groups. An alternative explanation for this result is that the effects of advertising of BULK exports on HVP export demand (and vice versa) have both complementary and substitution effects that cancel each other out in the aggregate.

In summary, our BULK and HVP export demand analyses provide evidence of a halo effect from the USDA Export Market Development Programs expenditures. Rather than a net substitution or "beggar thy neighbor" effect of the program in each case, we found a net positive ("halo") effect on the entire category of bulk and intermediate agricultural exports from the promotion of a subgroup of products within that category. We found the same result for high value product exports. We also found that the promotion of bulk and intermediate agricultural products does not cannibalize HVP exports and vice versa. Thus, the two export promotion programs work well together. They are individually highly effective at promoting exports of the products within their respective categories without negatively impacting exports in the other category of product exports. More consideration of a halo effect of U.S. agricultural export promotion is provided in a later section discussing the benefit-cost results of our analysis.

4. Historical Simulation Analysis

To analyze the effects of the USDA Export Market Development Programs on U.S. export revenue, the two U.S. agricultural export demand models developed above were linked to the GASM to simulate two scenarios relating to total U.S. agricultural exports (BULK and HVP) over the historical period (1977-2014)[9]: (1) a scenario *with* USDA Export Market Development Programs promotion funding (the "*with* scenario") and (2) a scenario *without* USDA Export Market Development Programs promotion funding (the "*without* scenario"). The *with* scenario represents actual history, that is, the level of export prices, volume, and revenue that actually existed over time as generated by the model which includes any effects on exports and prices from the export promotion expenditures. The *without* scenario represents the level of exports, prices, and revenue that would have existed over time if the USDA Export Market Development Programs had not existed or, in other words, if the export promotion expenditures had not been made over time.

The *with* scenario analysis was conducted through historical simulation of the Global Agricultural Sector Model (GASM) linked to the two U.S. agricultural export demand models we estimated (bulk/intermediate and high value products) over the 1977-2014 simulation period of analysis to generate a baseline scenario of the endogenous variables in the model, including U.S. agricultural prices, volume, and revenue. The *without* scenario was then conducted as a counterfactual analysis in which the USDA Export Market Development Programs were assumed to have never existed so that the government FMD/MAP expenditures and cooperator contributions were not made over the period of analysis. This assumption effectively eliminated the effects of the program on U.S. agricultural exports and prices over that period. The result was lower simulated levels of agricultural export price, volume, and revenue than actually occurred. Because the changes in the endogenous model variables in the *without* scenario were generated by changing only the level of promotion expenditures, they represent the levels of those variables that would have existed over time *if there had been no USDA Export Market Development Programs.*

Differences in the simulated levels of total U.S. agricultural exports (BULK and HVP), prices, and revenue along with other model variables in the *with* scenario from those in the *without* scenario are then taken as direct measures of the effects of the program expenditures over time. Because no other exogenous variable in the model (e.g., levels of inflation, exchange rates, income levels, agricultural and trade policies, etc.) other than promotion expenditures is allowed to change in either scenario, this process effectively isolates the effects of the USDA Export Market Development Programs on total U.S.

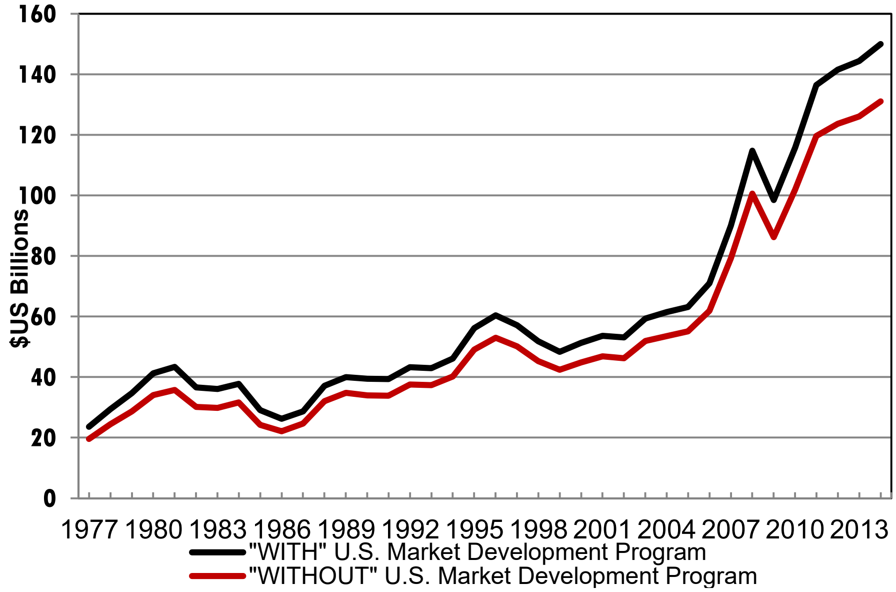
[9] As indicated earlier, the simulation analysis is conducted over the 1977-2014 period rather than the 1975-2014 period used for parameter estimation because two observations are lost given the two-year estimated lag in promotion expenditures.

agricultural exports and prices. Thus, the simulated differences between the levels of U.S. agricultural export and prices and, therefore, U.S. agricultural export revenue in the *with* promotion expenditures scenario and in the *without* promotion expenditures scenario provide a direct measure of the historical impacts of the export promotion expenditures under the USDA Export Market Development Programs (and only those expenditures) on U.S. agricultural export revenue.

Exhibit 10 shows the "with funding" and "without funding" simulation results over the 1977-2014 simulation period. The results show that on average over that period, the USDA Export Market Development Programs increased total U.S. agricultural export revenue (BULK and HVP) by 15.3% over what might otherwise have been the case. In other words, the USDA Export Market Development Programs has provided an annual average "lift" of $8.15 billion or 15.3% to the value of total U.S. agricultural exports over time. The "lift" is the average annual increase in some variable like export revenue due to promotion over the period of analysis (1977-2014 in this case)[10]. At the same time, the program has provided an annual average lift to the volume of aggregate U.S. agricultural exports of about 8.0% (11.5 million mt) and to the aggregate price of U.S. agricultural exports of about 6.7% ($25.07/mt). Over the 1977-2014 time period, these "lifts" equate to $309.7 billion in additional export revenues, and 437 million metric tons of additional export volume. Clearly, the USDA Export Market Development Programs have had a substantial and statistically significant impact on U.S. agricultural exports and U.S. agriculture in general.

[10] Lift is defined with respect to the level of a variable (the value of exports in this case) in the absence of the promotion program over the period of analysis (1977-2014 in this case).

Exhibit 10: Simulated Impact of the USDA Export Market Development Programs on U.S. Agricultural Exports, 1977-2014



Because the previous study of the USDA Export Market Development Programs (Global Insight 2010) focused on the period of 2002 through 2009, the "with funding" and "without funding" scenarios in this study were re-run over the 2002 to 2014 period to provide some basis of comparison of the results of the two studies[11]. The results indicate that on average over the 2002 to 2014 period, the USDA Export Market Development Programs increased total U.S. agricultural export revenue (BULK and HVP) by 14.3% over what might otherwise have been the case. In other words, the USDA Export Market Development Programs provided an annual average "lift" of $12.5 billion or 14.3% to the value of total U.S. agricultural exports over the 2002-2014 period. Over that period, the programs provided an annual average lift to the volume of aggregate U.S. agricultural exports of about 7.5% (12.2 million mt) and to the aggregate price of U.S. agricultural exports of about 6.3% ($33.79/mt). Between 2002 and 2014, these "lifts" added a total of $162.5 billion in additional export revenues, and 158.6 million metric tons in additional export volume. The Global Insight Study does not indicate the average annual impact on U.S. agricultural exports or price from their analysis over the 2002 to 2009 period. The study only indicates that in the last year of the analysis (2009) the value of exports is $6.1 billion higher than otherwise would have occurred. In this analysis, the increase in agricultural export value from the USDA Export Market Development Programs is $6.9 billion in 2002 and increases to $18.9 billion in 2014.

[11] Note, however, that this analysis considers the full effects of the USDA Export Market Development Programs over the 2002 to 2014 period while the Global Insight (2010) study only considered the effects of the funding in excess of an arbitrary flat level (2001) over the 2002 to 2009 period.

B. National Impact Analysis

In this analysis, the simulation results of the impact of the USDA Export Market Development Programs on U.S. agricultural export value over the historical period of 2002 to 2014 discussed previously are used to measure the impacts of the program on the overall U.S. economy over that time period under two different assumptions: (1) less than full employment in the economy and (2) full employment. The analysis under the first assumption is conducted with the IMPLAN model and assumes that unemployment exists in the economy so that an increase in economic activity resulting from the additional exports generated through the USDA Export Market Development Programs can generate additional employment by drawing labor from the ranks of the unemployed at a constant wage. The same analysis is also done using a CGE model which maintains the assumption of full employment in the U.S. economy. Most data underlying the CGE model are from IMPLAN so that IMPLAN 2010 data provides a consistent baseline for the analysis and the results of both models can be confidently compared[12]. Historic data from ERS (USDA 2015) and the U.S. Bureau of Economic Analysis (USBEA 2015) form the basis of both analyses. Together the results from the full employment and less-than-full-employment analyses represent a highly reasonable and realistic range of likely impacts of the USDA Export Market Development Programs on U.S. agriculture and the overall U.S. economy. Also, the less-than-full-employment results from the IMPLAN analysis serve as a sensitivity test of the full employment assumption maintained in the CGE analysis.

1. Agriculture Sector Impacts

The USDA Export Market Development Programs generated a positive lift[13] to the U.S. agriculture sector, pushing up annual average U.S. farm cash receipts in the range of $8.4 billion (2.7%), assuming less than full employment, to $8.7 billion (2.8%), assuming full employment, over the base average value for cash farm receipts for the 2002-2014 period of analysis (Exhibit 11). Over the entire period, $109.2 billion to $113.1 billion was added to farm cash receipts as a result of the program. As with all economic variables shown in Exhibit 11, the standard deviations (measures of uncertainty around the means) for the lift in farm cash receipts under both assumptions is shown in parentheses in Exhibit 11 beneath the respective changes in farm cash receipts. The lift in U.S. net cash farm income was in the range of $1.1 billion (1.8%) to $2.1 billion (3.7%) over the same period as a result of the USDA Export Market Development Programs assuming full employment and less than full employment, respectively. In total, the USDA Export Market Development Programs added between $14.3 billion and $27.3 billion above the baseline

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[12] USDA/ERS data that have been used to supplement the IMPLAN have been converted into 2010 dollars with a GDP deflator from USDA/ERS.

[13] Recall that "lift" is defined as an average annual increase in some variable like farm cash receipts due to promotion over some period of analysis (2002-2014 in this case). In this analysis, the lift is defined with respect to a "base value" representing the average annual level of the variable (cash receipts in this case) in the absence of the promotion program.

U.S. net cash farm income over the time period, also under the assumptions of full and less than full employment, respectively. The corresponding range of the lift of U.S. farm asset value was $1.0 billion (0.05%) to $1.1 billion (0.1%) on average per year, adding $13.0 billion to $14.3 billion, respectively, over the period.

The lift in U.S. farm cash receipts from the USDA Export Market Development Programs is higher in the full employment analysis than in the less-than-full-employment analysis because the increased export demand generated by the program results in higher commodity prices in both the foreign and domestic markets in the full employment analysis. In the less-than-full-employment analysis, the fixed production relationships prevented higher export demand from increasing commodity prices, thereby moderating increases in farm cash receipts. At the same time, input costs are driven up in the full employment analysis resulting in a lower lift in net cash farm income in that analysis compared to the less-than-full-employment analysis

The UDSA Market Development Programs also generated a positive lift in employment across the entire agri-food sector, which includes food product processing as well as production agriculture, in the range of 93,900 (2.4%) jobs and 90,000 (2.3%) jobs over the 2002-2014 period assuming less than full employment and full employment, respectively (Exhibit 11). Because the less-than-full-employment analysis has fixed production relationships and a linear response to the increased export demand through the USDA Export Market Development Programs, the lift in the demand for labor is higher across the agri-food sector as compared to the price-moderated effects of the full employment model. In the full employment analysis, the 90,000 workers drawn into the agri-food sector as a result of increased U.S. exports under the USDA Export Market Development Programs necessarily come from other sectors of the economy, predominantly the manufacturing sector (29,000 jobs) and the service sector (61,000 jobs). This is associated with small output contractions in the U.S. manufacturing and service industries (0.2% and 0.03%, respectively), and small rises in the prices of output in those sectors (0.02% and 0.05%, respectively). The latter price rises are smaller than the average price rise for products in the agri-food sector as a whole (0.9%). Under the linear assumptions of the less-than-full-employment analysis, the lift of 93,900 jobs in the agricultural sector does not require workers to be taken from other sectors. In fact, more workers are demanded in all sectors to meet the increased demand for agricultural inputs and for agricultural commodities and processed food products by newly employed households. Neither analysis distinguishes between full and part-time jobs.

Exhibit 11: Average Annual Impacts of USDA Export Market Development Programs on the U.S. Agriculture Sector and Overall U.S. Economy, 2002-2014a

Variable	Base average value[b] (2002-2014)	Less than Full Employment		Full Employment	
		Change	Percent Change	Change	Percent Change
Agriculture Sector	**$US billions**	**$US billions**	**%**	**$US billions**	**%**
Farm cash receipts	310.2 (55.3)	8.4 (2.3)	2.7 (0.3)	8.7 (1.4)	2.8 (0.1)
Net cash farm income	58.0 (17.6)	2.1 (0.6)	3.7 (3.7)	1.1 (0.4)	1.8 (0.2)
Farm assets	2,081.2 (390.9)	1.1 (0.3)	0.1 (0.0)	1.0 (0.2)	0.05 (0.001)
	1,000 jobs	**1,000 jobs**		**1,000 jobs**	
Employment in agri-food sector[c]	3,900.4 (--)	93.9 (25.2)	2.4 (0.6)	90.0 (2.2)	2.3 (0.06)
U.S. Economy	**$US billions**	**$US billions**	**%**	**$US billions**	**%**
U.S. Output (Gross Sales)	25,070.0 (--)	39.3 (11.4)	0.2 (0.05)	7.1 (0.18)	0.03 (0.001)
U.S. GDP	14,785.6 (916.8)	16.9 (4.9)	0.1 (0.03)	4.4 (0.08)	0.03 (0.001)
U.S. Labor Income	9,017.0 (--)	9.8 (2.8)	0.1 (0.03)	1.7 (0.04)	0.02 (0.004)
U.S. Labor Wage Rate	--	--	--	--	0.06
U.S. Economic Welfare	--	--	--	2.4 (0.05)	--
	1,000 jobs	**1,000 jobs**		**1,000 jobs**	
U.S. Employment	173,414.20 (--)	239.8 (68.4)	0.14 (0.05)	0.00 (--)	0.00 (--)

Note: -- = Not available as an output from this analysis. See Note b.
[a] Numbers in parentheses are standard deviations based on 13 observations using 2010 deflated values.
[b] The "base value" for a variable is the average annual level of that variable in the absence of the promotion program. Some variables such as U.S. economic welfare and labor wage do not have a base value because the full employment model only calculates the change in those variables and not a base value while the less-than-full-employment model holds wages fixed and calculates no changes in these outputs.
[c] The base employment value is measured as actual 2010 jobs as reported in IMPLAN. In the full employment analysis, total U.S. employment is held fixed but labor is mobile across sectors of the economy.

2. U.S. Economy Effects

The lift of the overall U.S. economy as a result of the USDA Export Market Development Programs given the assumption of less than full employment tends to be larger than the lift measured given the assumption of full employment for several reasons:

- The full employment analysis does not allow for unemployment in the aggregate. Thus, jobs created in the agricultural sector through the USDA Export Market Development Programs are lost from other sectors of the economy which constrains the extent to which the economy can grow as a result of the new export demand created. In contrast, the less-than-full-employment analysis does not require labor to be shifted from other sectors to agriculture when the demand for agricultural goods increases. Rather, the analysis allows workers to be pulled from the ranks of the unemployed at a constant wage.

- At the same time, the assumption of full employment implies a fixed amount of capital in the aggregate economy, meaning that any capital expansion of the agricultural sector from increased demand as the result of greater agricultural exports must come at the expense of other sectors. Again, the result is a constraint on the lift in the overall economy to some extent. The less-than-full-employment analysis assumes that not only capital, but all assets are unconstrained and that prices and production relationships are fixed. Thus, as more purchased inputs are needed to meet increased export demand in the less-than-full-employment analysis, those inputs are available at a constant price. As a result, the analysis produces linear responses to the changes in agricultural export demand from the USDA Export Market Development Programs that are un-moderated by price elasticities or the switching of labor and capital or other inputs.

- Finally, the full employment analysis accounts for the costs of the USDA Export Market Development Programs. That is, tax payments by U.S. citizens and expenses made by agri-food businesses are adjusted so that they reflect the expenditures that were made. The result is some constraint on consumer spending which also blunts the lift of the program relative to those from the less-than-full-employment analysis. Such adjustments are not made in the less-than-full employment analysis.

Across the overall U.S. economy, the USDA Export Market Development Programs led to an average annual lift of total U.S. economic output in the range of $39.3 billion in the less-than-full-employment analysis to $7.1 billion in the full employment analysis over 2002-2014 (Exhibit 11); adding $510.9 billion to $92.3 billion in output, respectively, over the entire period. This total contribution to U.S. output includes a contribution to U.S. GDP in the range of $16.9 billion (less than full employment) to $4.4 billion (full employment) – adding $219.7 billion to $92.3 billion, respectively, to U.S. GDP over the entire period – and a contribution to U.S. labor income in the range of $9.8 billion (less than full employment) and $1.7 billion (full employment) across the economy. Over the entire time period, USDA Export Market Development Programs generated between $127.4 billion (less than full employment) and $22.1 billion (full employment) in additional labor income. Labor income is a component of value added, which is a component of output, so the corresponding numbers in Exhibit 11 cannot be summed. While substantial at both ends of the range, the measured lifts of economic variables are not large in percentage terms. For example, the lift in GDP represents only 0.1% to 0.03% of the $14.7 trillion base value of GDP over the period (under less-than-full-employment and full employment, respectively). In comparing the ends of the measured ranges of lifts in the economic variables, the growth constraints of the full employment analysis relative to the unconstrained nature of growth in the less-than-full-employment analysis must be kept in mind.

The U.S. GDP impact is broken out by economic sector in Exhibit 12. In the cases of both less than full employment and full employment, the USDA Export Market Development Programs' contribution to agriculture and agribusiness value added ($4.62 billion and $1.47 billion, respectively) was surpassed by the contribution to the service sector ($7.20 billion and $1.89 billion, respectively) which provides inputs to the food and agricultural sector and is also stimulated by increased spending arising out of the food and agricultural sector.

The USDA Export Market Development Programs also contributed up to 239,800 full- and part-time jobs across the entire economy assuming less than full employment. Although the job lift represented a modest 0.14% of total U.S. employment, the 239,800 jobs made up 3.0% of the December 2015 U.S. Bureau of Labor Statistics (2016) 7.9 million-person unemployment estimate. In other words, given the unemployment that exists in the U.S. economy, the USDA Export Market Development Programs have helped reduce unemployment by up to 3.0%. Again, by definition, unemployment does not exist in the full employment analysis so that the program creates no net addition to employment in the full employment analysis and, of course, no reduction in unemployment.

Finally, the lift in the well-being of U.S. citizens as a whole, referred to as U.S. economic welfare or "equivalent variation," as a result of the USDA Export Market Development Programs can be generated from the full employment analysis (the next to last row of Exhibit 11). The lift in U.S. economic welfare is measured to be $2.4 billion, denoting a positive change in the well-being of U.S. citizens as a whole. The lift in economic welfare is less than the lift in the GDP ($4.4 billion) because the economic welfare measure accounts for the fact that some prices have changed, as mentioned above, thus blunting the effect of an expanding economy.

Looking at the less than full employment case, the largest share of the $16.9 billion expansion in GDP is associated with the service sector (Exhibit 12). This broad sector provides inputs to the food and agricultural sector and is also stimulated by increased spending arising out of the food and agricultural sector. The second and third largest effects for the less-than-full-employment analysis are associated with two sectors most directly affected by the Market Development Program: production agriculture and food processing. Their share of the $16.9 billion GDP improvement is $4.10 and $1.50 billion, respectively. The wholesale and retail trade sector is also affected. The GDP impact breakout by sector for the full employment analysis follows a similar pattern as for the less-than-full-employment analysis.

Exhibit 12: Average Annual GDP Contribution of USDA Export Market Development Programs by Sector, 2002-2014 ($Billions 2010)

Sector	Less than full employment $US billions	Full employment $US billions
Production Agriculture and Support Industries	$4.10	$1.07
Food Processing	$1.50	$0.39
Other Agriculture Product Processing	$0.02	$0.01
Mining, Energy, and Utilities	$0.80	$0.21
Construction and Maintenance	$0.10	$0.03
Other Manufacturing	$1.10	$0.29
Wholesale and Retail Trade	$1.40	$0.37
Transportation and Warehousing	$0.60	$0.16
Services	$7.20	$1.89
Total	**$16.90**	**$4.43**

3. Regional Economic Effects

Although this report focuses on the national-level impacts of the USDA Export Market Development Programs, those impacts vary by region across the country. Consequently, this section of the report considers the lift, or contribution, of the program to the economies of the four primary U.S. Census regions: Northeast, South, Midwest, and West (U.S. Census Bureau, 2015). The states included in the four Census regions are shown in Exhibit Appendix B5. The IMPLAN model is used in this analysis. The IMPLAN model, which assumes less than full employment, is the most appropriate approach to analyzing regional impacts. Full employment is not necessarily a useful concept in a regional context since labor can flow from one region to another easily given a change in demand in some region.

Exhibit 13 shows that the economic contributions of the USDA Export Market Development Programs over the 2002-2014 period were not equally distributed across the U.S.[14] Because the Midwest produces the largest share of the exported agricultural output (by dollar value), that region experiences the greatest economic benefit[15]. The

[14] Note that the U.S. labor income and GDP figures reported in Exhibit 11 are greater than the sum of the figures reported in Exhibit 13 because economic leakages from each region are captured in the broader U.S. economy, resulting in a larger U.S. multiplier.

[15] In this analysis, each region's share of the increased exports was estimated based on its share of the production of bulk commodities and high value products participating in the USDA Export Market Development Programs. Based on this assumption, we estimated that the Midwest produces 61% of bulk exported agricultural products, as compared to 4% by the Northeast, 24% by the South, and 11% by the West. The West produces a higher share of high value products with 34% of the U.S. total, as compared to 11% by the Northeast, 27% by the South, and 28% by the Midwest.

average annual economic impact of the USDA Export Market Development Programs over the period of 2002-2014 in the Midwest was up to $13.5 billion in output, $5.4 billion in GDP, $3.1 billion in labor income, and 79,100 full- and part-time jobs. Over the entire 2002-2014 period, these average annual impacts equate to $175.5 billion, $70.2 billion, and $40.3 billion in additional Midwest output, GDP, and labor income, respectively. Labor income and GDP are components of output so these dollar figures cannot be summed. In the South, the program contributed $3.0 billion in GDP on average annually – $39.0 billion in additional GDP above the baseline over the period – and 55,300 jobs. In the West, the program contributed up to $2.9 billion in GDP and 39,900 jobs. Although labor income was similar in the South and West, lower per-worker wages resulted in higher employment impacts in the South. Impacts in the Northeast included $751.3 million in GDP and 9,500 jobs. For the West and Northeast, USDA Export Market Development Programs generated $37.7 billion and $9.8 billion in additional revenue above the baseline, respectively.

The GDP contributions of the Market Development Program in each region are shown by sector in Exhibit 14. In the Northeast, the GDP contribution of food processing exceeds that of production agriculture while farmers are more affected in the other regions. The majority of the GDP contribution is in the agriculture production and processing sectors and the services sector. The wholesale and retail trade sector is also strongly affected, both through businesses' supply chains and induced household spending. As a share of agricultural exports, the South realizes a larger impact in the mining, energy, and utilities sector relative to other regions, probably reflecting oil and gas production in Texas and other Southern States.

Exhibit 13: Average Annual Economic Contributions of USDA Export Market Development Programs by Census Region, 2002-2014

	Northeast	South	Midwest	West
	---------- millions of 2010 dollars ----------			
Output (Gross Sales)	1,810.0	7,693.9	13,527.4	6,242.8
GDP	751.3	3,015.2	5,431.2	2,914.6
Labor Income	430.4	1,776.2	3,104.9	1,763.8
	---------- thousands of jobs ----------			
Employment	9.5	55.3	79.1	39.9

Exhibit 14: Average Annual GDP Contributions of the USDA Export Market Development Programs by Regional and Economic Sector, 2002-2014

Sector	Northeast	South	Midwest	West
	------------------------ millions of 2010 dollars-----------------			
Production Agriculture and Support Industries	102.4	732.8	1,645.9	1,090.0
Food Processing	187.2	406.4	467.9	262.3
Other Agriculture Product Processing	0.6	2.3	1.5	2.6
Mining, Energy, and Utilities	22.7	124.8	168.3	77.2
Construction and Maintenance	5.5	28.7	49.4	18.2
Other Manufacturing	32.7	143.8	249.1	94.4
Wholesale and Retail Trade	69.2	257.8	449.7	232.5
Transportation and Warehousing	23.5	118.7	193.1	80.6
Services	307.4	1,199.8	2,206.3	1,056.8
Total	**751.3**	**3,015.2**	**5,431.2**	**2,914.6**

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VI. BENEFIT-COST ANALYSIS OF THE USDA EXPORT MARKET DEVELOPMENT PROGRAMS

As the discussion in the previous sections of the report clearly demonstrates, the USDA Export Market Development Programs have had a substantial impact on U.S. agricultural exports, the U.S. farm sector, and the overall U.S. economy measured in billions of dollars. A critical question, however, is whether these "benefits" of the program have outweighed the costs. As the scan of previous literature shows, the standard method of determining if export promotion has been beneficial is to calculate a benefit-cost ratio (BCR) in terms of the additional "benefits" that the promotion program has generated per promotion dollar spent over time. The "benefits" of the USDA Export Market Development Programs were discussed in the previous sections of the report in terms of the lift or changes in agricultural export revenue, GDP and other economic measures as a result of the agricultural export promotion funded through that program. In this section of the report, the measured "benefits" of the program are compared to the costs of the USDA Export Market Development Programs to develop various BCR measures of the program. While BCRs are useful in determining the effectiveness of a program, they do not consider the scale of a program's impact. So, rather than being the sole measure of effectiveness, BCRs should be used in conjunction with the other measures of effectiveness provided within this study to provide a more holistic view of the USDA Export Market Development Programs' effectiveness. Additionally, it should be understood that although a high BCR indicates that promotional spending has been effective, it also suggests that the program is underfunded.

A. Benefit-Cost Measures from the Export Demand Analysis

In evaluations of export promotion programs, a common measurement of the "benefit" of the program used in BCR analyses is the additional export revenue generated. Another measurement of the "benefit" of export promotion relies on standard economic welfare analysis (consumer and producer surplus concepts) in which the calculated net changes to national economic welfare as a result of the promotion program are considered to be the "benefits" of the promotion program. The cost of the program is the total amount of funds invested in the promotion program.

1. Calculating Export Promotion BCR Measures

Exhibit 15 illustrates the expected export revenue "benefits" of export promotion in general. The objective of export demand promotion is to shift out the export demand curve (a shift of ED_R out to ED_R' in Exhibit 15) and, thereby, increase the export price (P_x to P_x') on a higher volume of export sales over time (Q_x^{us} to $Q_x^{us\prime}$). The result is an increase in export revenue represented in Exhibit 15 as the sum of the dark and light red areas in the right-hand panel of that figure. The increase in export revenue generated by the

USDA Export Market Development Programs was measured through historical simulation as reported in an earlier section of this report.

The simulated change in export revenue induced by the USDA Export Market Development Programs over time is used as the export revenue "benefits" of the program for the benefit-cost analysis. Several export revenue BCRs are often computed. The Gross Revenue BCR (GRBCR) is calculated as the additional export revenue generated over the period of promotion (R) per dollar of promotion spent (E) over that period:

$$(5)\quad GRBCR = \sum_{t=1}^{T} \frac{R_t}{E_t}$$

where t represents a given year and T represents the last year of the promotion period.

Because the promotion represents a cost of generating the additional export revenue, the promotion expenditures in each year must be netted out of the additional export revenue generated (R_t) in each corresponding year to arrive at the *net* export revenue BCR:

$$(6)\quad NRBCR = \sum_{t=1}^{T} \frac{R_t - E_t}{E_t}$$

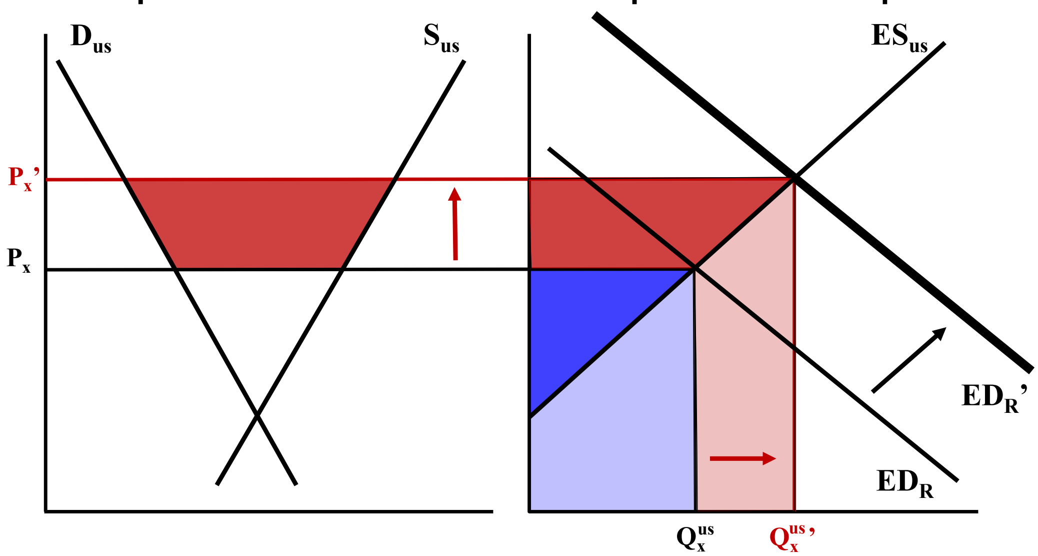
To comply with the Office of Management and Budget (OMB) guidelines for conducting benefit-cost analyses (OMB Circular A-94 1992), the time value of money must be accounted for by discounting the net export revenue BCR to generate a *discounted* export revenue benefit-cost ratio:

$$(7)\quad DRBCR = \frac{\sum_{t=1}^{T} (R_t - E_t)/(1+i)^t}{\sum_{t=1}^{T} E_t}$$

where i is the interest rate chosen to discount the additional export revenue flows to present value. To be compliant with the OMB guidelines for conducting benefit-cost analyses, we use "discount rates for cost-effectiveness, lease purchase, and related analyses" required for such analyses by the OMB which are essentially the Treasury interest rates (Appendix C of OMB Circular A-94 1992).

A shortcoming of export revenue BCR measures is that they account for the additional export revenue associated with additional exports but do not subtract the additional costs required to generate the additional exports. Such costs include the additional production costs, inland transport costs, freight, and insurance costs and so on. To account for those costs, we can calculate a measure referred to as the export "economic surplus". This measure is the difference between the amount that exporters receive for their exports and the minimum amount they would be willing to accept to just cover their costs. In Exhibit 15, the U.S. export supply curve (ES_{us}) shows the prices that exporters would be willing to accept for each additional unit of export sales to just cover costs. Thus, the area under ES_{us} (the U.S. export supply curve) at Q_x^{us} where the excess demand curve ED_R crosses ES_{us} (the light blue area in Exhibit 15) is a measure of the minimum total amount exporters would be willing to accept for the level of exports demanded in the market. Of course, however, producers do not sell each additional quantity of exports at the price that would just cover their costs. Rather, they sell all units of exports at the export market price of P_x. Thus, their export revenue for selling Q_x^{us} units of exports is the sum of the dark and light blue areas. The dark blue area then is the "export surplus" of export revenue over and above the costs of exporting that export volume. Although not precisely the same thing, "export surplus" can be thought of as a measure of exporters' profit from exporting.

Exhibit 15: Export Revenue and Economic Surplus Effect of Export Promotion



When promotion shifts export demand out to ED_R' in Exhibit 15, export revenue increases by the amount represented by the sum of the dark and light red areas in the right hand graph in Exhibit 15 but the light red represents the additional costs of that additional level of exports. Thus, the dark red area on the right side of the exhibit represents the additional "export surplus" to exporters for the additional exports up to $Q_x^{us\prime}$. That area is equal to the difference between what economists call the additional "producers surplus" and the additional "consumer surplus" in the domestic market (the dark red area in the left-hand panel of Exhibit 15. Because the ES_{us} curve is just the difference between the domestic supply curve (S_{us}) and the domestic demand curve (D_{us}) in the left-hand panel of Exhibit 15, the red area in that panel is equal to the red area in the right-hand panel. Thus, the "export surplus" is a measure of the net change in economic welfare as a result of exporting. Because Exhibit 15 represents the U.S. aggregate agricultural export sector, the red area (in both panels) represents the net additional economic welfare to the U.S.

agricultural economy and to the overall U.S. economy resulting from agricultural export promotion.

The export surplus or net additional welfare from export promotion is calculated through the same simulation scenario process used to calculate the additional export revenue from export promotion over time described above. In the process, however, the additional export surplus portion of the additional export revenue is calculated using simple formulas. Then the additional export surplus (call it “S”) is used as the measure of the “benefit” of export promotion in place of export revenue (R) in equations (5), (6), and (7) to calculate a Gross Export Surplus BCR (GSBCR), a Net Export Surplus BCR (NSBCR), and a Discounted Export Surplus BCR (DSBCR), respectively.

2. Export Promotion Benefit-Cost Analysis Results

Based on equations (5), (6), and (7), we calculated the BCRs for the USDA Export Market Development Programs over the entire program period (Exhibit 16) and over the more recent 2002-2014 period (Exhibit 17). These calculated returns to the USDA Export Market Development Programs are above the average returns calculated for individual commodity export promotion programs as indicated in our earlier environmental scan of literature. The results compare well to those of the previous analysis of the returns to the USDA Export Market Development Programs that were calculated for a shorter time period. A BCR that is greater than 1 is interpreted as meaning that the program has more than paid for itself. Otherwise, the program would be considered to have created an economic loss because the revenue generated would be less than the cost of the program.

Exhibit 16: Export Revenue and Surplus Benefit-Cost Ratios for the USDA Export Market Development Programs from the Export Demand Analysis, 1977-2014

Benefit-Cost Measures	Non-Discounted BCR	Discounted BCRs at Nominal Treasury Interest Rates of Different Maturities[a]					
		--------------- Year at Maturity ---------------					
		3	5	7	10	20	30
Net Export Revenue Benefit-Cost Ratio (NRBCR)	28.3	22.1	18.1	16.0	14.5	14.2	12.3
Net Export Surplus Benefit-Cost Ratio (NSBCR)	13.9	11.8	9.8	8.7	7.9	7.7	6.7

[a] Appendix C of OMB Circular A-94 (OMB 1992).

The net export revenue benefit-cost ratio (NRBCR) of the USDA Export Market Development Programs (including both FMD/MAP and cooperator export promotion expenditures) over the entire 1977-2014 period of the program is calculated as 28.3. That is, for every dollar of export promotion expenditure, the net return in additional export revenue, net of the promotion expenditures, is $28.3 (Exhibit 16). The discounted BCR is lower but depends importantly on the discount rate used. As a sensitivity test of the discount rate used, we calculated DRBCRs using the nominal[16] Treasury interest rate of different maturities of 3 to 30 years. The resulting DRBCRs vary from 12.3 to 22.1 over the various rates (Exhibit 16).

The net economic surplus BCR (NSBCR) is calculated at 13.9 indicating a net addition to U.S. economic welfare of $13.9 per dollar spent on export promotion through the USDA Export Market Development Programs (Exhibit 16). This measure is necessarily smaller than the NRBCR because additional economic costs have been netted out of the additional export revenue to calculate the additional export surplus generated by the program. The discounted NSBCR varies from 6.7 to 11.8 depending on the discount rate used.

Exhibit 17: Export Revenue and Surplus Benefit-Cost Ratios for the USDA Export Market Development Programs from the Export Demand Analysis, 2002-2014

		Discounted BCRs at Nominal Treasury Interest Rates of Different Maturities[a]					
		--------------- Year at Maturity ---------------					
Benefit-Cost Measures	**Non-Discounted BCR**	3	5	7	10	20	30
Net Export Revenue Benefit-Cost Ratio (NRBCR)	24.0	21.1	19.6	18.7	17.9	17.8	16.7
Net Export Surplus Benefit-Cost Ratio (NSBCR)	11.5	10.5	9.7	9.2	8.8	8.7	8.2

[a] Appendix C of OMB Circular A-94 (OMB 1992).

The calculated BCRs over the shorter and more recent 2002-2014 time period are somewhat smaller than those for the longer 1977-2014 time period. This is the expected result due to the principle of diminishing returns. The annual export revenue impacts of the program are higher in the more recent period on average, but so are the average funding levels. At the higher funding level during the more recent period, the marginal effect of each dollar spent is lower. So the increase in the export revenue for each funding dollar spent is slightly lower. Thus, the total increase in export revenue divided by the funding level (BCR) during that period is slightly lower. A common error is to assume that the level of the BCR indicates the impact of the program so that a high BCR implies a high impact and a low BCR implies a low impact of the program. Nothing could be farther from the truth. For example, the BCR for a $1 investment that returns $5 is the same (5 to 1) as the BCR for a $1 billion investment that returns $5 billion. Obviously the more that is spent, the bigger the impact on exports. As spending increases, however, each additional dollar spent has a declining effect so that the total additional revenue achieved

[16] Given that we use the nominal rather than the real Treasury interest rate for the various maturity bonds, the calculated DRBCRs represent upper bounds.

increases at a declining rate. Thus, the ratio between additional revenue and additional funding (the BCR) declines as funding increases. That is the law of diminishing returns. Thus, just because a BCR is lower for the more recent time period than for an earlier time period does not mean that the program is less effective. The lower BCR simply reflects the increase in funding. In fact, if the calculated BCR does not decrease over time as funding increases, then the analysis likely violates the law of diminishing returns.

Actually, a high BCR indicates that a promotion program is underfunded. For example, the non-discounted BCR of 24.0 indicates that for every dollar in additional funding NOT allocated to the USDA Export Market Development Programs, the U.S. agricultural sector and the U.S. economy in general loses an average of $24.0 in additional export revenue. That is, $24 in additional agricultural export revenue is forfeited for every dollar not allocated to the USDA Export Market Development Programs. Of course, as indicated above, increases in funding on promotion are accompanied by a reduction in the corresponding BCR. With such a high estimated BCR, however, funding for agricultural export promotion could be increased substantially before the BCR would decline to the $10 average level reported by analyses of agricultural export promotion programs. Indeed, the desired BCR is 1 to 1 because that would indicate that funding has increased to such a level that every additional dollar of funding would generate only an additional one dollar in export revenue. Given the BCR of 24 to 1, the USDA Export Market Development Programs are highly underfunded.

3. Halo or Indirect Effects Analysis Benefit-Cost Results

Earlier we demonstrated that there may be a halo effect within the bulk/intermediate agricultural export category and within the HVP agricultural export category. For both groups of exports, we concluded that export promotion of a subgroup of products in each category of exports under the USDA Export Market Development Programs have had a positive effect on the entire corresponding category of agricultural exports. If that is the case, then some portion of the additional export revenue generated by the program has come from additional exports of agricultural products not actually promoted under the program. If we adopt the assumption made in the previous analysis of the USDA Export Market Development Programs (Global Insight 2010) that "80% of the markets for 80% of the products (trade weighted) see some type of direct market promotion," then only about 64% of U.S. agricultural exports are directly promoted. If this is the case, then we can decompose the DRBCR into a direct promotion BCR and a halo BCR. The result suggests that over the 1977 to 2014 period, $18.3 per dollar of promotion expenditure actually came from directly promoted exports and the rest ($10.1) from non-promoted agricultural exports. As a sensitivity test of the assumption regarding the share of U.S. exports that are promoted, we alternatively assumed that the estimate is 25% higher (80%) or 25% lower (48%). The results suggest that plausible ranges for the direct promotion and halo BCRs are 13.6 to 23.0 and 5.4 to 14.8, respectively.

B. Benefit-Cost Measures from the National Economic Analysis

The national economic analysis of the impacts of the USDA Export Market Development Programs presented earlier demonstrate that the effects of the program go well beyond generating additional agricultural exports (Exhibit 11). Those effects can be considered to be broad measures of "benefits" of the program to the U.S. agricultural sector and the overall U.S. economy. Comparing those benefits to the amount of funds that have been invested in the USDA Export Market Development Programs yields broad BCR measures of the program.

In the agriculture sector, the farm cash receipt BCR was 16.0 assuming full employment and 15.4 assuming less than full employment (Exhibit 18). In other words, over the 2002-2014 time period, $16 in additional farm cash receipts were generated for every dollar spent on agricultural export promotion through the USDA Export Market Development Programs assuming full employment in the economy and $15.4 assuming less than full employment[17]. To comply with the Office of Management and Budget (OMB) guidelines for conducting benefit-cost analyses (OMB Circular A-94 1992), the time value of money was accounted for by discounting the farm cash receipt BCR by the Treasury interest rate. A discounted BCR depends critically on the discount chosen. Consequently, the farm cash receipt BCR was discounted by a range of nominal Treasury interest rates of different maturities of 3 to 30 years as a test of the sensitivity of the discounted BCR to different discount rates. The resulting discounted farm cash receipt BCRs vary from 5.8 to 11.5 assuming full employment and 5.7 to 14.5 assuming less than full employment (Exhibit 18). Thus, the program generated many times more dollars in farm cash receipts then the cost of the program over the 2002-2014 period of analysis.

The net cash farm income BCR which nets out the additional cash costs from additional farm revenues generated by the USDA Export Market Development Programs is 2.0 assuming full employment and 3.8 assuming less than full employment. The discounted net cash farm income BCRs range from 0.8 to 1.6 assuming full employment and from 1.4 to 3.6 assuming less than full employment. The lower net cash farm income BCRs for the full employment assumption than for the less-than full employment assumption results because input costs, not just the number of inputs, are allowed to increase in the full employment analysis as the demand-driven level of production increases. The farm asset BCRs follow the same pattern as the net cash farm income BCRs. Also, the agri-food sector employment BCR (the number of jobs created per $US million in export promotion) ranged from 168.9 to 176.3 under the full employment and less-than-full-employment assumptions, respectively.

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[17] The underlying values have been deflated over time to be in 2010 values using a GDP deflator from USDA/ERS.

Exhibit 18: National Economy Benefit-Cost Ratios for the USDA Export Market Development Programs, 2002-2014

Benefit-Cost Measures	Analysis[b]	Non-Discounted BCR	Discounted BCRs at Nominal Treasury Interest Rates of Different Maturities[a] --- Year at Maturity --- 3	5	7	10	20	30
Agriculture Sector		---------- $ benefit per $ spent on agricultural export promotion[c] -----------						
Farm Cash Receipts	Full	16.0	11.5	8.9	7.9	7.0	6.3	5.8
	Less	15.4	14.5	10.3	8.7	7.4	6.3	5.7
Net Cash Farm Income	Full	2.0	1.6	1.3	1.1	1.0	0.9	0.8
	Less	3.8	3.6	2.5	2.1	1.8	1.5	1.4
Farm Assets	Full	1.8	1.4	1.1	1.0	0.9	0.8	0.7
	Less	2.0	1.9	1.3	1.1	1.0	0.8	0.7
		Jobs created per $million spent						
Employment in agri-food sector	Full	168.9						
	Less	176.3						
U.S. Economy		---------- $ benefit per $ spent on agricultural export promotion[c] -----------						
U.S. GDP	Full	8.2	5.3	4.1	3.6	3.3	2.9	2.7
	Less	30.9	29.1	20.6	17.4	14.8	12.6	11.4
U.S. Economic Welfare	Full	4.4	2.7	2.1	1.8	1.6	1.5	1.3
	Less	--	--	--	--	--	--	--
		Jobs created per $million spent						
U.S. Employment	Full	0.0						
	Less	450.2						

Note: -- = Not available as an output from this analysis.
[a] Appendix C of OMB Circular A-94 (OMB 1992).
[b] Full employment analysis (Full) or Less-than-full-employment analysis (Less).
[c] Includes both government expenditures and cooperator expenditures.

For the overall economy, the U.S. GDP BCR (the GDP generated per dollar spent on agricultural export promotion) ranged from 8.2 assuming full employment to 30.9 assuming less than full employment. That is, every dollar spent on agricultural export promotion between 2002 and 2014 generated an annual average of between $8.2 and $30.9 in additional U.S. GDP depending on the employment assumption used in the analysis. On a discounted basis, the U.S. GDP BCRs ranged from 2.7 to 5.3 assuming full employment and from 11.4 to 29.1 assuming less than full employment. For the reasons discussed earlier, the measured lift in the U.S. GDP as a result of the USDA Export Market Development Programs in the less-than-full employment analysis is larger than in the full employment analysis. Consequently, the U.S. GDP BCR in the less-than-full-employment employment analysis is greater than in the full analysis.

The U.S. economic welfare BCR, the change in the well-being of U.S. citizens ("equivalent variation") per dollar spent on agricultural export promotion through the USDA Export Market Development Programs, was 4.4. That is, for every dollar spent on agricultural export promotion over the 2002 to 2014 period, the average annual welfare of U.S. citizens increased by $4.4. On a discounted basis, the welfare BCR ranged from a low of 1.3 to a high of 2.7 depending on the discount rate used.

Over both the agricultural sector and the general U.S. economy, the BCRs are quite robust. Thus, although the effects of the USDA Export Market Development Programs on the U.S. economy as a whole may be small in percentage terms, the program delivers a healthy return on investment and has large effects in absolute terms as well. Note that benefit-cost ratios based on economic impacts, particularly those calculated using economy-wide impacts such as GDP, should be interpreted with caution. The benefit-cost analysis simply provides a ratio of positive impacts to expenditures and does not consider the returns of possible alternate uses of program funds.

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VII. ANALYSIS OF POTENTIAL FUTURE FUNDING SCENARIOS FOR THE USDA EXPORT MARKET DEVELOPMENT PROGRAMS

This section considers the likely U.S. agricultural export revenue and the general economy impacts of three proposed future market development program funding scenarios:

- *Flat Funding Scenario*: Flat funding beginning in 2015 with full annual program expenditures ($234.5 million) plus 2014 cooperator contributions ($468.7 million) through 2030.

- *Reduced Funding Scenario*: Elimination of government expenditures with a 50% reduction in 2014 current cooperator contributions (from $468.7 million to $234.35 million) through 2030 (a 65.5% reduction in funding from the Flat Funding Scenario).

- *Increased Funding Scenario*: A 50% increase in 2015 budgeted program expenditures (from $234.5 million to $351.75 million) and cooperator contributions remaining at 2014 level through 2030 (a 17.4% increase in funding from the Flat Funding scenario).

The future likely export revenue effects are first considered. Then a national impact analysis of the future funding scenarios is conducted to measure the future potential national economic impacts of the USDA Export Market Development Programs under those funding assumptions. Sensitivity analyses were conducted to consider the potential range of results for both export revenue and the overall economy measures.

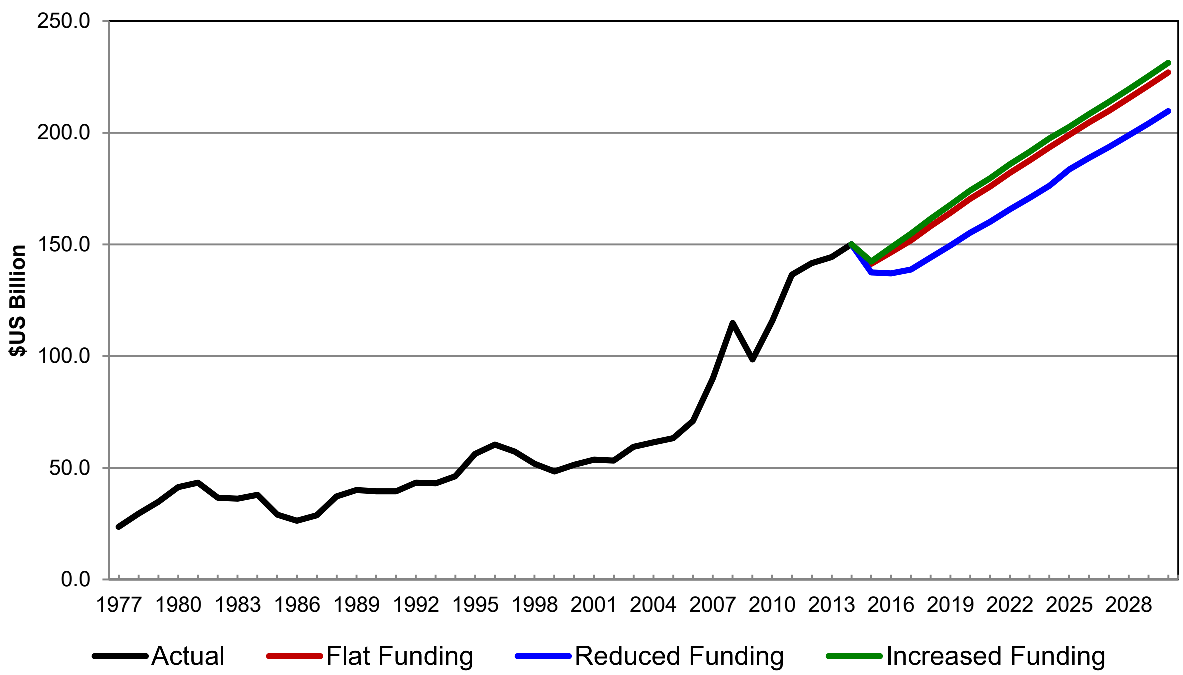
A. Export Revenue Effects of the Three Potential Funding Scenarios

Using the bulk and HVP export demand models discussed previously, a forecast baseline was first set by using the *Flat Funding Scenario* values for total USDA export market development over the period of 2015 to 2030. This scenario assumes the USDA Export Market Development Programs are fully funded at $234.5 million per year along with cooperator contributions at the 2014 level of $468.7 million in every year from 2015 through 2030. Forecasts for most other exogenous variables over the period (real GDP of non-U.S. countries, the agricultural trade weighted U.S. exchange rate, the world GDP deflator, and population of non-U.S. countries) were based on the projections provided by the USDA International Macroeconomic Dataset (baseline projections) (USDA 2015). Projections of the production of bulk/intermediate commodities and high value products by the rest of the world were provided by Informa.

1. Flat Funding Scenario

The *Flat Funding Scenario* analysis essentially involved linking the Bulk and HVP export demand models to the Global Agricultural Sector Model (GASM) at Texas A&M University and simulating the level of total export value (BULK and HVP) given the exogenous variable levels and the flat funding scenario levels of USDA market development expenditures over the 2015 to 2030 period. In this scenario, U.S. export value (BULK and HVP) dips by almost 6% in 2015 from the 2014 level of $150.0 billion due to a forecasted drop in the bulk export price, weakness in the purchasing power of foreign currency, and continuing animal disease issues in 2015 (Exhibit 19). The export value level recovers somewhat in 2016 and then grows over the forecast period at about the trend levels imposed by the USDA trend forecasts of the exogenous variables and foreign bulk production to $227.0 billion in 2030 (an average of $184.2 billion over the period). Total (BULK and HVP) export value growth averages about 4% between 2017 and 2020, 3%-3.5% between 2021 and 2025, and 2.5%-3% between 2025 and 2030. Note that there are no ups and downs in this scenario forecast. Like most forecasts, this scenario generates the trend forecast. The ups and downs, or variations around the trend forecast, will occur over time as events that are as yet unknown impact future export demand.

Exhibit 19: Scenario Analysis – The U.S. Agricultural Export Revenue Effects of Flat, Reduced, and Increased Funding of the USDA Export Market Development Programs, 2015-2030



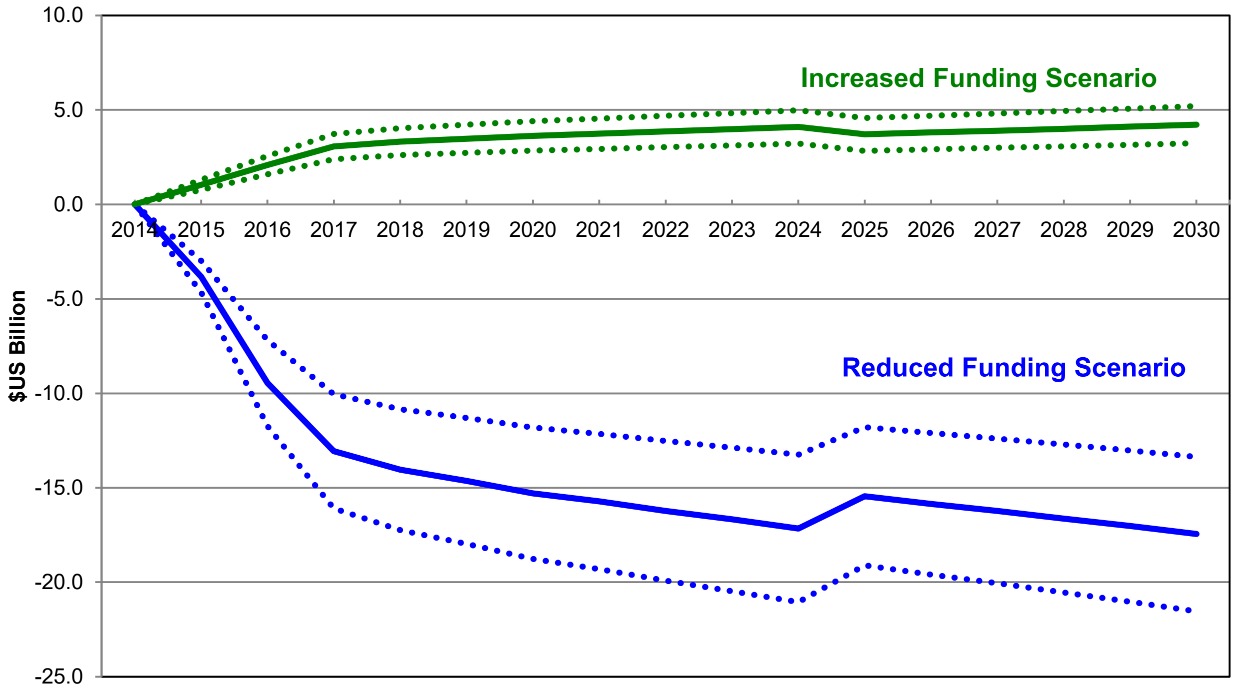
2. Reduced Funding Scenario

The *Reduced Funding Scenario* analysis was also conducted using the aggregate U.S. agricultural export demand models presented above linked to the GASM model at Texas A&M University. This scenario assumes that the FMD/MAP expenditures are completely eliminated and, as a consequence, cooperators reduce their funding of U.S. agricultural export promotion by 50% from $468.7 million to $234.35 million. The result is a 65.5% reduction in funding from the Flat Funding Scenario levels in each year from 2015 through 2030. The assumed reduction in cooperator funding given the elimination of FMD/MAP program funding is reasonable based on the interviews that were done with the representatives of cooperator groups. As indicated in Chapter III, most of those interviewed indicated that they would reduce their market promotion contributions if the FMD/MAP program was eliminated. Some indicated that they would eliminate their export promotion programs altogether.

In the analysis under this scenario, the value of U.S. agricultural exports drops by an annual average of $14.7 billion (7.9%), lowering U.S. agricultural exports by $235.2 billion over the entire 2015-2030 forecast period relative to the flat funding scenario. The only difference between this scenario and the Flat Funding Scenario is the assumed difference in the level of export promotion funding. The result is different quantity and price effects from the different level of funding. The implication is that an elimination of this government program and the consequent retrenchment of export promotion funding from agricultural commodity groups (cooperators) would cost the U.S. agricultural sector and the overall U.S. economy $14.7 billion in agricultural export revenue on average in each year that the program is not funded. As shown in Exhibit 20, the reduction in export revenue (compared to the Flat Funding Scenario) does not happen all at once. As discussed earlier, promotion spending has a lagged effect on demand. The export revenue drop occurs slowly as the reduced funding kicks in reaching a loss of $13.1 billion in 2017 and sinking to a low of $17.2 in lost export revenue in 2024 before some retrenchment in loss occurs through 2030.

In compliance with OMB guidelines for conducting benefit-cost analyses (OMB 1992), we conducted a sensitivity analysis of the results of this scenario relative to those of the Flat Funding Scenario as a result of varying the long-run promotion elasticity above and below the mean estimate by one standard deviation. The resulting mean loss of U.S. agricultural export revenue varies from a high of $18.1 billion to a low of $11.3 billion. The resulting range of negative export revenue effects between 2015 and 2030 is indicated by the dotted blue lines in Exhibit 20. Over that period, export revenues lose a total of between a high of $289.6 billion and a low of $180.8 billion. The range is modest given the high statistical significance of the estimated promotion elasticity and consequent low standard deviation.

Exhibit 20: Scenario Analysis – Change in U.S. Agricultural Export Revenue from the Flat Funding Level Under Reduced and Increased Funding Scenarios, 2015-2030



3. Increased Funding Scenario

The *Increased Funding Scenario* analysis was conducted in the same way as the Flat Funding and Reduced Funding Scenarios. This scenario assumes that USDA FMD/MAP export promotion expenditures increase by 50% from the 2014 budgeted level of $234.5 million to $351.75 million with cooperator contributions remaining flat at the 2014 level in each year from 2015 through 2030. The result is an annual average total export promotion funding increase of 17.4% from the Flat Funding scenario level. This is a conservative estimate of the total increase in funding that might occur with an increase in FMD/MAP funding. Nearly all the cooperator group representatives interviewed said they would also expand their market promotion activities if FMD/MAP program funding were increased. Some indicated that they might even expand the number of their overseas offices.

In the analysis of this simulation scenario, the value of U.S. agricultural exports increases by an annual average of $3.5 billion (1.9%), adding $56.0 billion in U.S. agricultural exports over the entire 2015-2030 forecast period. Again, the only difference between this scenario and the Flat Funding and Reduced Funding scenarios is the assumed change in the level of export promotion funding. The result is different quantity and price effects from the different level of funding assumed over 2015 to 2030. The implication is that a moderate percentage increase in funding of the overall USDA Export Market Development Programs (17.4%) would generate $3.5 billion for the U.S. agricultural sector and the overall U.S. economy in additional agricultural export revenue on average in each year over the 2015 to 2030 period. As shown in Exhibit 20, the increase in export revenue (compared to the Flat Funding Scenario) does not happen all at once. Rather, the export revenue increase occurs slowly as the increase in funding begins to take effect. The increase in export revenue reaches about $3.0 billion in 2017 and $4.0 billion in 2024 before some decay as a result of the higher but flat level of funding in this scenario.

In compliance with OMB guidelines for conducting benefit-cost analyses (OMB 1992), we also conducted a sensitivity analysis of the results of this scenario relative to those of the Flat Funding Scenario as a result of varying the long-run promotion elasticity above and below the mean estimate by one standard deviation. The resulting mean increase in U.S. agricultural export revenue varies from a high of $4.2 billion to a low of $2.7 billion. The resulting range of increased export revenue effects between 2015 and 2030 is indicated by the dotted green lines in Exhibit 20. Over that entire period, USDA Export Market Development Programs generate between a high of $67.2 billion to a low of $43.2 billion in additional export revenues. The range is small given the low level of the simulated increase and the high statistical significance of the estimated promotion elasticity and consequent low standard deviation.

B. National Economic Analysis of the Effects of the Future Funding Scenarios

1. Reduced Funding Scenario

The impacts of the *reduced funding scenario* on key economic variables over the 2015-2030 time period are shown in Exhibit 21 as changes from the respective *flat funding scenario* (base) values. Reducing funding for agricultural export market promotion consistent with the reduced funding scenario would likely result in a decline in farm cash receipts in the range of 2.2% to 3.1% (full employment and less than full employment, respectively) on average over the 2015-2030 time period. Likewise, net cash farm receipts would be expected to decline in the range of 3.7% to 3.8% (full employment and less than full employment, respectively) on average over the same period. Farm assets would be expected to be slow to “disappear,” dropping only in the range of 0.03% to 0.1% (full employment and less than full employment, respectively) over the forecast period.

The relatively small percentage changes in farm outcomes in this reduced funding scenario actually represent fairly substantial losses of between $7.0 billion and $9.9 billion in farm cash receipts and between $2.4 billion and $2.5 billion in net cash farm income (full employment and less than full employment, respectively, in each case) (Exhibit 21). Over the entire period, without USDA Export Market Development Programs funding, farm cash receipts and net cash farm income are $112.0 billion to $158.4 billion lower and $38.4 billion to $40.0 billion lower, respectively.

Exhibit 21: General Economy Impacts of the Reduced Funding Scenario Relative to the Flat Funding Scenario, 2015-2030[a]

Variable	Flat Funding Base Value[b]	Less than Full Employment: Change	Less than Full Employment: Percent Change	Full Employment: Change	Full Employment: Percent Change
Agriculture Sector	**$US billions**	**$US billions**	**%**	**$US billions**	**%**
Farm cash receipts	321.2	-9.9 (2.3)	-3.1 (0.7)	-7.0 (1.5)	-2.2 (0.5)
Net cash farm income	63.9	-2.5 (0.6)	-3.8 (0.9)	-2.4 (0.5)	-3.7 (0.8)
Farm assets	2,161.4	-1.3 (0.3)	-0.1 (0.0)	-0.7 (0.1)	-0.03 (0.01)
	1,000 jobs	**1,000 jobs**		**1,000 jobs**	
Employment in agri-food sector[c]	3,900.4	-102.8 (24.4)	-2.6 (0.6)	-64.4 (13.3)	-1.7 (0.3)
U.S. Economy	**$US billions**	**$US billions**	**%**	**$US billions**	**%**
U.S. Output (Gross Sales)	25,070.0 (--)	-45.3 (10.8)	-0.2 (0.04)	-3.6 (0.63)	-0.01 (0.003)
U.S. GDP	14,522.5 (916.8)	-19.5 (4.6)	-0.1 (0.03)	-2.6 (0.5)	-0.02 (0.003)
U.S. Labor Income	9,017.0 (--)	-11.3 (2.7)	-0.1 (0.03)	-0.9 (0.17)	-0.01 (0.002)
U.S. Labor Wage Rate	--	--	--	--	-0.04 (0.01)
U.S. Economic Welfare	--	--	--	-1.3 (0.2)	--
	1,000 jobs	**1,000 jobs**		**1,000 jobs**	
U.S. Employment	173,414.20 (--)	-278.6 (66.3)	-0.2 (0.04)	0.00 (--)	0.00 (--)

Note: -- = Not available as an output from this analysis.
[a] Numbers in parentheses are standard deviations based on the 16 observations from 2015-2030.
[b] The base value is for the year 2010. The "base value" is the average annual level of a variable in the absence of the promotion program. Some variables such as U.S. economic welfare and labor wage do not have a base value because the models only calculate the change in those variables and not a base value.
[c] The base employment value is measured as actual 2010 jobs as reported in IMPLAN. In the full employment analysis, total U.S. employment is held fixed but labor is mobile across sectors of the economy.

Employment in the agri-food sector, which includes both production agriculture and food processing, would likely decline by between 1.7% and 2.6% (full employment and less than full employment, respectively) under the reduced funding scenario which corresponds to a job loss in the range of 64,400 and 102,800 full- and part-time jobs (Exhibit 21). As noted earlier, the IMPLAN model on which the less-than-full-employment analysis relies is linear so that reducing exports reduces employment and use of other inputs while maintaining constant wages and prices. Thus, reduced program expenditures and resultant reduced production of agricultural and food products in the less-than-full-employment analysis cause unmitigated reductions in labor across the agri-food sector as well as supplying sectors. In contrast, the CGE model assumes full employment so that a reduction in the demand for labor in the agricultural sector necessarily requires the labor to be reemployed in other sectors which leads to a decline in wages and prices which constrains the transfer of labor from the agricultural sector.

In the overall economy, the reduced funding scenario would be expected to lead to a drop in U.S. output in the range of 0.01% and 0.2% and gross domestic product in the range of 0.02% and 0.1% (full employment and less than full employment, respectively, in each case) over the forecast period. These small percentage changes represent average annual losses of between $3.6 billion and $45.3 billion in U.S. output (gross sales) and between $2.6 billion and $19.5 billion in GDP (full employment and less than full employment, respectively). Labor income, a portion of GDP, would be expected to fall in the range of 0.01% and 0.1% or $0.9 billion to $11.3 billion each year (full employment and less than full employment, respectively). Over the entire period, reduced funding to the USDA Export Market Development Programs would lower U.S. output by $57.6 billion to $724.8 billion, U.S. GDP by $41.6 billion to $312.0 billion, and labor income by $14.4 billion to $180.8 billion, assuming full and less than full employment, respectively.

At the same time, 278,600 jobs are lost in the reduced funding scenario under the less-than-full-employment analysis. The IMPLAN model assumes that decreases in agricultural production and processing results in linear decreases in purchased inputs and labor, and, therefore, in demand by households, creating a multiplier effect that is effectively an upper boundary on job losses. In the full employment analysis, no jobs are lost because by definition all labor must remain employed. So a loss of labor in the agricultural sector must be absorbed by other sectors of the economy to keep the economy at full employment.

2. Increased Funding Scenario

The impacts of the *increased funding scenario* on key economic variables over the 2015-2030 time period are shown in Exhibit 22 as changes from the respective *flat funding scenario* (base) values[18]. In the agriculture sector, the increase in funding in this scenario extending out to 2030 would raise farm cash receipts, net cash farm income, farm assets, and employment by relatively small percentages of about 0.1% to 1% across the full employment and less than full employment analyses. In monetary equivalents, farm cash receipts would be between $1.7 billion and $2.4 billion higher in the full employment and less than full employment analyses, respectively, and net cash farm income would be $0.6 billion higher in both analyses. Over the entire 2015-2030 period, increased funding

[18] The flat funding (base) values shown in Exhibit 21 and Exhibit 22 are different from the base values used in the historical analysis of the program shown in Exhibit 11 and Exhibit 12 because they represent 2010 values rather than those for 2002-2014.

to the USDA Export Market Development Programs would generate $27.2 billion (full employment) to $38.4 billion (less than full) in additional farm cash receipts, and $9.6 billion in net farm income under both assumptions of full employment and less than full employment.

Exhibit 22: General Economy Impacts of the Increased Funding Scenario Relative to the Flat Funding Scenario, 2015-2030[a]

Variable	Flat Funding Base Value[b]	Less than Full Employment: Change	Less than Full Employment: Percent Change	Full Employment: Change	Full Employment: Percent Change
Agriculture Sector	**$US billions**	**$US billions**	**%**	**$US billions**	**%**
Farm cash receipts	321.2	2.4 (0.6)	0.7 (0.2)	1.7 (0.4)	0.5 (0.1)
Net cash farm income	63.9	0.6 (0.1)	0.9 (0.2)	0.6 (0.2)	1.0 (0.3)
Farm assets	2,161.4	0.3 (0.1)	0.1 (0.0)	0.2 (0.0)	0.01 (0.002)
	1,000 jobs	**1,000 jobs**		**1,000 jobs**	
Employment in agri-food sector[c]	3,900.4	25.3 (6.3)	0.6 (0.2)	15.8 (3.6)	0.4 (0.1)
U.S. Economy	**$US billions**	**$US billions**		**$US billions**	
U.S. Output (Gross Sales)	25,070.0 (--)	10.8 (2.6)	0.04 (0.01)	0.9 (0.17)	0.003 (0.001)
U.S. GDP	14,522.5 (916.8)	4.7 (1.1)	0.03 (0.01)	0.6 (0.1)	0.004 (0.001)
U.S. Labor Income	9,017.0 (--)	2.7 (0.6)	0.03 (0.01)	0.2 (0.04)	0.002 (0.0005)
U.S. Labor Wage Rate	--	--	--	--	0.01 (0.002)
U.S. Economic Welfare	--	--	--	0.3 (0.1)	--
	1,000 jobs	**1,000 jobs**		**1,000 jobs**	
U.S. Employment	173,414.20 (--)	66.9 (16.1)	0.04 (0.01)	0.00	0.00

Note: -- = Not available as an output from this analysis.
[a] Numbers in parentheses are standard deviations based on the 16 observations from 2015-2030.
[b] The base value is for the year 2010. The “base value” is the average annual level of a variable in the absence of the promotion program. Some variables such as U.S. economic welfare and labor wage do not have a base value because the models only calculate the change in those variables and not a base value.
[c] The base employment value is measured as actual 2010 jobs as reported in IMPLAN. In the full employment analysis, total U.S. employment is held fixed but labor is mobile across sectors of the economy.

Across the broader U.S. economy, the increase in the USDA Export Market Development Programs funding under this scenario would likely result in small average annual percentage increases in the value of output (gross sales), GDP, and labor income. In absolute terms, however, the increases are notable with the average annual value of U.S. output increasing by $0.9 billion to $10.8 billion, GDP by $0.6 billion to $4.7 billion, and labor income by $0.2 billion to $2.7 billion, all under the assumptions of full and less than full employment, respectively. Over the 2015-2030 period, USDA Export Market Development Programs would add totals of between $14.4 billion to $172.8 billion in U.S. output, $9.6 billion to $75.2 billion in GDP, and $3.2 billion to $43.2 billion in labor income, also under the assumptions of full and less than full employment, respectively, and relative to the flat funding scenario. The labor wage and U.S. economic welfare would not be much affected. U.S. employment would be higher by only 66,900 jobs in the less-than-full-employment analysis.

C. Regional Effects of the Future Funding Scenarios

The regional impacts of the future funding scenarios can also be analyzed with the IMPLAN model. Exhibits 23 and 24 report the estimated regional effects of the changes in export levels under the reduced and increased funding scenarios relative to a flat funding scenario, respectively. In both cases, the Midwest is most affected as a result of concentrated agricultural production and processing in that region. Because the less-than-full-employment input-output model uses fixed production relationships, regions and sectors respond to reduced and increased funding in proportion to the impacts reported in Exhibits 13 and 14.

Eliminating program funding under the *reduced funding scenario* would be expected to reduce annual output in the Midwest by $15.9 billion, GDP by $6.4 billion, and labor income by $3.7 billion on average in each year over the 2015 to 2030 forecast period and eliminate 94,100 jobs (Exhibit 23). Over the entire 2015-2030 period, reduced funding to the USDA Export Market Development Programs results in $254.4 billion, $102.4 billion, and $59.2 billion lower in Midwest output, GDP, and labor income, respectively relative to the flat funding scenario. The South would be expected to lose $3.5 billion in GDP and 64,500 jobs annually, on average, while the West would likely lose an annual average of $3.2 billion in GDP and 44,700 jobs. The Northeast could lose up to $841.5 million annually in GDP and 10,800 jobs through 2030. For the South, West, and Northeast the reduced funding scenario results in $56.0 billion, $51.2 billion, and $13.5 billion in lower GDP for each respective region relative to the flat funding scenario over the entire period. While average annual dollar amounts can be summed over years in the planning horizon, jobs simply do or do not exist and cannot be summed over years.

In the *increased funding scenario*, the Midwest would likely realize the largest benefit, gaining up to $1.6 billion in GDP on average in each year through 2030 and 23,100 jobs (Exhibit 24). The South would likely gain $830.2 million in GDP and 15,600 jobs while the West would gain $747.4 million in GDP on average in each year and 10,300 jobs. Gains in the Northeast would likely reach $194.7 million in GDP annually and 2,500 jobs through 2030. Over the period, increased funding to the USDA Export Market Development Programs generates $25.6 billion, $13.3 billion, $12.0 billion, and $3.1

billion in additional GDP for the Midwest, South, West, and Northeast economies, respectively, relative to the flat funding scenario.

Exhibit 23: Average Annual Regional Impacts of the Reduced Funding Scenario Relative to the Flat Funding Scenario by Census Region, 2015-2030

	Northeast	South	Midwest	West
	----------------------- millions of $US (2010) -----------------------------			
Output (Gross Sales)	-$2,022.8	-$8,845.5	-$15,931.6	-$6,969.1
GDP	-$841.5	-$3,480.7	-$6,432.2	-$3,248.0
Labor Income	-$483.1	-$2,051.6	-$3,679.0	-$1,965.0
	---------------------------- thousands of jobs ----------------------------			
Employment (thousands of jobs)	-10.8	-64.5	-94.1	-44.7

Exhibit 24: Average Annual Regional Impacts of the Increased Funding Scenario Relative to the Flat Funding Scenario by Census Region, 2015-2030

	Northeast	South	Midwest	West
	----------------------- millions of $US (2010) -----------------------------			
Output (Gross Sales)	$466.9	$2,101.3	$3,873.9	$1,606.6
GDP	$194.7	$830.2	$1,572.2	$747.4
Labor Income	$112.0	$489.6	$899.7	$452.0
	---------------------------- thousands of jobs ----------------------------			
Employment	2.5	15.6	23.1	10.3

VIII. SUMMARY AND CONCLUSIONS

Four major conclusions come out of this report. First, the USDA Export Market Development Programs have been highly effective in achieving its objective of boosting U.S. agricultural exports and export revenues. Second, the program has made a substantial and important contribution beyond the expansion of agricultural exports to impacts on the U.S. agricultural sector and on the overall U.S. economy. Third, the return on the investment that has been achieved by the USDA Export Market Development Programs is impressive. Fourth, any reduction in funding of the USDA Export Market Development Programs would have substantial negative impacts on the U.S. agricultural sector and on the growth of the U.S. economy. Likewise, an increase in funding for the program would contribute substantially to the support of the farm sector and to the overall U.S. economy. Specific conclusions related to each of these major conclusions include the following:

A. Effectiveness of the USDA Export Market Development Programs in Boosting Agricultural Exports

- The USDA Export Market Development Programs has had a highly statistically significant and positive effect on U.S. bulk/intermediate (BULK) and high value product (HVP) exports over time. The estimated dynamic long-run elasticities of BULK and HVP export promotion are 0.1482 and 0.1774, respectively, which are in the range of those reported by other studies for various agricultural export promotion programs.

- The USDA Export Market Development Programs create a “halo” effect on U.S. agricultural exports by the entire category of BULK and HVP agricultural exports from the promotion of a subgroup of products within each category. At the same time, the promotion of BULK agricultural products does not cannibalize HVP exports and vice versa. Rather, the two export promotion programs work together to create a synergistic or “halo” effect on U.S. agricultural exports.

- The USDA Export Market Development Programs provided an annual average lift of $8.15 billion or 15.3% to the value of U.S. agricultural exports over the history of the program (1977 through 2014). Over the same period, the program provided an annual average lift to the volume of aggregate U.S. agricultural exports of about 8.0% (11.5 million mt) and to the aggregate price of U.S. agricultural exports of about 6.7% ($25.07/mt). Between 1977 and 2014, the USDA Export Market Development Programs generated a total of $309.7 billion in additional export value and 437.0 million metric tons of additional export volume.

- Over the more recent period of 2002 to 2014, the USDA Export Market Development Programs provided an annual average “lift” of $12.5 billion or 14.3% to the value of total U.S. agricultural exports. Over that period, the program provided an annual average lift to the volume of aggregate U.S. agricultural exports of about 7.5% (12.2 million mt) and to the aggregate price of U.S. agricultural exports of about 6.3% ($33.79/mt). Between 2002 and 2014, the USDA Export Market Development Programs generated a total of $162.5 billion in additional export value and 158.6 million metric tons of additional export volume. The increase in agricultural export value from the USDA Export Market Development Programs is $6.9 billion in 2002 and increases to $18.9 billion in 2014.

B. Impacts of the USDA Export Market Development Programs on the Overall U.S. Economy

- Over the 2002-2014 time period, the USDA Export Market Development Programs had a substantial impact on the U.S. agricultural sector. Farm cash receipts were higher by an annual average of $8.4 billion (2.7%) - $8.7 billion (2.8%) as a result of the program, while net cash farm income was $1.1 billion (1.8%) - $2.1 billion (3.7%) higher, farm asset value was higher by $1.0 billion (0.05%) - $1.1 billion (0.1%), and employment in the agri-food sector was higher by 90,000 jobs (2.3%) - 93,900 jobs (2.4%). These values over the entire period equate to $109.2 billion - $ 113.1 billion in higher farm cash receipts, $14.2 billion - $27.3 billion in additional net cash farm income, and $13.0 billion - $14.3 billion in higher farm asset values. The range of impact measured reflects alternative assumptions of full employment vs. less than full employment in the analysis.

- The USDA Export Market Development Programs created 90,000 jobs in the agri-food sector over the 2002-2014 time period assuming less than full employment. When assuming full employment, increased agri-food employment came from the manufacturing sector (29,000 jobs) and the services sector (61,000). Assuming less than full employment, the additional agri-food sector employment came from the ranks of the unemployed.

- The USDA Export Market Development Programs also had an important impact on the overall U.S. economy. The program increased U.S. output (gross sales) by an annual average of $7.1 billion - $39.3 billion (assuming full employment and less than full employment, respectively) over the 2002-2014 time period. U.S. GDP also increased by an average of $4.4 billion - $16.9 billion per year over that time period. U.S. economic welfare also increased by a sizeable $2.4 billion, which is somewhat less than the full-employment increase in GDP because it accounts for the fact that the program also affected U.S. consumer prices. These values equate to $92.3 billion - $510.9 billion in additional U.S. output, $57.2 billion - $219.7 billion in additional U.S. GDP, and $31.2 billion in additional U.S. economic welfare. Assuming less than full employment, the program also added up to 239,800 jobs to the U.S. economy, equivalent to 3% of December 2015 U.S. unemployment.

- Regionally, the largest effects of the USDA Export Market Development Programs have been on the Midwest, which produces more than half of the bulk commodities exported under the program. The annual program impacts between 2002 and 2014 in the Midwest averaged $5.4 billion in GDP, resulting in $70.2 billion in additional GDP over the period, and 79,100 jobs. The West produces the largest share of high value products but ranks third behind the Midwest and the South in terms of regional program impacts from the increased agricultural exports.

C. Return on Investment Achieved by the USDA Export Market Development Programs

- The USDA Export Market Development Programs generated high benefit-to-cost ratios (BCRs) over history (1977-2014) which are in the range of those reported by other studies of various agricultural export promotion programs:
  - The undiscounted net export revenue BCR of the USDA Export Market Development Programs (including both USDA and cooperator export promotion expenditures) is calculated as 28.3. That is, for every dollar of export promotion expenditure, the undiscounted net return in additional export revenue, net of the promotion expenditures, over the 1977 to 2014 was $28.3. Between $13.6 and $23.0 per dollar of total export promotion expenditure actually came from directly promoted exports depending on the assumption made regarding the proportion of exports that are directly promoted. An indirect impact on non-promoted agricultural exports accounted for the remainder (between $5.4 and $14.8).
  - On a discounted basis, the export revenue BCR of the USDA Export Market Development Programs ranges from $12.3 to $22.1 depending on the discount rate used (the nominal Treasury rates of different maturities).

- Over the shorter and more recent period of 2002-2014, the USDA Export Market Development Programs continued to maintain a high BCR.
  - Over that period, the undiscounted net export revenue BCR of the programs (including both FMD/MAP and cooperator export promotion expenditures) is calculated as 24.0. That is, for every dollar of export promotion expenditure over that period, the undiscounted net return in additional export revenue, net of the promotion expenditures, was $24.0.
  - On a discounted basis, the export revenue BCR of the USDA Export Market Development Programs for the 2002 to 2014 period ranges from $16.7 to $21.1 depending on the discount rate used (the nominal Treasury rates of different maturities).

- ❍ The net addition of the USDA Export Market Development Programs to national welfare per dollar spent on promotion over that period is 11.5, indicating a net addition to U.S. economic welfare of $11.5 per dollar spent on export promotion over that period through the program. On a discounted basis, the net addition to national welfare BCR ranges from 8.2 to 10.5 depending on the discount rate used.

- The USDA Export Market Development Programs also generated high returns in terms of their impact on the U.S. agricultural sector and the overall U.S. economy. Various BCRs reflecting the additional dollars generated for the farm sector per dollar spent on agricultural export promotion through the USDA Export Market Development Programs over the 2002-2014 period include the following under the alternative assumptions of full employment (full) and less than full employment (less):
  - ❍ Farm cash receipt BCR: 15.4 (less) - 16.0 (full) undiscounted and 5.8 - 11.5 (full) and 5.7 - 14.5 (less) discounted depending on the discount rate used.
  - ❍ Net cash farm income BCR: 2.0 (full) - 3.8 (less) undiscounted and 0.8 - 1.6 (full) and 1.4 - 3.6 (less) discounted depending on the discount rate used.
  - ❍ Farm asset value BCR: 1.8 (full) - 2.0 (less) undiscounted and 0.7 - 1.4 (full) and 0.7 - 1.9 (less) discounted depending on the discount rate used.
  - ❍ Also, the program generated between 168.9 jobs and 176.3 jobs in the agri-food sector[19] per $US million spent on export promotion assuming full employment and less than full employment, respectively.

- For the overall economy, various BCRs reflecting the contribution of the USDA Export Market Development Programs to the overall economy per dollar spent on agricultural export promotion over the 2002-2014 period include the following under the alternative assumptions of full employment (full) and less than full employment (less):
  - ❍ U.S. GDP BCR: 8.2 (full) - 30.9 (less) undiscounted and 2.7 - 5.3 (full) and 11.4 - 29.1 (less) discounted depending on the discount rate.
  - ❍ U.S. economic welfare BCR: 4.4 (full) undiscounted and 1.3 - 2.7 (full) discounted depending on the discount rate.
  - ❍ In addition, assuming less than full employment, the USDA Export Market Development Programs generated 450.2 jobs per $US million spent on export promotion.

[19] Under full employment, jobs cannot be created across the economy, so the jobs created in the agri-food sector were originally in other sectors.

D. Impacts of Future Funding Scenarios

- Reducing funding for the USDA Export Market Development Programs (a complete elimination of the funding of the FMD/MAP program and a retrenchment by cooperators in their funding of U.S. agricultural export promotion by 50%) over the period of 2015 to 2030 would result in an average annual reduction in agricultural export revenue of $14.7 billion (7.9%) over that period. The reduced funding scenario results in a total of $235.2 billion lower U.S. agricultural export revenues for the entire 2015-2030. That reduction in export revenue would have important consequences for the U.S. agricultural sector and the overall economy. The major average annual impacts would be the following under alternative assumptions of full employment (full) and less than full employment (less):
    - A decline in U.S. farm cash receipts of between $7.0 billion (full) and $9.9 billion (less). Over the entire period, U.S. farm cash receipts are a total of $112.0 billion (full) to $158.4 billion (less) lower relative to the flat funding scenario.
    - A decline in net cash farm income of between $2.4 billion (full) and $2.5 billion (less). Over the entire period, net farm cash income is a total of $38.4 billion (full) to $40.0 billion (less) lower relative to the flat funding scenario.
    - A decline in the value of farm assets of between $0.7 billion (full) and $1.3 billion (less). Over the entire period, farm asset values are a total of $11.2 billion (full) to $20.8 billion (less) lower relative to the flat funding scenario.
    - A reduction in agri-food sector employment of between 64,400 jobs (full) and 102,800 jobs (less).
    - A decline in U.S. GDP of between $2.6 billion (full) and $19.5 billion (less). Over the entire period, U.S. GDP is a total of $36.2 billion (full) to $312.0 billion (less) lower relative to the flat funding scenario.
    - A reduction of labor income of between $0.9 billion (full) and $11.3 billion (less). Over the entire period, labor income is a total of $14.4 billion (full) to $180.8 billion (less) lower relative to the flat funding scenario.
    - A reduction in U.S. employment of 278,600 jobs assuming less than full employment.
    - Regionally, the Midwest stands to be hardest hit if funding for the USDA Export Market Development Programs was reduced because that region produces more than half of bulk commodities exported under the program.

- An increase in funding for the USDA Export Market Development Programs (a 50% increase in USDA FMD/MAP export promotion expenditures) over the period of 2015-2030 would result in an average annual increase in agricultural export revenue of $3.5 billion (1.9%) over that period. The increased funding scenario would generate $56.0 billion in additional U.S. agricultural export revenues between 2015 and 2030.

Such an increase in export revenue would have important consequences for the U.S. agricultural sector and the overall economy. The major average annual impacts would be the following under alternative assumptions of full employment (full) and less than full employment (less):

- An increase in U.S. farm cash receipts of between $1.7 billion (full) and $2.4 billion (less). Over the entire period, U.S. farm cash receipts would be a total of $27.2 billion (full) to $38.4 billion (less) higher relative to the flat funding scenario.
- An increase in net cash farm income of $0.6 billion assuming either full or less than full employment. Over the entire period, net cash farm income would be a total of $9.6 billion higher relative to the flat funding scenario under both assumptions of full and less than full employment.
- An increase in the value of farm assets of between $0.2 billion (full) and $0.3 billion (less). Over the entire period, farm asset values would be a total of $3.2 billion (full) to $4.8 billion (less) higher relative to the flat funding scenario.
- An increase in agri-food sector employment of between 15,800 jobs (full) and 25,300 jobs (less).
- An increase in U.S. output (gross sales) of between $0.9 billion (full) and $10.8 billion (less). Over the entire period, U.S. output would be a total of $14.4 billion (full) to $172.8 billion (less) higher relative to the flat funding scenario.
- An increase in U.S. GDP of between $0.6 billion (full) and $4.7 billion (less). Over the entire period, U.S. GDP would be a total of $9.6 billion (full) to $75.2 billion (less) higher relative to the flat funding scenario.
- An increase in U.S. labor income of between $0.2 billion (full) and $2.7 billion (less). Over the entire period labor, income would be a total of $3.2 billion (full) to $43.2 billion (less) higher relative to the flat funding scenario.
- An increase in U.S. employment of 66,900 jobs assuming less than full employment.
- Regionally, the increase in funding would be a boon to all U.S. regions but particularly the Midwest.

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X. APPENDIX A – UPDATE OF GLOBAL INSIGHT 2010 COST-BENEFIT STUDY ECONOMETRIC RESULTS

A. Approach

Similar to Dwyer (1995), an Armington-type market share trade model (Armington, 1969) was used to model the impact of U.S. export promotion expenditures[20] on U.S. market share for high value and bulk commodities in both the 2006 and 2010 Global Insight, Inc. studies of all FAS programs. Unlike Dwyer (1995), who estimated an Armington model for just high value commodities, separate equations were estimated for U.S. high value and bulk (plus intermediate) commodities. In this section, we update this model and contrast the results to the most recent economic evaluation of FAS programs conducted in 2010[21].

In the 2010 study, the following model was estimated with annual time series data from 1975-2008:

(1) $\ln(MS_{it}) = \beta_0+\beta_1 \ln(MS_{it-1})+\beta_2 \ln(SDR_t)+\beta_3 \ln(T_t)+\beta_4 \ln(GWILL_t)+\beta_5 DUMBSE_t$

where MS_{it} is U.S. market share of for the ith commodity (1=high value products, 2=bulk plus intermediate products) in year t, SDR_t is Special Drawing Rights in year t, T_t is a linear trend term in year t, $GWILL_t$ is a "goodwill" variable for FAS and cooperator expenditures based on current and lagged export promotion expenditures, $DUMBSE_t$ is an intercept dummy variable included in the high value products model for years that U.S. exports were restricted because of outbreaks of BSE and avian influenza, ln is the natural logarithmic operator, and the βs are the coefficients to be estimated.

A lagged market share variable was included to reflect rigidities in international trade, i.e., U.S. trade share in one year should be positively correlated with trade share in the previous year. This technique is also called a partial adjustment model, which allows for the calculation of short-run effects and long-run effects. The U.S. exchange rate variable, SDR, was included since the value of the U.S. dollar should have an impact on U.S. trade market share. The coefficient for the SDR variable was expected to be negative since a stronger dollar should weaken U.S. market share of world trade. The linear trend variable,

[20] Expenditures by FAS and cooperators are used for a variety of activities in foreign markets designed to enhance U.S. export demand including promotion, trade servicing, technical assistance, and other activities. In this report, we use the term "export promotion" as short hand for all these activities while it is explicitly recognized that the total U.S. effort encompasses other activities in addition to promotion.

[21] The estimated equations for high valued and bulk commodities had an identical specification in terms of the variables included with one exception. An intercept dummy variable equal to 0 for 1975-2000 and equal to 1 for 2001-2004 was included in the high value equation because U.S. trade market share for these commodities abruptly fell in 2001-2004. This was due to an abrupt decline in U.S. poultry and beef exports resulting from the BSE and avian flu scares over this period, which did not affect other U.S. high value or bulk product exports.

T, was included as a proxy for missing variables in the model. The dummy variable for BSE and for avian influenza was included in the high value products model since these events had a significant negative event on U.S. market share.

The factor of interest in these studies was high value and bulk product expenditures for U.S. export promotion. These studies used combined FAS and cooperator expenditures as a measure of promotional goodwill. For the bulk market share equation, FAS and cooperator expenditures for bulk commodities were included in the GWILL variable, while the high value market share equation included expenditures for high value commodities. It is well documented in the promotion literature that promotion has a "carry-over effect," i.e., past promotions have an effect on current exports. To capture this carry-over effect, current and lagged expenditures were included in the model[22]. Similar to Dwyer (1995), promotion expenditures were multiplied by the exchange rate variable, SDR, to reflect the impact of the relative value of the dollar on promotion effectiveness. This variable was then deflated by dividing it by the world price deflator so that promotion expenditures were expressed in real, inflation-adjusted terms.

Since this analysis was highly aggregate in nature, there was no explicit price variable included in the model. However, the use of the SDR variable could be interpreted broadly as a de facto measure of the U.S. price relative to other countries' price. That is, the SDR variable reflects the value of the U.S. dollar relative to other countries' currencies, and hence any change in the value of the dollar is similar to a change in the relative U.S. price. Dwyer (1995) used an identical approach, and argued that "where price is not explicitly modeled, including exchange rates as a proxy for price behavior would seem appropriate." (page 9).

Exhibit Appendix A1 presents the results of the 2010 analysis under the column labeled "2010 Results." The models fit the data well in terms of the adjusted coefficient of variation with over 90% of the variation in the independent variables explaining the variation in U.S. market shares for both high value and bulk products. The models all are free of autocorrelation as indicated by the low Durbin-h statistic. In addition, the Breusch-Godfrey serial correlation test indicated that the null hypothesis of no autocorrelation could not be rejected. White's heteroskedasticity test was conducted both with cross terms and no cross terms, and the resulting test statistic failed to reject the null hypothesis of homoskedasticity for all models. Hence, the models were judged to be reasonable in terms of their statistical properties.

[22] Specifically, the model was specified as a second-degree polynomial distributed lag with both end point restrictions imposed. Various lag lengths were run, and a specification of current and three years of lags on export promotion expenditures resulted in the best model. One advantage of this specification is that it saves on degrees of freedom since only one coefficient has to be estimated even though the lag structure includes three lags.

Exhibit A1: Original and Updated Armington Trade Model Regression Results for U.S. High Value and Bulk Commodities*

Variable	2010 Results	2015 Results
High Value Products		
U.S. Market Share Previous Year	0.808 (0.000)	0.811 (0.000)
Special Drawing Rights Short-Run Elasticity	-0.194 (0.083)	-0.154 (0.075)
Special Drawing Rights Long-Run Elasticity	-1.010 (0.083)	-0.814 (0.075)
High Value Export Promotion Intermediate-Run Elasticity[a]	0.036 (0.016)	0.050 (0.000)
High Value Export Promotion Long-Run Elasticity[b]	0.188 (0.016)	0.265 (0.000)
Dummy Variable for 2001-2004	-0.097 (0.000)	-0.072 (0.000)
Adjusted R-Square	0.91	0.96
Durbin-h Statistic	0.70	0.74
Bulk plus Intermediate Products		
U.S. Market Share Previous Year	0.258 (0.081)	0.579 (0.000)
Special Drawing Rights Short-Run Elasticity	-0.317 (0.019)	-0.157 (0.120)
Special Drawing Rights Long-Run Elasticity	-0.427 (0.019)	-0.373 (0.120)
Trend Term	-0.286 (0.000)	-0.179 (0.000)
Bulk Export Promotion Intermediate-Run Elasticity[a]	0.143 (0.007)	0.073 (0.065)
Bulk Export Promotion Long-Run Elasticity[b]	0.193 (0.007)	0.174 (0.065)
Adjusted R-Square	0.94	0.95
Durbin-h Statistic	0.47	0.62

[*] P-values are given in parentheses.
[a] Computed as the sum of the current and lagged short-run elasticities.
[b] Computed as the intermediate elasticity divided by one minus the coefficient of the lagged dependent variable.

All estimated coefficients were statistically significant at the 10% level or better. The estimated partial adjustment coefficient on the lagged dependent variable was 0.808 for high value and 0.258 for bulk commodities. This result indicates more of a rigidity in the high value market relative to the bulk market. The estimated short-run elasticity for the

SDR, which can be broadly interpreted as an aggregate price elasticity for U.S. commodities, was -0.194 and -0.317 for high value and bulk commodities, respectively. This means that a 1% increase in the value of the U.S. dollar would decrease market share for U.S. high value commodities by 0.194% and U.S. market share of bulk commodities by 0.317%. The long-run SDR elasticity for high value commodities is higher than that for bulk commodities, -1.01 (high value) vs. -0.427 (bulk). The trend term had a coefficient of -0.021 (not significant) for high value market share, and -0.286 for bulk. The negative sign for this coefficient for bulk commodities is indicative of the negative trend in U.S. market share over this period.

The coefficient for the FAS and cooperator export expenditures was positive and statistically significant indicating that export promotion had a positive impact for U.S. market share for bulk and high value commodities. The intermediate-run (i.e., 3 years) promotion elasticity was 0.036 for high value and 0.143 for bulk. The long-run (i.e., longer than 3 years) promotion elasticity was 0.186 for high value and 0.192 for bulk.

This model was updated for high value and bulk products with data through 2014, and the results are also presented in Exhibit Appendix A1 in the right-hand-side column[23]. The addition of six-years of annual data (and revisions in the U.S. calculated market shares) change some of the results a bit, but the estimated promotion elasticities are still very comparable to the 2010 results. Hence, the model appears to be quite robust in terms of the updated data.

Focusing on the export promotion elasticities, the intermediate-run high value product elasticity increased from 0.036 in the 2010 study to 0.050 in the 2015 updated model. The long-run elasticity also increased from 0.188 in 2010 to 0.265 in 2015. On the other hand, the estimated bulk promotion elasticities declined somewhat in the 2015 update. The intermediate-run elasticities for bulk promotion for the 2010 study were 0.143 and 0.073 for the 2015 update. The long-run elasticity for the 2015 update was 0.174, which was slightly lower than the 2010 estimate of 0.193. The empirical evidence suggests that the original 2010 results were fairly robust and did not change very much with the additional data from the 2015 update.

A dynamic, in-sample simulation was conducted to determine how close the predicted values for U.S. trade market share were to actual values. To do this, the updated model (referred to as Model 1) was simulated for bulk and high value market share by setting all explanatory variables in the model to historic levels over the time period 1978-2014. Exhibits Appendix A2 and Appendix A3 illustrate the resulting predicted vs. actual market shares over this time period for bulk and high value commodities, respectively. These simulations were dynamic because the predicted value for market share for any time period was substituted into the equation as the value of the lagged dependent variable in the subsequent time period. A measure of how well the simulated market share predicted

[23] The market share variable in the updated models for bulk and for high value products was revised as well as updated based on data from Informa.

actual market share is the mean absolute percentage error. Over this time period, the mean absolute percentage errors for bulk and high value commodities were 4.8% and 3.5%, respectively. That is, the simulated market shares from the updated model had an average prediction error of less than 5%, on average, which was judged to be quite reasonable.

Exhibit A2: Actual vs. Predicted (Model 1) U.S. Bulk Product Market Share, 1978-2014

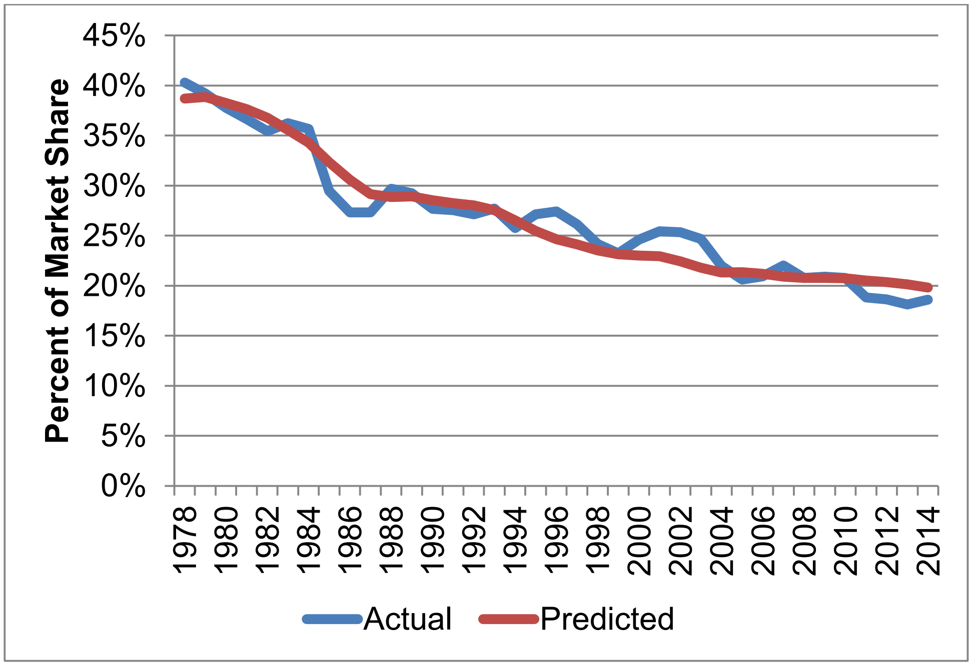
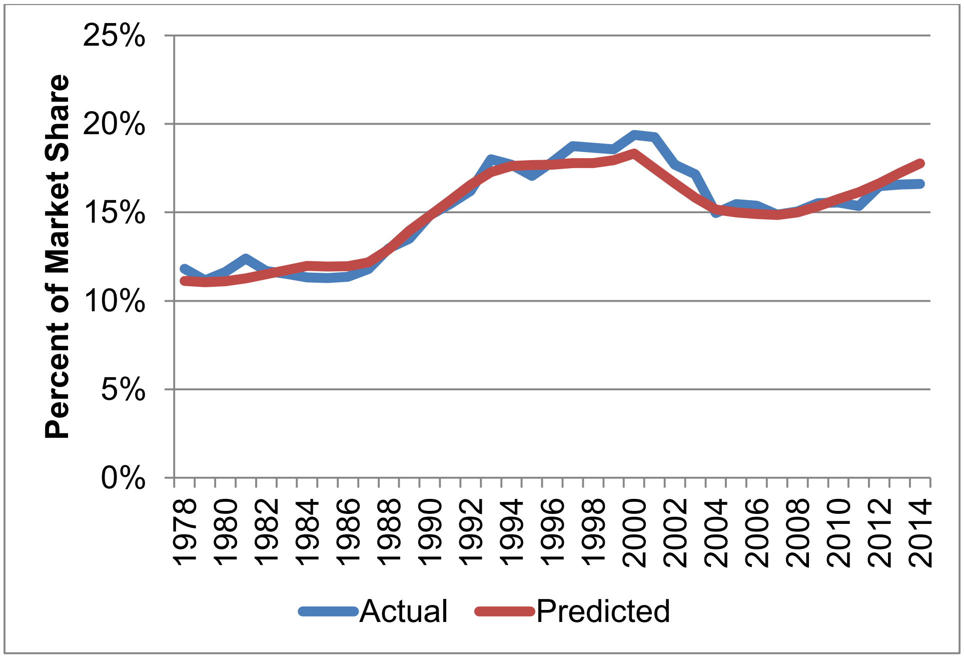


Exhibit A3: Actual vs. Predicted (Model 1) U.S. High Value Product Market Share, 1978-2014



B. Modified Armington Trade Model

The GAO critique of the 2010 Global Insight, Inc. study was critical that the model did not include any price variables. Hence, we modified the model to include a unit value ("price") variable for both the bulk and the high valued products model. The variable was constructed by taking total expenditures for U.S. bulk (and high value) exports divided by the total quantity of U.S. bulk (and high value) exports. The unit-value (deflated by the World Price Deflator) was included in the high value and bulk equations to determine whether it had a significant relationship with U.S. market share.

Also, rather than using Special Drawing Rights as a proxy for exchange rates, we use trade-weighted, real exchange rate values for high value products and bulk products from the Economic Research Service, USDA international macroeconomic data set. The modified model results for high value and bulk products are presented in Exhibit Appendix A4.

Exhibit A4: Modified Armington Trade Model Regression Results for U.S. High Value and Bulk Commodities*

Variable	High Valued Products	Bulk Products
U.S. Market Share Previous Year	0.778 (0.000)	0.697 (0.000)
Unit Value/World Price Deflator Short-Run Elasticity	-0.143 (0.065)	-0.148 (0.002)
Unit Value/World Price Deflator Long-Run Elasticity	-0.644 (0.065)	-0.488 (0.002)
U.S. Exchange Rate Short-Run Elasticity	-0.079 (0.035)	-0.117 (0.015)
U.S. Exchange Rate Long-Run Elasticity	-0.356 (0.035)	-0.386 (0.015)
Export Promotion Intermediate-Run Elasticity[a]	0.029 (0.001)	0.057 (0.010)
Export Promotion Long-Run Elasticity[b]	0.131 (0.001)	0.188 (0.010)
Dummy Variable for 2001-2004	-0.098 (0.001)	NA
Trend Term	NA	-0.166 (0.003)
Adjusted R-Square	0.95	0.95
Durbin-h Statistic	0.70	0.74

* P-values are given in parentheses.
[a] Computed as the sum of the current and lagged short-run elasticities.
[b] Computed as the intermediate elasticity divided by one minus the coefficient of the lagged dependent variable.

The modified Armington model has a slightly higher adjusted coefficient-of-variation than the updated. All estimated coefficients were statistically significant at the 10% or better (and most were better than the 5% level). The estimated partial adjustment coefficient on the lagged dependent variable was 0.778 for high value and 0.697 for bulk commodities. This result again indicates more of a rigidity in the high value market relative to the bulk market. The estimated short-run unit value elasticity was -0.143 and -0.148 for high value and bulk commodities, respectively. This means that a 1% increase in the unit value would decrease high valued product market share for by 0.143% and U.S. market share of bulk commodities by 0.148%. The respective long-run unit value elasticity for high value commodities is -0.644 (high value) vs. -0.488 (bulk). The U.S. exchange rate variables follow a similar pattern. In the long-run, the elasticity of market share for high valued products with respect to exchange rates is -0.356 and for bulk commodities is -0.386. The trend term continues to have a coefficient of -0.166 for bulk. The negative sign for this coefficient for bulk commodities is indicative of the negative trend in U.S. market share over this period, and may be picking up the increasing demand for biofuels, which has displaced some of the export demand for U.S. grains. Finally, the dummy variable for the years that BSE and avian influenza were in effect is negative (-0.098) and statistically significant.

Interestingly, the estimated promotion elasticities continue to be positive, statistically significant, and in line with the original Armington model. The intermediate-run elasticities were 0.029 for high value and 0.057 for bulk products. The long-run elasticities were 0.131 for high value and 0.188 for bulk products, which are similar to both the 2010 and 2015 updated results.

A dynamic, in-sample simulation was conducted to determine how close the predicted values for U.S. trade market share were to actual values for the modified Armington model (referred to as Model 2). Exhibits Appendix A5 and Appendix A6 illustrate the resulting predicted vs. actual market shares over this time period for bulk and high value commodities, respectively. Over this time period, the mean absolute percentage errors for bulk and high value commodities were 3.9% and 3.7%, respectively, which were lower than the errors were for Model 1 (bulk products).

Exhibit A5: Actual vs. Predicted (Model 2) U.S. Bulk Product Market Share, 1978-2014

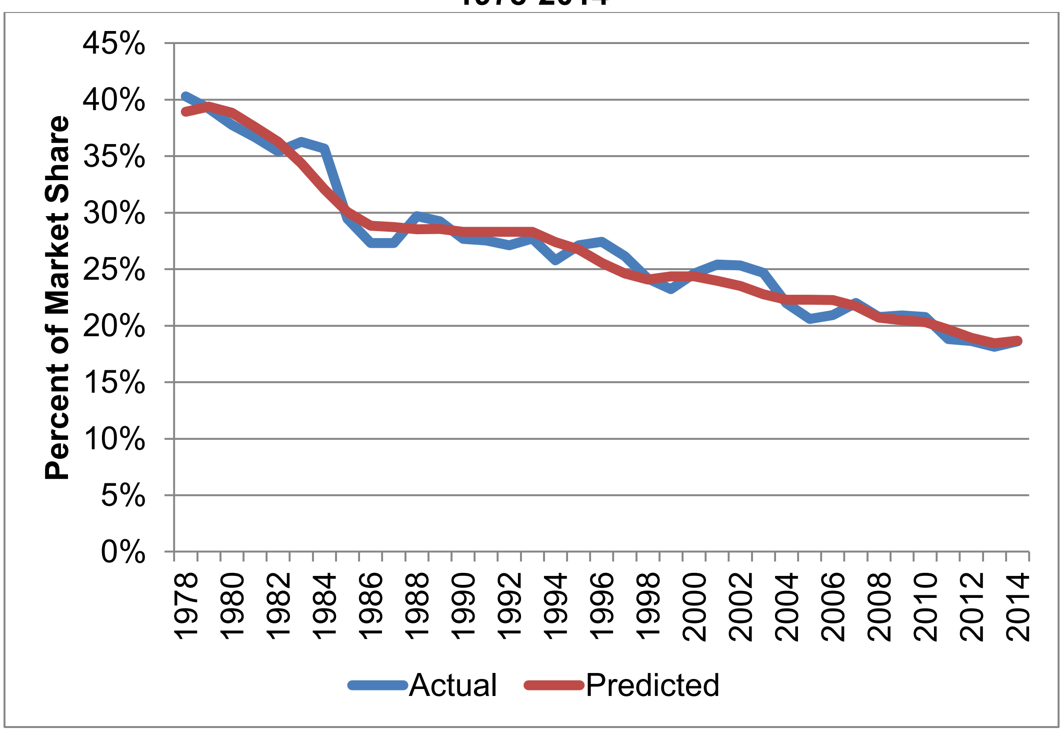
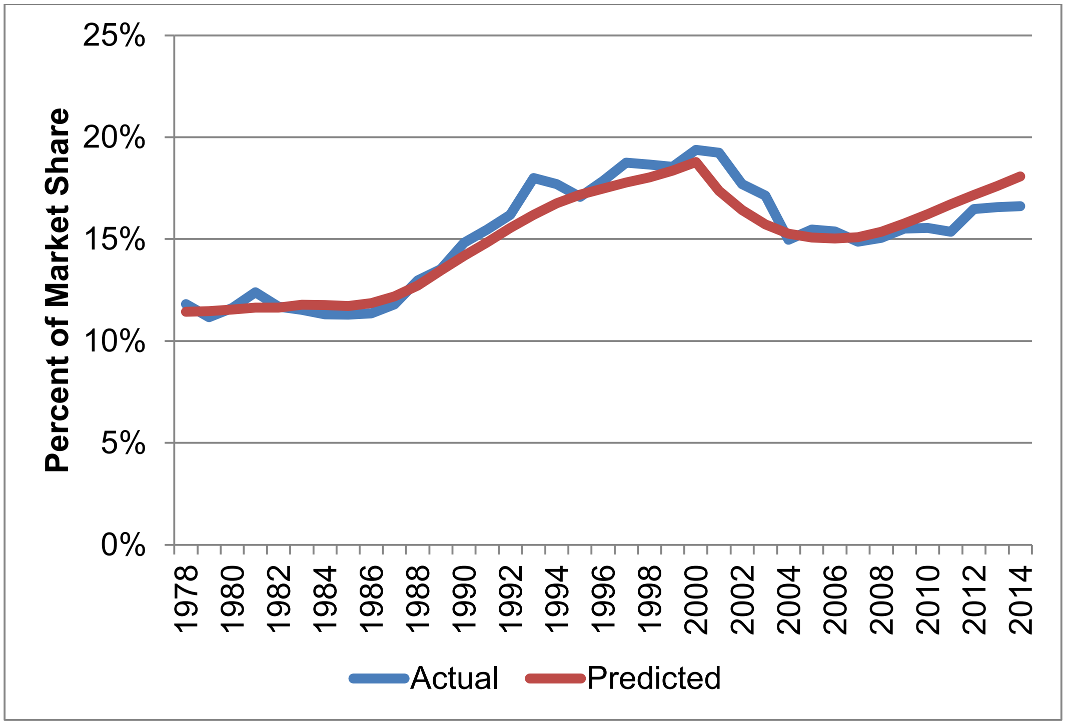


Exhibit A6: Actual vs. Predicted (Model 2) U.S. High Value Product Market Share, 1978-2014



C. In Sample Simulation: 2002 Farm Bill Scenario

Model 1 was simulated under two scenarios over the period 2002-2014: (1) baseline, where all independent variables including FAS and MAP cooperator and government funding levels were set equal to their actual levels, and (2) 2002-level funding, which was identical to the baseline except FAS and MAP cooperator and government funding levels were frozen at their 2002 levels for the entire simulation period. The baseline is reflective of the increase in funding that occurred following the 2002 Farm Bill, while the counter factual scenario illustrates a lower (2002-level) funding level throughout the period, 2002-2014. Exhibits Appendix A7 and Appendix A8 display the funding levels for the two scenarios over this period for bulk and high value commodities, respectively. Model 1 was used since it is similar to the one used in the 2010 Global Insight study.

The predicted U.S. market share for the two scenarios is displayed in Exhibits Appendix A9 and Appendix A10. The results show that had funding levels not increased since 2002, U.S. trade market share for bulk and for high value products would have been lower than it actually was for this period. For instance, from 2002-14, average U.S. market share for bulk commodities was 21.2% in the baseline scenario compared with 20.2% under the counter-factual 2002-level funding scenario. Assuming price is unaffected by export promotion, this implies that each dollar invested in export promotion yielded an increase in gross discounted export revenue of $47.80. In other words, each dollar invested in U.S. bulk commodity export promotion resulted in $47.80 in additional (discounted) export revenue for the U.S. bulk commodities industry. The results were less dramatic for high value products. From 2002-14, average U.S. market share for high value products was 16.3% in the baseline scenario compared with 15.7% under the counter-factual 2002-level funding scenario. Again assuming price is unaffected by export promotion, this suggests that each dollar invested in U.S. high value product export promotion resulted in $17.40 in additional (discounted) export revenue for the U.S. high value products industry. Aggregating both high value and bulk commodities, and assuming price is unaffected by export promotion, the results indicate that each dollar invested in export promotion yield an increase in discounted gross export revenue of $31.98.

Exhibit A7: Total Export Promotion Expenditures for Bulk Commodities for Baseline and 2002-Level Funding Scenarios, 2002-2014

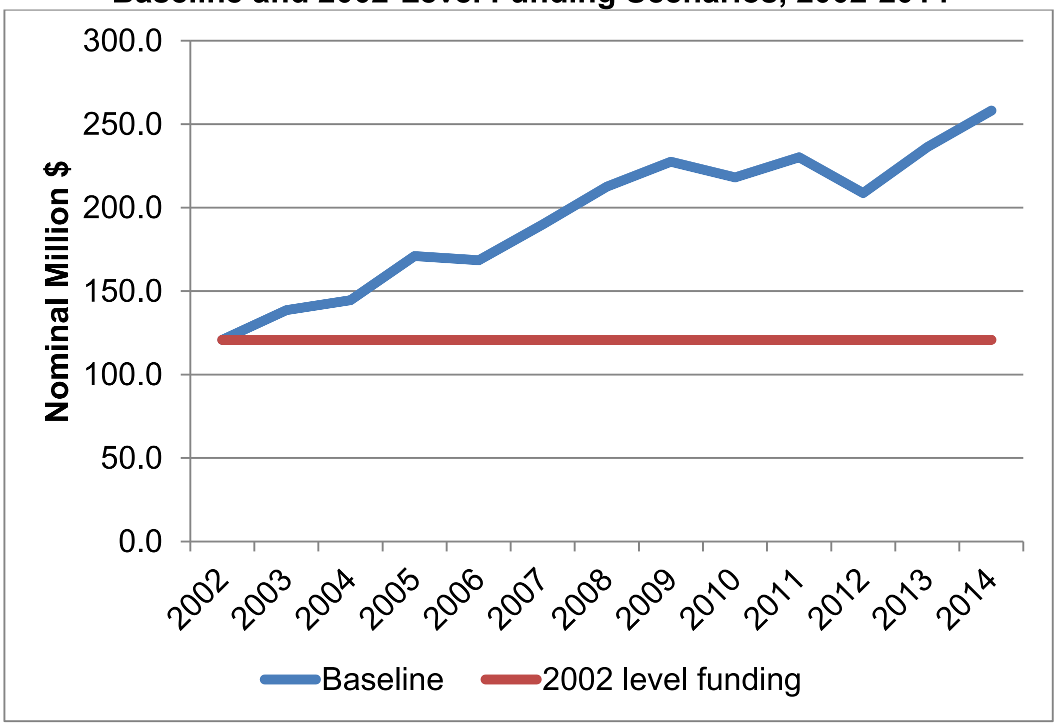


Exhibit A8: Total Export Promotion Expenditures for High Valued Products for Baseline and 2002-Level Funding Scenarios, 2002-2014

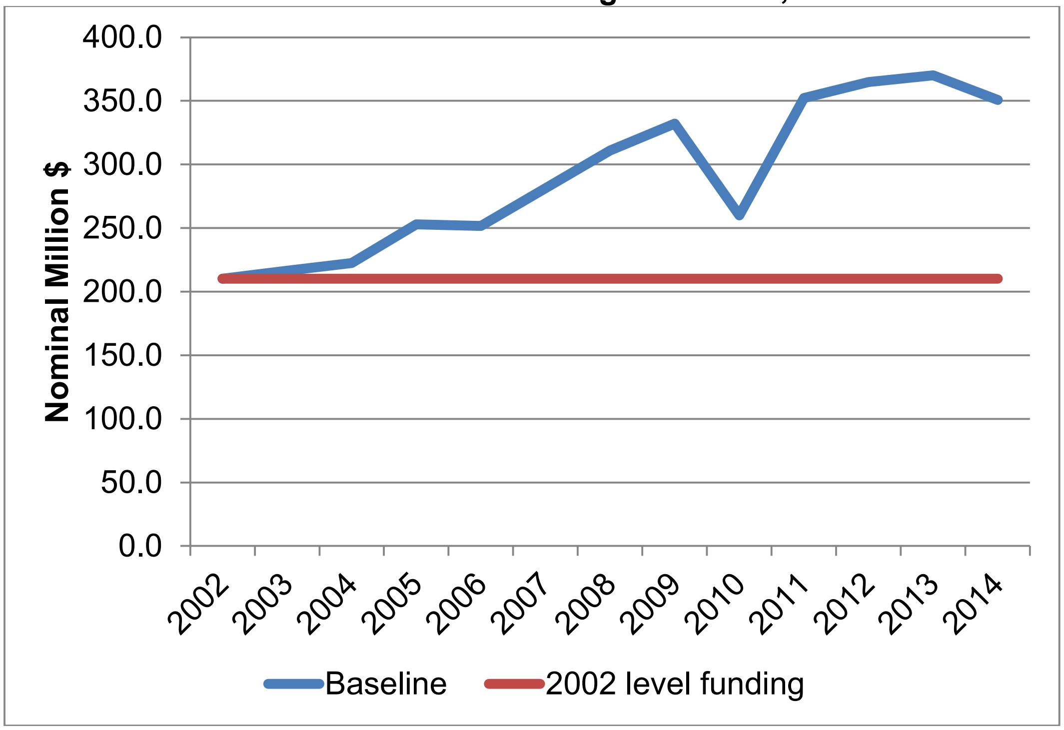


Exhibit A9: Simulated Market Share for Bulk Commodities under Baseline vs. 2002-Level Funding Scenarios, 2002-2014

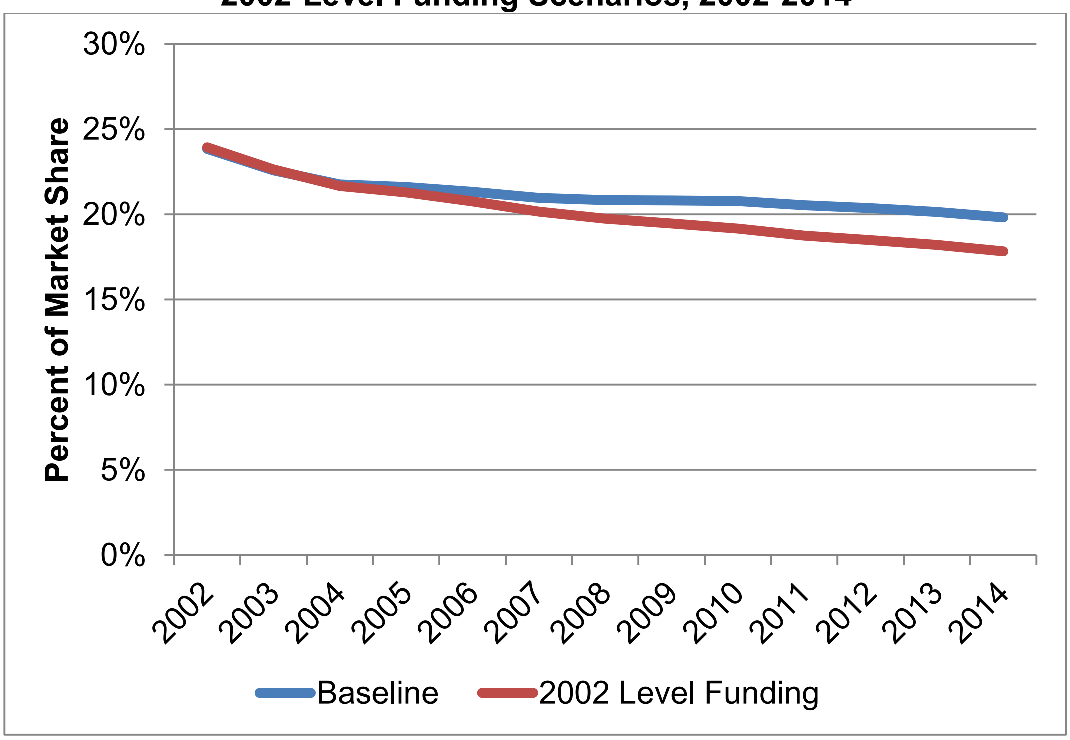
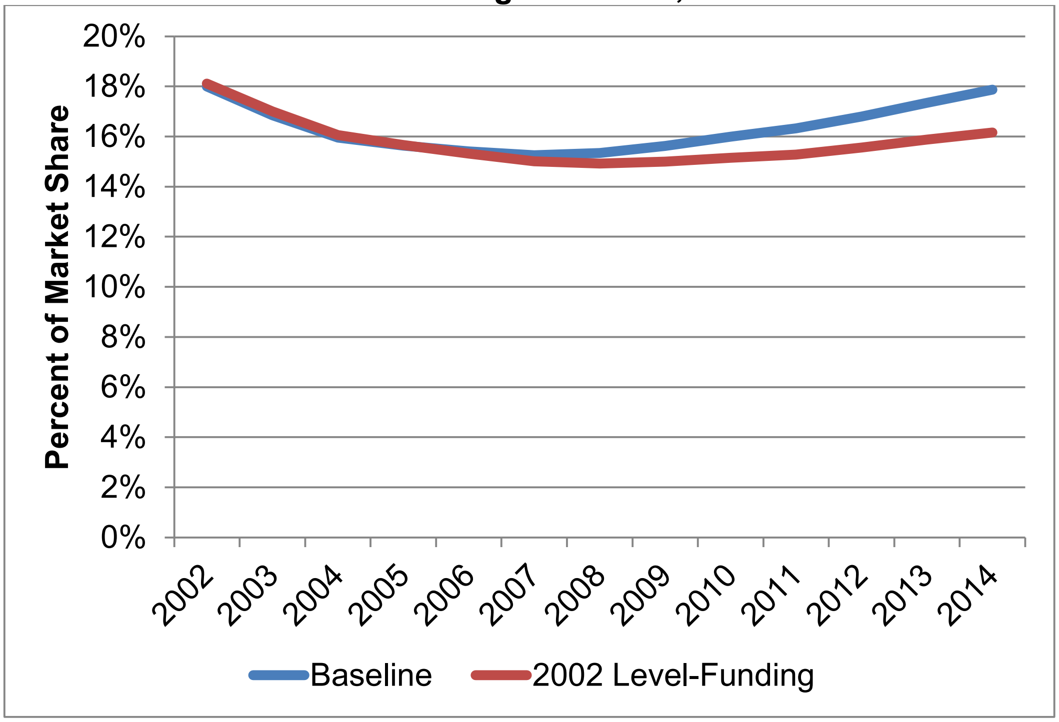


Exhibit A10: Simulated Market Share for High Valued Products under Baseline vs. 2002-Level Funding Scenarios, 2002-2014



D. Alternative Export Funding Levels Simulation

To measure the impact of alternative funding levels on U.S. exports, Model 1 was used for high value and bulk commodities to simulate U.S. market share under three scenarios for the period 2015-2030. In Scenario 1, which is the baseline, FAS and cooperator expenditures were held constant at their 2014 pre-sequester levels over the entire period. In Scenario 2, which represents the elimination of public export promotion funding, FAS expenditures were set to zero and cooperator expenditures were reduced by 50% from their 2014 level. In Scenario 3, which represents an increase in FAS spending, FAS expenditures were increased by 50% from their 2014 level, while contributor expenditures were held constant.

In order to run these simulations, values were needed for all explanatory variables in the 2015 updated model. For the period 2015-2030, the following assumptions were made. Because SDR is difficult to forecast, SDR was held at its 2014 level for 2015-2030. The forecast for the world price deflator was based on the Economic Research Service, USDA projected baseline from their international macroeconomic data set.

An important assumption in this simulation is that the export price is the same under all scenarios. In reality, price would likely increase under increased export promotion. Consequently, the export demand impacts that follow should be considered upper bound estimates because supply response and price effects are not considered in this analysis.

The results for bulk and high value market share under the three scenarios are displayed in Exhibits Appendix A11 and Appendix A12. Because funding levels were dramatically different in each of the three scenarios, the simulated U.S. trade market shares for each scenario were quite a bit different.

For bulk commodities, U.S. market share declined for each scenario reflecting a long-term trend. In the increased funding Scenario 3, which was the best case for U.S. bulk commodities, market share fell from 20.8% in 2015 to 19.7% in 2030. In the case where the FAS funding is completely eliminated (Scenario 2), market share fell from 20.8% in 2015 to 13.8% in 2030. In the baseline scenario (Scenario 1), market share declined to 16.6% by 2030.

For high value commodities, market share rose over this period in all but the FAS-funding elimination scenario (Scenario 3). For instance, in the baseline Scenario 1, market share increased from 16.3% in 2015 to 18.6% in 2030. In the increased FAS funding case (Scenario 3), market share rose from 16.3% in 2015 to 19.7% in 2030. In the FAS-funding elimination scenario, market share fell from 16.3% in 2015 to 9.1% by 2030.

Exhibit A11: U.S. Market Share for Bulk Commodities under Alternative Export Promotion Funding Scenarios, 2015-2030

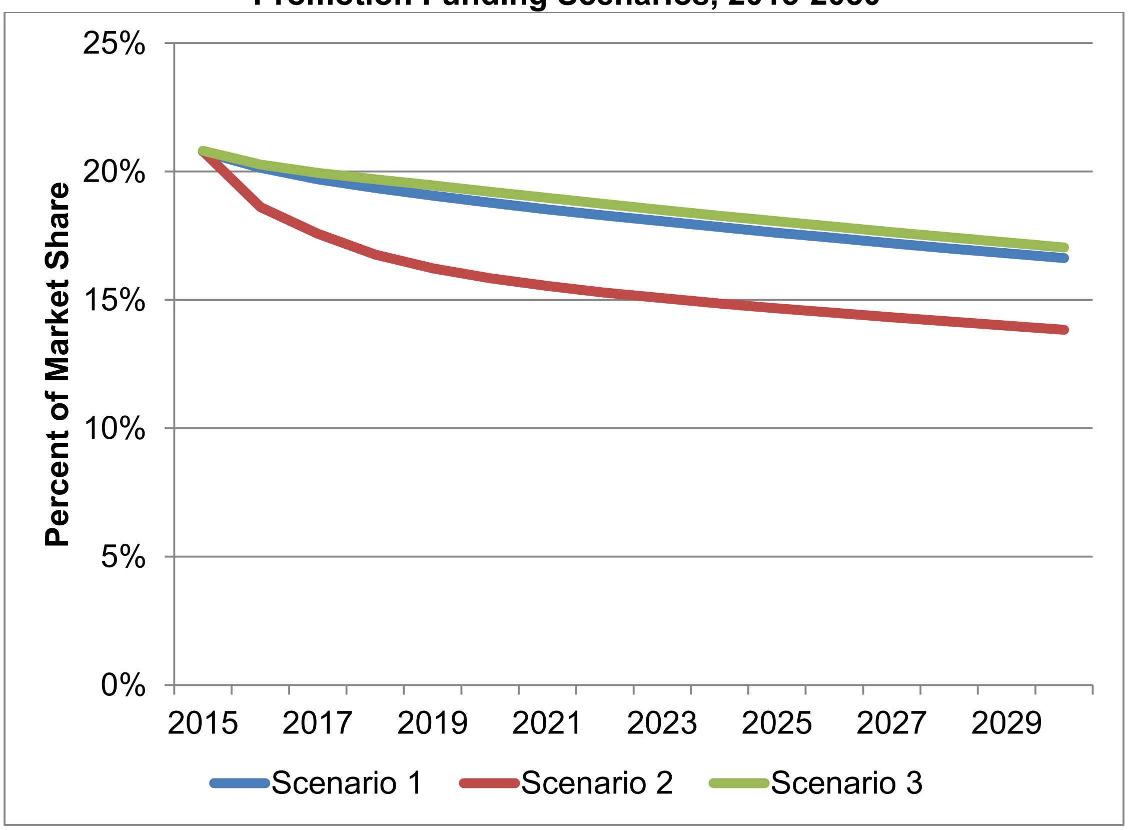
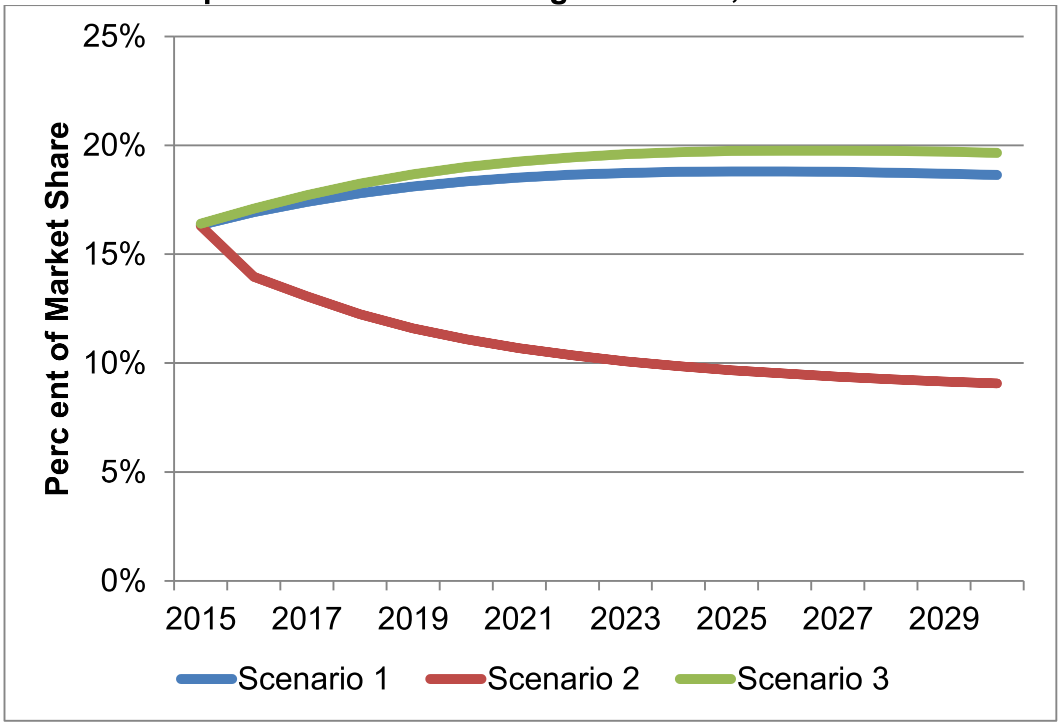


Exhibit A12: U.S. Market Share for High Value Commodities under Alternative Export Promotion Funding Scenarios, 2015-2030



E. Conclusions

In summary, it is clear from the Armington model that U.S. export promotion expenditures for bulk and high value products have had a significant impact on U.S. market share. The results from our analyses are consistent and highly robust across all versions of the model, including updating the original model with six additional annual observations and revisions in how U.S. market share is calculated and modifications in the model to include a price variable and substitution of exchange rates for Special Drawing Rights. The empirical evidence suggests that the original 2010 results are fairly robust and did not change very much with the additional data or the modifications from the 2015 update. The results show that the higher level of FAS funding following the 2002 Farm Bill resulted in large benefits in terms of increasing the value of U.S. bulk and high value commodities. Aggregating both high value and bulk commodities, and assuming price is unaffected by export promotion, the results indicate that each dollar invested in export promotion yielded an increase in discounted gross export revenue of $31.98. Further, the simulation results clearly show that future funding levels for U.S. export promotion will significantly influence future U.S. market share. For instance, comparing the increased funding to the decreased funding scenario, market share for bulk commodities is predicted to be 17% rather than 13.8%, by 2030. A similar result is found for high value commodities, which is predicted to be 19.7% in 2030 under increased funding, but only 9.1% under decreased funding. These results provide empirical evidence that these government and industry funded export promotion activities have significantly increased foreign demand for U.S. agricultural and food commodities.

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XI. APPENDIX B – ADDITIONAL EXHIBITS

Exhibit B1: Export Commodity Groups Used in the Study

Bulk and Intermediate			Consumer Oriented			Excluded Products
Alfalfa meal and pellets	Grain, mixed	Sorghum	Almonds shelled	Fruit, prepared nes	Nuts, nes	Beverages, distilled alcoholic
Bambara beans	Grease incl. lanolin wool	Soybeans	Anise, badian, fennel, coriander	Fruit, tropical fresh nes	Nuts, prepared (exc. groundnuts)	Cigarettes
Barley	Groundnuts, shelled	Straw husks	Apples	Garlic	Offals, edible, cattle	Cigars, cheroots
Barley, pearled	Hair, fine	Sugar beet	Apricots	Ghee, of buffalo milk	Offals, edible, goats	Cocoa, beans
Beans, dry	Hair, goat, coarse	Sugar crops, nes	Apricots, dry	Ginger	Offals, liver chicken	Coffee, green
Beeswax	Hay (clover, lucerne,etc)	Sugar non-centrifugal	Artichokes	Gooseberries	Offals, liver duck	Rubber natural dry
Beet pulp	Hay (unspecified)	Sugar Raw Centrifugal	Asparagus	Grapefruit (inc. pomelos)	Offals, liver geese	Rubber, natural
Bran, buckwheat	Hides, buffalo, dry salted	Sugar refined	Avocados	Grapes	Offals, other camelids	Tobacco products nes
Bran, fonio	Hides, buffalo, wet salted	Sugar, nes	Bacon and ham	Hazelnuts, shelled	Offals, pigs, edible	Tobacco, unmanufactured
Bran, maize	Hides, camel, nes	Sunflower seed	Bananas	Ice cream and edible ice	Offals, sheep,edible	
Bran, millet	Hides, camel, wet salted	Tallow	Beans, green	Infant food	Olives	
Bran, sorghum	Hides, cattle, fresh	Triticale	Beer of barley	Juice, citrus, concentrated	Olives preserved	
Bran, wheat	Hides, cattle, wet salted	Turnips for fodder	Beer of sorghum	Juice, citrus, single strength	Onions, dry	
Broad beans, horse beans, dry	Hides, horse, dry salted	Vegetable tallow	Beverages, fermented rice	Juice, fruit nes	Onions, shallots, green	
Buckwheat	Hides, nes	Vetches	Beverages, non alcoholic	Juice, grape	Oranges	
Bulgur	Honey, natural	Vitamins	Blueberries	Juice, grapefruit	Papayas	
Butter of karite nuts	Hops	Waxes vegetable	Brazil nuts, shelled	Juice, grapefruit, concentrated	Pastry	
Meal/Cake, copra	Hops	Wheat	Bread	Juice, lemon, concentrated	Peaches and nectarines	
Meal/Cake, cottonseed	Jute	Wool, degreased	Butter, cow milk	Juice, orange, concentrated	Peanut butter	
Meal/Cake, groundnuts	Kapok fibre	Wool, greasy	Buttermilk, curdled, acidified milk	Juice, orange, single strength	Pears	
Meal/Cake, hempseed	Kapokseed in shell	Wool, hair waste	Cabbages and other brassicas	Juice, pineapple	Peas, green	
Meal/Cake, kapok	Kapokseed shelled		Carrots and turnips	Juice, pineapple, concentrated	Pepper (piper spp.)	
Meal/Cake, linseed	Lactose		Cashew nuts, shelled	Juice, plum, concentrated	Persimmons	
Meal/Cake, maize	Lentils		Cashew nuts, with shell	Juice, plum, single strength	Pet food	
Meal/Cake, mustard	Linseed		Cashewapple	Juice, tomato	Pineapples	
Meal/Cake, palm kernel	Maize		Cauliflowers and broccoli	Kiwi fruit	Pineapples canned	
Meal/Cake, rapeseed	Malt		Cereal preparations, nes	Kola nuts	Pistachios	
Meal/Cake, rice bran	Manila fibre (abaca)		Cereal preparations, nes	Lard	Plantains	
Meal/Cake, safflower	Maple sugar and syrups		Cereals, breakfast	Leeks, other alliaceous vegetables	Plums and sloes	
Meal/Cake, sesame seed	Meal, meat		Cheese, processed	Lemons and limes	Plums dried (prunes)	
Meal/Cake, soybeans	Millet		Cheese, sheep milk	Lettuce and chicory	Potatoes	
Meal/Cake, sunflower	Molasses		Cheese, whole cow milk	Macaroni	Potatoes, frozen	
Canary seed	Mustard seed		Cherries	Maize, green	Pumpkins, squash and gourds	
Cane tops	Oats		Cherries, sour	Mangoes, mangosteens, guavas	Quinces	
Cassava	Oats rolled		Chestnut	Margarine, liquid	Raisins	
Chick peas	Oil, boiled etc		Chillies and peppers, dry	Margarine, short	Roots and tubers, nes	
Cocoons, unreelable & waste	Oil, castor beans		Chillies and peppers, green	Maté	Soya curd	
Copra	Oil, coconut (copra)		Chocolate products nes	Meat, ass	Soya paste	
Cotton lint	Oil, cottonseed		Cider etc	Meat, beef and veal sausages	Soya sauce	
Cotton linter	Oil, groundnut		Cinnamon (canella)	Meat, beef, preparations	Spices, nes	
Cotton waste	Oil, kapok		Cloves	Meat, cattle	Spinach	
Cotton, carded, combed	Oil, linseed		Cocoa, butter	Meat, cattle, boneless (beef & veal)	Strawberries	
Cottonseed	Oil, maize		Cocoa, paste	Meat, chicken	Sugar confectionery	
Crude materials	Oil, olive residues		Cocoa, powder & cake/meal	Meat, chicken, canned	Sweet corn frozen	
Dregs from brewing, distillation	Oil, olive, virgin		Coconuts	Meat, dried nes	Sweet corn prep or preserved	
Fat, camels	Oil, palm		Coconuts, desiccated	Meat, duck	Sweet potatoes	
Fat, cattle	Oil, palm kernel		Coffee, extracts	Meat, game	Tangerines, mandarins, clementines, satsumas	
Fat, pigs	Oil, poppy		Coffee, husks and skins	Meat, goat	Tea	
Fatty acids	Oil, rapeseed		Coffee, roasted	Meat, goose and guinea fowl	Tea, mate extracts	
Fatty substance residues	Oil, rice bran		Coffee, substitutes containing coffee	Meat, horse	Tomatoes	
Feed and meal, gluten	Oil, safflower		Cranberries	Meat, nes	Tomatoes, paste	
Feed minerals	Oil, sesame		Cream fresh	Meat, pig	Tomatoes, peeled	
Feed supplements	Oil, soybean		Cucumbers and gherkins	Meat, pig sausages	Vanilla	
Feed, compound, nes	Oil, sunflower		Currants	Meat, pig, preparations	Vegetables in vinegar	
Feed, pulp of fruit	Oil, vegetable origin nes		Dates	Meat, pork	Vegetables, dehydrated	
Feed, vegetable products nes	Oils, fats of animal nes		Eggplants (aubergines)	Meat, rabbit	Vegetables, fresh nes	
Flax fibre and tow	Oilseeds nes		Eggs, dried	Meat, sheep	Vegetables, fresh or dried products nes	
Flax fibre raw	Peas, dry		Eggs, hen, in shell	Meat, turkey	Vegetables, frozen	
Flax tow waste	Popcorn		Eggs, liquid	Melons, other (inc.cantaloupes)	Vegetables, homogenized preparations	
Flour, cereals	Poppy seed		Eggs, other bird, in shell	Milk, products of natural constituents nes	Vegetables, preserved nes	
Flour, fonio	Potato offals		Fat, liver prepared (foie gras)	Milk, reconstituted	Vegetables, preserved, frozen	
Flour, maize	Rapeseed		Fat, nes, prepared	Milk, skimmed cow	Vegetables, temporarily preserved	
Flour, mixed grain	Rice		Figs	Milk, skimmed dried	Vermouths & similar	
Flour, wheat	Rye		Figs dried	Milk, whole condensed	Wafers	
Fonio	Sesame seed		Flour, mustard	Milk, whole dried	Walnuts, shelled	
Food wastes	Silk raw		Flour, potatoes	Milk, whole evaporated	Walnuts, with shell	
Forage and silage, clover	Silk-worm cocoons, reelable		Flour, roots and tubers nes	Milk, whole fresh cow	Watermelons	
Forage and silage, grasses nes	Skins, calve, wet salted		Food prep nes	Milk, whole fresh sheep	Waters,ice etc	
Forage and silage, legumes	Skins, goat, wet salted		Food preparations, flour, malt extract	Mixes and doughs	Whey, condensed	
Forage products	Skins, sheep, dry salted		Food preparations, flour, malt extract	Mixes and doughs	Whey, dry	
Fructose and syrup, other	Skins, sheep, fresh		Fruit, cooked, homogenized preparations	Mushrooms and truffles	Wine	
Germ, maize	Skins, sheep, wet salted		Fruit, dried nes	Mushrooms, canned	Yoghurt, concentrated or not	
Glucose and dextrose	Skins, sheep, with wool		Fruit, fresh nes	Nutmeg, mace and cardamoms		

Exhibit B2: Commodity Description and Aggregation in the Full Employment (CGE) Analysis

Identifier	Descriptive name	IMPLAN commodities forming aggregate
Bagr	Bulk and intermediate agricultural products	Rice, wheat, cereal grains, oilseeds, raw sugar, plant fibers, other crops, wool, livestock production
HVAgr	High value consumer oriented agricultural products	Vegetables, fruits, nuts, milk, vegetable oils and fats, fruits and vegetables, processed rice, processed sugar, meat from ruminants, other meat products, dairy products, other foods
Mnfcs	Manufactures and related activities	Extractive industries (non-agricultural), textiles, wearing apparel, furniture, chemical products, transportation equipment, electronics, other equipment
Svces	Services	Trade and transport, construction, education and medical services, wholesale and retail trade, business and financial services, recreation

Exhibit B3: Definition of Variables in the BULK and HVP Agricultural Export Demand Equations

Variable	Definition	Source
BULK	Bulk/intermediate commodity export volume, 1,000 mt	FAS/USDA
BULKP	Per capita bulk/intermediate export volume, lb calculated as BULK*2.204622/RPOP	Calculated
BULKTOT	Total promotion funding (government expenditures plus cooperator contributions) for bulk/intermediate commodities, $US million	FAS/USDA
DA7	U.S. animal disease issues indicator variable, 2001=-1 (EU hoof & mouth disease); 2003, 2004 =1 (BSE); 2009 =1 (swine flu); 2014=1 (avian influenza) ; 0 in other years	INFORMA
DA8	Severe California Medfly attack indicator variable, 1989 = 1, 0 in other years	INFORMA
DE2	Recession indicator variable, 2009 and 2010 = 1, 0 in other years	INFORMA
DE4	World economic conditions indicator variable, 1980, 1981, 2008, and 2014 = 1, 0 in other years	INFORMA
DE6	Droughts in Asia and Europe indicator variable, 1977 = 1, 0 in other years	INFORMA
DF4	U.S. Export Enhancement Program indicator variable, 1986-1996 = 1, 0 in other years	INFORMA
DT2	WTO agreement indicator variable, 1994-2014 = 1, 0 in other years	INFORMA
DT6	Chinese corn & soybean trade policy indicator variable, 1995 = 1, 0 in other years	INFORMA
DW1	Hurricane Katrina indicator variable, 2005=1 and 0 in other years	INFORMA
DW7	Australian drought (increased Australian beef exports) indicator variable, 2007 =1, 0 in other years	INFORMA
DW10	Severe U.S. drought and Chernobyl incident, 1986=1, 0 in other years	INFORMA
DW11	Significant California droughts indicator variable, 1977, 2012, 2013 = 1, 0 in other years	INFORMA
GBULKP	Goodwill variable for total promotion funding for bulk/intermediate commodities calculated as BULKTOT/RPOP*XUSTW/WGDEF	Calculated
GHVPP	Goodwill variable for total promotion funding for consumer-oriented (HVP) commodities calculated as HVPTOT/RPOP*XUSTW/WGDEF	Calculated
HVPTOT	Total promotion funding (government expenditures plus cooperator contributions) for bulk/intermediate commodities, $ million	FAS/USDA
HVP	Consumer-Oriented (HVP) Export Volume, 1,000 mt	FAS/USDA
HVPP	Per capita HVP export volume, lb calculated as HVP*2.204622/RPOP	Calculated
RBPROD	Production of Bulk/Intermediate Products in Non-U.S. Countries, 1,000 mt	FAS/USDA
RBPRODP	Per capita production of Bulk/Intermediate Products in Non-U.S. Countries, pounds calculated as RBPROD*2.204622/RPOP	Calculated
RHPROD	Production of Consumer-oriented Products (HVP) in Non-U.S. Countries, 1,000 mt	FAS/USDA
RHPRODP	Per capita production of Consumer-oriented Products (HVP) in Non-U.S. Countries, pounds calculated as RHPROD*2.204622/RPOP	Calculated
RGDP	Real ROW GDP (World less U.S.), 2010 $US billion	ERS/USDA
RGDPP	Per capita real ROW GDP (World less U.S.) calculated as RGDP*1000/RPOP	Calculated
RPOP	Rest-of-the-World (World less U.S.) Population, million	ERS/USDA
UBP	Bulk/Intermediate Export Unit Value, $US/mt	ERS/USDA
UBPR	Real exchange-rate-adjusted bulk export price, $US/lb calculated as UBP/2204.622*XUSTW/WGDEF	Calculated
UHP	Consumer-Oriented (HVP) Export Unit Value, $US/mt	ERS/USDA
UHPR	Real exchange-rate-adjusted HVP export price, $US/lb calculated as UHP/2204.622*XUSTW/WGDEF	Calculated
WGDEF	World GDP Deflator, 2010=100	ERS/USDA
XUSTW	U.S. Exchange Rate Ag. Trade Weighted, Index 2010=100	ERS/USDA

Exhibit B4: Indicator Variables of Potentially Key Events Impacting U.S. Agricultural Exports Tested for Statistical Significance

Years	Designation	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Weather & Natural Events	**DW**																																								
Hurricane Katrina	1																															1									
El Nino/La Nina concerns	2																										1							1							
Historic US flooding	3																			1																					
USSR crop problems	4					1																																			
South America Drought (countries vary)	5						1									1	1	1						1							1	1	1			1		1	1		
US Droughts (locations vary)	6							1								1					1									1			1	1				1	1	1	
Australian drought	7																																	1							
Japanese Earthquake	8																																					1			
EU Grain Shortage	9																																	1	1						
Severe U.S. Drought and Chernobyl Incident	10												1																												
Significant California Droughts	11			1																																			1	1	
Animal & Crop Disease Events	**DA**																																								
Avian Influenza	1																																								1
Swine Flu	2																																			1					
BSE	3																													1	1										
PEDv	4																																							1	1
EU Hoof & mouth	5																											1													
US Soybean Aphid Infestion	6																														1										
Animal Diseases (combined DA1, DA2, DA3 & DA5)	7																											-1		1	1					1				1	1
Severe California Medfly Attack	8															1																									
Trade Issues/Events	**DT**																																								
China enters WTO	1																												1	1	1	1	1	1	1	1	1	1	1	1	1
WTO Agreement	2																					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
NAFTA	3																				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Japanese Beef Agreement	4															1																									
Starlink issue	5																											1													
Chinese ban corn exports and allow soybean imports	6																				1																				
Discovery of GMO wheat in Oregon	7																																							1	
USSR Embargo	8						1																																		
China's Slow Approval of MIR 162 & rejection of US Corn	9																																							1	1
Russian Drought & Export Ban	10																																				1				
Economic Events	**DE**																																								
Financial Meltdown	1																																	1	1						
Recession	2																																			1	1				
Euro Debt and 9/11	3																																					1			
US/World Economic concerns	4						1	1																											1						1
Energy price run up	5																																	1	1						
Droughts in Europe and Asia	6			1																																					
Farm Policy Events	**DF**																																								
Dairy Whole Herd Buyout	1												1																												
Ethanol Program	2																																	1	1	1	1	1	1	1	1
PIK Program	3									1																															
US Export Enhancement Program	4												1	1	1	1	1	1	1	1	1	1	1																		
Loss of Australian Wheat Board's single desk authority	5																																		1	1	1	1	1	1	1
Loss of Canadian Wheat Board's single desk authority	6																																						1	1	1
Lack of Packer Capacity Hogs	7																								1	1															
Rise of FSU prod'n & export capability following the fall of the Soviet Union	8																											1	1	1	1	1	1	1	1	1	1	1	1	1	1
EU CAP reform	9																																							1	1
Political Events	**DP**																																								
Ukraine/Russian situation	1																																								1
Arab Spring Unrest in N. Africa	2																																					1			

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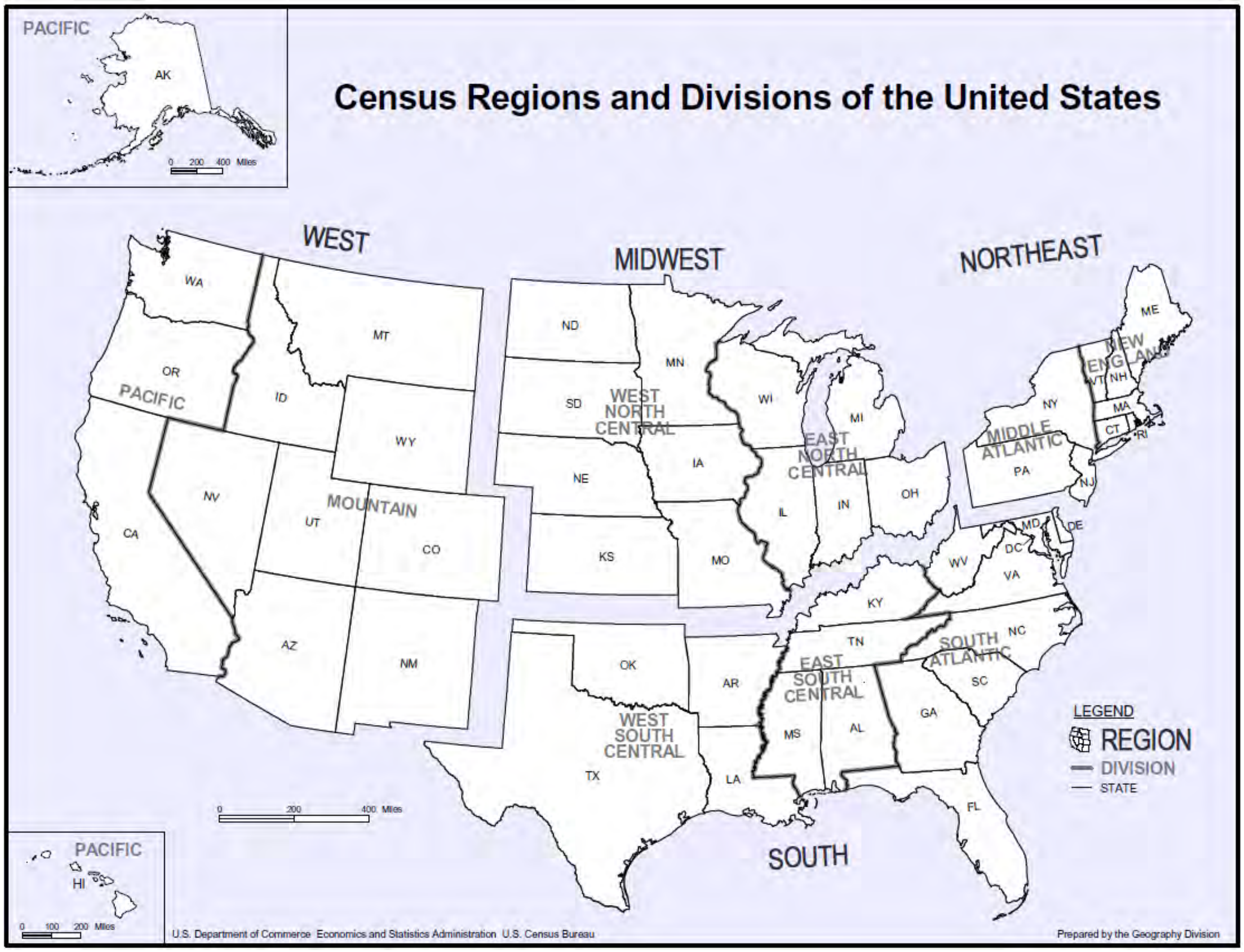
Exhibit B5: U.S. Census Regions



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XII. APPENDIX C – EXPANDED LITERATURE REVIEW

The economic impacts of foreign market development, or export promotion programs as they are often called, have been studied by agricultural and applied economists. In this section, we review the literature regarding the economic impacts and effectiveness of U.S. export promotion programs. We discuss the types of economic models used to model the impacts of export promotion as well as the data used to estimate these models. This is followed by a generalization of the key findings on the impacts of export promotion programs. In addition, a detailed summary of a representative sample of some of the studies of various commodities that have been conducted is contained in this section of the report.

A. Methods for Economic Evaluation of Export Promotion

The majority of studies conducted on export promotion programs have either estimated import or export demand functions to measure the effect of export promotion on U.S. trade. An export demand function covers all U.S. exports for a particular commodity or set of commodities. The advantage of this is it is more comprehensive since it measures the impact of export promotion programs on total U.S. exports. A disadvantage of this is it is difficult to accurately measure some of the demand determinants for a region as large as all non-U.S. countries. For example, how does one accurately measure an exchange rate between the U.S. and all other countries? An import demand function measures U.S. imports for specific importing countries as the dependent variable of interest, e.g., import demand for frozen potatoes in Singapore. The advantage of this is it provides more detail on the responsiveness of specific countries to U.S. export promotion. A disadvantage of import demand models is it generally does not provide complete coverage of all U.S. exports.

Most studies have been commodity- and individual-country-specific, and almost always partial equilibrium models, e.g., U.S. beef export promotion in Pacific Rim countries. A partial equilibrium model looks at the effects of export promotion on the specific commodity industry being studied and ignores the potential impacts on the general economy. These studies have looked at the direct impacts of FAS and cooperator programs on specific commodity demand. The models employed by economists have varied in the type of estimation techniques used (e.g., single equation vs. system of equations estimation), functional form specification (e.g., linear vs. logarithmic), and variables included in the model. Quantity dependent, price inverse, and market share demand specifications have been used.

Two recent exceptions to the partial equilibrium analysis are the 2006 and 2010 analysis of all USDA/FAS programs by Global Insight, Inc. These two studies featured both partial and general equilibrium analysis. Based on the estimated export promotion elasticities from the partial equilibrium model, a computable general equilibrium model, GTAP, was used to simulate the effects of export promotion on the general economy, including impacts on employment, GDP, farm income, farm prices, and other welfare measures. The use of general equilibrium model is advantageous since it measures the effects of export promotion on the general economy. On the other hand, partial equilibrium models usually provide more details on the industry that is being investigated. Similar to the 2006 and 2010 previous studies of FAS programs, our study includes both a partial and general equilibrium analysis of all FAS programs.

Most studies have employed single-equation estimation, e.g., Germany's import demand for pork could be estimated by fitting an equation where the dependent variable is U.S. pork imports to Germany and the explanatory variables include some or all of the following: the real import price of U.S. pork in Germany, the real price of pork by a competitor country (e.g., Denmark) in Germany, the real price of pork substitutes (e.g., beef or chicken) in Germany, the real exchange rate of the euro per U.S. dollar, per capita German income, real U.S. pork export promotion expenditures in Germany, and policy variables reflecting any trade barriers in effect (e.g., tariffs or quotas) on U.S. pork imports to Germany. This approach assumes that the independent variables are exogenous, however, the own-price variable may in fact not be. Some studies have conducted statistical price endogeneity tests to determine the validity of this assumption. Other studies have addressed the issue by using statistical estimation techniques that correct for price endogeneity such as using an instrumental variable approach for price. Proper estimation requires dealing with the potential endogeneity of price.

In order to accurately isolate the net impact of export promotion, the impact of all other factors that impact the demand for the U.S. commodity must be accounted for. In an ideal model, the following demand factors should be included: own-price, price of substitutes and complements, income, exchange rates, population, trade barrier measures, own export promotion, and competing export promotion as independent variables in the model. It is usually difficult, however, to find data for all these factors, e.g., obtaining competing country export promotion is usually not available. In other cases, studies have been forced to use only partial measures for important variables such as U.S. export promotion expenditures. Some previous studies, for instance, have only included FAS expenditures for this variable since private industry promotion data were unavailable. Another variable that is hard to measure, especially when there are numerous countries being modeled, is government trade distortions. Most studies simply ignore this dimension of trade, which in some cases can be problematic. Consequently, the demand factors included in the model are usually constrained by data availability.

The bulk of studies have used time series data, but there have also been some that have used panel data. To account for the effects of inflation over time, nominal monetary variables such as prices, income, and promotion expenditures are usually converted to "real" inflation-adjusted basis by dividing the nominal measures by the Consumer Price Index for all items, or an alternative price deflator in the respective country. Capturing the impact of exchange rate fluctuations over time has been dealt with in three ways. The first approach expresses all monetary variables in U.S. currency, in which case the real exchange rate (e.g., euro per U.S. dollar adjusted for inflation in the respective countries) is included as an additional explanatory variable measuring the impact of a devalued or stronger dollar on local prices in the importing country. Alternatively, some studies express all monetary variables in the local currency, in which case an exchange rate variable is generally not included in the model unless the researcher wants to test for money illusion or imperfections in international price transmission. A third, but less common approach is to also include the exchange rate of competing exporting countries (e.g., Andino et al., 2005; Kaiser, 2015).

The level of aggregation of the export promotion variable has varied across studies. Some researchers have aggregated all export demand enhancing activities into one variable, which may include such activities as media advertising, trade servicing, trade assistance, retail programs, public relations, and other promotional activities. This highly aggregated approach may be advantageous in saving degrees of freedom for the regression analysis, but can also suffer from aggregation bias. On the other end, there have been highly disaggregated studies as well. One problem with this approach is that many export promotion programs have such small marketing budgets that it may be difficult in finding a positive demand effect when the level of disaggregation results in activities with minimal expenditure levels.

Advertising and promotion may have a carry-over effect on demand, i.e., promotion today has an effect on demand tomorrow. Previous studies have dealt with this in two ways. First, the carry-over effect can be captured by using some sort of lag structure, i.e., current and lagged promotion expenditures are included. In these cases, both a short- and long-term promotion effect can be calculated. Various functional forms such as polynomial distributed lags and polynomial inverse lag structures have been used. Other studies have not lagged the promotion variable, but have lagged the dependent variable. Studies that include a lagged dependent variable, which is sometimes called a *partial adjustment model*, assume that promotion has a geometrically declining effect on sales over time. Partial adjustment models also permit the calculation of short- and long-run promotion elasticities.

The estimated coefficients from the econometric model are generally converted to a demand elasticity for easier interpretation. For example, an own-price elasticity of demand measures the percentage change in quantity demanded given a one percent change in the commodity's price. Generally, the most important elasticity in export promotion studies is the export promotion elasticity, which measures the percentage change in demand given a one percent change in promotion expenditures. Accordingly, a key hypothesis test is whether the estimated promotion elasticity is positive and statistically significantly different from zero. This is generally a necessary, but not sufficient condition, for export promotion to be profitable.

If export promotion is effective in increasing the demand for the commodity being studied, then the price will likely rise unless the supply is perfectly price elastic. Therefore, to measure the impact of export promotion on price, the supply-side of the market needs to be incorporated into the analysis. For example, in measuring the returns to U.S. walnut promotion in Asia, one needs to not only estimate the demand equation for U.S. walnut in Asia, but also the export supply equation for U.S. walnuts. Past studies have approached this in one of three ways. First, some (e.g., Kaiser pork) have explicitly estimated an export supply equation in order to derive an own-price elasticity of supply, which is necessary for determining the price impact. Second, others (e.g., Alston, Kaiser etc.) have not econometrically estimated the own-price elasticity of supply, but instead have either used previous estimates or have used an assumed range of values. Finally, other studies have simply assumed that price is not impacted by promotion, which is akin to assuming the supply curve is perfectly price elastic. The first two approaches are more desirable than the last since assuming a perfectly price elastic supply curve is usually not very realistic.

After the price effect of promotion has been determined, the benefit to producers is calculated using a measure of profit such as “producer surplus,” or another measure of net revenue. Producer surplus is a measure of profits. Changes in producer surplus associated with an increase in export demand due to export promotion can be calculated in one of two ways. If the commodity is undifferentiated (e.g., international customers regard U.S. and Canadian corn as identical) the change in domestic producer surplus is measured as the incremental increase in price due to export promotion multiplied by the level of domestic production. This is the way to measure producer surplus in this case because if the commodity is homogenous, all units of production benefit from the increase in price due to export promotion.

If the commodity is differentiated (e.g., Europeans regard U.S. wheat as superior to Black Sea countries), then the change in producer surplus is equal to the increase in the U.S. price due to the demand increase multiplied by U.S. quantity exported to that country. Benefit-cost ratios are typically measured as the increase in gain in producer surplus divided by some measure of promotion cost. Promotion costs are typically total outlays, but some studies separate government from industry costs to distinguish between private and public returns.

Some studies have used alternative measures of profitability instead of producer surplus. For example, some have computed the change in net revenue, which is equal to price times quantity minus production costs. Still others have used gross revenue (price times quantity) when cost data are unavailable. Since there are alternative measures of benefits used, it is important to know what specific measure is being used. Measures of profitability are preferable to gross revenue since it is important to factor the cost side into any measure of benefits.

The bottom line measure that is common to almost all studies is the calculation of a benefit-cost ratio (BCR), or return on investment. Indeed, the U.S. Department of Agriculture requires that all independent evaluations of federal checkoff programs include an estimated BCR. There are two main types of BCR that have been computed: marginal and average BCR.

A marginal benefit-cost ratio (MBCR) is based on a small, marginal increase or decrease in export promotion and the resulting incremental benefits and costs accruing from the change in promotion. This is computed by simulating the estimated demand model for alternative export promotion expenditure levels. As mentioned early, some studies account for the supply side as well. MBCRs are primarily used in determining optimal levels of export promotion since they measure the incremental benefits from an additional dollar of promotion. However, they are also used as a measure of effectiveness of the program.

Some studies compute an average benefit-cost ratio (ABCR), which compares benefits and costs with and without export promotion. Benefits are measured as the change in producer surplus (or other measures of profitability) accruing as a result of the export promotion, which are then divided by the total cost of the promotion. Average BCRs are the best measure for evaluating the overall profitability of export promotion since it gives the average return per dollar invested.

Some, but certainly not all studies, have included confidence intervals on important measures such as promotion elasticities and BCRs in their analysis. This is advantageous since econometric estimates are "point estimates," which are estimates rather than exact measures. That is, there is uncertainty about the precision of these estimates and therefore it is useful to construct confidence intervals around these point estimates. The confidence intervals give a lower and upper bound to the point estimate in where one can be reasonably confident that the true measurement lies. Hence, it is usually good practice to compute a lower bound estimate of a confidence interval for parameters such as the promotion elasticity and the BCR. If the lower bound of a BCR for say a 90% confidence interval is above 1 that provides even more robust evidence that the promotion is profitable.

B. General Findings

Because of the vastly different methods and data sets used in the many studies conducted on the impact of export promotion, it is difficult to make accurate comparisons among studies on the various commodities. This is especially true in trying to compare specific promotion elasticity estimates and BCRs among studies. Nevertheless, it is possible to make several generalizable conclusions from these studies.

The intent of market development and promotion programs operated by the USDA's Foreign Agricultural Service is to "develop, maintain, and expand foreign markets for U.S. agricultural products…" (GAO 1997, p. 41). The first important generalization from the individual commodity and aggregate studies reviewed in this section is that this intent has clearly been satisfied. As empirical evidence for this, consider Exhibit Appendix C1, which lists the estimated export promotion elasticities for 25 representative U.S. commodities from previous evaluation studies. Of these previous studies, 24 out of 25 of them (or 96%) found a positive and statistically significant relationship between export promotion expenditures and export demand. The estimated promotion elasticities from the 25 studies listed in Exhibit Appendix C1 range from a low of -0.085 (not statistically significant) to a high of 0.625. The average and median from these studies is 0.256 and 0.205. Thus, the overwhelming bulk of empirical evidence supports the notion that export promotion has a positive and statistically significant impact on increasing demand for U.S. exports.

Second, while statistically significant from zero, it is also clear from the findings listed in Exhibit Appendix C1 that export promotion elasticities are relatively small in magnitude, especially when compared with other demand factors such as price and exchange rates. This is not to say that promotion is ineffective. On the contrary, these programs have very large benefits relative to their costs. The point is that the current level of export promotion is boosting U.S. exports, but is less important than the main traditional export demand drivers.

Third, as alluded to in the previous paragraph, the benefits of these programs are very large relative to their costs. The average and median ABCR from the 10 studies that computed one in Exhibit Appendix C1 are 10.81 and 9.52[24]. Not a single study in this table computed an ABCR less than 1. Indeed, the lowest ABCR was 3.5, i.e., the net benefits of export promotion were 3.5 times more than their costs. Questions often arise about the believability of these high BCR estimates in economic evaluations of export (as well as domestic) promotion programs. BCRs are generally large because marketing expenditures are very small relative product value, and therefore only a small demand effect is needed to generate positive and large returns. For example, average total export promotion expenditures in 2015 were a mere 0.141% of the total value of agricultural exports[25]. Still, this relatively small proportional investment in export promotion increased producer net revenue by an average of 10.81 times (based on the average ABCR from Exhibit Appendix C1). The resulting BCR is therefore quite large on a relative basis.

Finally, from an economic optimality standpoint, these programs are vastly underfunded. The average and median MBCR from the 16 studies computing it in Exhibit Appendix C1 are 13.67 and 10.17, which are significantly greater than 1. Not a single study estimated a MBCR lower than 1. This means that increasing the amount of promotion would be profitable for the U.S. industries investing in these programs. Alternatively, U.S. food and agricultural exporters are foregoing additional profits by not increasing their levels of export promotion.

C. Individual Commodity Studies

The 2006 Global Insight, Inc. evaluation of all FAS programs contained a detailed annotated bibliography for 23 studies in its literature review. This section adds to this annotated bibliography by updating this list for export promotion evaluations that have been conducted since the 2006 study. The interested reader is referred to the 2006 report

[24] This average is based on converting the average gross benefit-cost ratio for soybeans from Williams et al. (2014) of 34.8 to an average net benefit-cost ratio of 3.48, which assumes a net margin factor of 10%. This was done to make the gross measure by Williams et al. (2014) consistent with the net revenue measures from the other studies. Kaiser (2010) used 10% as a net margin factor to translate gross revenue into net revenue.

[25]The 0.141% figure was derived by taking total MAP and FMD funding allocations for 2015, which was almost $200 million and dividing it by the total annual value of agricultural exports in 2014-15, which was $141.6 billion.

by Global Insight, Inc. to see the annotated bibliography of the 23 studies conducted prior to 2006.

Each study is summarized below with an emphasis on methods used, time period covered by the analysis, findings regarding promotion elasticities, and the resulting BCRs. Exhibit C1 presents a summary of the same studies (and some of the ones covered in the FAS 2006 study) in more abbreviated form, but may be useful to the reader as a shorter synopsis of each study.

1. Raisins

The Raisin Administrative Committee (RAC) conducts export promotion programs in various countries with the principal aim of increasing exports of California raisins. The RAC is part of a federal raisin marketing order that has been operating in California since 1949. The RAC has used its own money as well as FAS funds to conduct export promotion in various countries. In the past, the RAC has used a variety of programs to stimulate sales of California raisins to export destinations, including: (1) Market Access Program, (2) MIP (Merchandise Incentive Program), (3) IMPF (Industry Marketing Promotion Fund) (4) General RAC Funds, and the Export Replacement Offer ERO program. Collectively, these programs have had an average total budget of $63.2 million in recent years with $1.5 million for IMPF, $1.1 million for MIP, $1.9 million for MAP, $1.2 million for RAC, and $57.5 million for ERO. However, recently both the ERO and IMPF have been discontinued.

Kaiser (2010) estimated import demand equations for California raisins using panel data over the time period 1996-2008 for the 12 importing countries/regions. Unlike previous research, this study separately measured an export promotion elasticity for each of the 12 countries/regions and each of the five programs being evaluated. In addition, the study also included the following demand determinants in each importing country: price of California raisins, price of competing country raisins, GDP, and the exchange rate of the U.S. dollar to importing country currency. Overall, this study found a positive and statistically significant average export promotion elasticity equal to 0.204 for 1996-2008 and the 12 importing regions. Kaiser (2010) found that California raisin export promotion resulted in a total incremental increase in imports of California raisins of 58,252 metric tons per year, which in percentage terms represented 66.5% of all California imports.

The overall average BCR for all programs and all countries was computed to be 3.49. That is, each one $1.00 invested in all California raisin export promotion programs in all countries returned, on average, $3.49 in additional export revenue to the industry. For the five individual programs run by the RAC, the average BCR varied from a return of $1.80 for every dollar invested to a return of $25.15 for every dollar invested. The overall average BCRs for each country were larger than 1.0 except China/Hong Kong, Germany, and Indonesia, indicating that the benefits of export promotion in terms of expanding total export revenue were greater than the costs of the programs. Scandinavia, Japan, and Taiwan had the highest average returns. Over this period, each dollar invested in export promotion returned over $5.00 in additional raisin export revenue in each of these markets. The United Kingdom and Singapore also had above average BCRs, indicating these were relatively profitable markets for raisin export promotion.

2. Potatoes

In a recent study, Richards and Kaiser (2012) estimated import demand models for fresh, frozen, dehydrated, and seed potatoes with annual panel data from 2007 through 2011 for seven importing regions. The authors regressed import quantity for each category of U.S. potatoes on U.S. price, GDP in importing country, exchange rate of U.S. dollar to importing country currency, and U.S. potato export promotion expenditures. The authors found that U.S potato export promotion programs, which are funded by public-private contributions, had the effect of increasing the import demand for U.S. potatoes. The estimated short-run export promotion elasticities for dehydrated, fresh, frozen potatoes, and seed potatoes were 0.062, 0.073, 0.054, and 0.186, respectively. The long-run export promotion elasticities for these three products were: 0.072, 0.098, and 0.085, respectively.

Richards and Kaiser (2012) simulated the import demand model to compute marginal BCRs for export promotion activities. For all assumed supply elasticities, the BCRs were larger than 1.0 indicating that the benefits of export promotion were larger than the costs. For example, based on a supply elasticity of 1.5, which is probably the most plausible estimate for potato exports, the BCRs for dehydrated, fresh, frozen, and seed potato export promotion were 2.53, 4.90, 6.39, and 2.89, respectively. Based on these marginal BCRs, it appears that frozen potato export promotion offered the highest return on investment followed by fresh potato, then seed potato, and finally dehydrated potato export promotion.

3. Beef

Kaiser (2014) estimated an Armington-type market share trade model (Armington, 1969) to evaluate the impact of U.S. beef export promotion expenditures by the Cattlemen's Beef Board (CBB) on U.S. market share for beef. The Armington model distinguishes commodities by type and source of origin. Thus, similar products produced in different countries are assumed to be imperfect substitutes. The model is based on a two-step budgeting procedure commonly used in consumer theory. In the first stage, consumers allocate expenditures to a group of commodities, while in the second stage, expenditures are allocated to individual commodities within a group. In context of the Armington trade model, an importer first decides how much of a particular commodity to import and then decides the share to import from each country.

Panel data from seven countries/regions and annual observations from 1995-2013 were used to estimate the Armington model. The seven regions included: Mexico, Japan, Russia, China combined with Hong Kong, Taiwan, European Union (29 countries combined), and South Korea. U.S. beef market share was estimated as a function of market share in the previous year, GDP in each importing country, real exchange rate per U.S. dollar for U.S. agricultural trade constructed by the Economic Research Service, USDA, and foreign market development expenditures by the CBB, U.S. Meat Export Federation, and USDA/FAS (combined) in each importing country. The statistical results indicated that U.S foreign market development programs had the effect of increasing market share of U.S. beef exports. Specifically, a 1% increase in foreign market development expenditures increase U.S. beef market share by 0.167% in the short-run and 0.249 in the long-run.

Kaiser (2014) also simulated the model to examine the impact of export promotion on export revenue. His results indicated that CBB contributions to foreign market development for U.S. beef had a substantial impact on the export market. Over the period 2009-2013, CBB contributed $4.8 million per year, on average, to foreign market development programs to these seven countries. The average annual difference in total revenue from beef exports to these seven countries over this period was simulated to be $232 million per year. In other words, every dollar invested in export promotion by CBB yielded an increase in gross (before costs are netted out) beef export revenue of $48.39. Finally, this study found an overall marginal BCR of 14.2.

4. Pork

Kaiser (2012) estimated an export demand model for U.S. pork with exports of U.S. pork as the dependent variable. U.S. exports were measured on a quantity basis (million pounds) for each calendar year from 1984 through 2010. U.S. exports were regressed on the following demand factors: U.S. price of pork exports, price of annual pork exports from all other countries, average annual world (net of U.S.) GDP, exchange rate per U.S. dollar for U.S. agricultural trade constructed by the Economic Research Service, USDA, and foreign market development expenditures (cooperator and FAS combined).

The statistical results indicated that U.S foreign market development programs increased the export demand for U.S. pork. The model indicated that there was a three-year carry-over effect of foreign market development. That is, current as well as three years of lagged foreign market development expenditures impact U.S. pork exports. The results indicated that a 1% increase in foreign market development expenditures increased U.S. pork exports by 0.302%. The estimated foreign market development elasticity was quite comparable to a 2007 Research Triangle Inc. study, which found a foreign market development elasticity of 0.312. These results were also comparable to the shorter-run elasticity by Kaiser (2011) for the U.S. pork export promotion program, who found a 1% increase in U.S. foreign market development expenditures increased U.S. pork exports by 0.288%.

Kaiser (2012) built an equilibrium displacement model (EDM) to simulate the impacts of the National Pork Board on domestic and international markets. Based on the EDM, a MBCR was estimated to be 19.1.

5. Dairy

Song and Kaiser (2015) measured the effectiveness of U S dairy export promotion programs on increasing foreign demand and enhancing dairy producers' revenues. An import demand equation based on annual 1999-2011 panel data for 10 countries/regions was used to test whether export promotion had a positive and significant impact on U S dairy exports. The effects of various promotion scenarios on the dairy market were then simulated, and BCRs for these programs were estimated.

The authors included the following demand determinants in their import demand model: U.S. dairy price, other countries dairy price, GDP, exchange rate of U.S. dollar to importing country currency, and U.S. dairy export promotion expenditures. U.S. dairy export promotion expenditures had a positive and statistically significant impact on demand for U.S. dairy products in the world market. We estimated a promotion elasticity of 0.273, indicating a 10% increase in export promotion expenditures increased dairy exports by 2.73%, holding all other factors constant. The findings indicated that export promotion stimulated total dairy exports by 4.14 billion pounds, on average, per year, which represented 55.8% of total exports.

The second main finding was that U.S. dairy export promotion has been highly profitable for the nation's dairy farmers. The calculated BCRs, based on assumed elasticity of supply, ranged from a low of 8.54 for the most elastic supply response assumption to a high of 30.12 for the least elastic supply response. The lower bound of a 95% confidence interval for the BCR ranged from a low of 7.81 to 27.40. The fact that these lower bound estimates were still substantially higher than 1 indicated that the benefits have vastly exceeded the costs.

The final conclusion was that from an optimality standpoint, dairy farmers have under-invested in export promotion. The marginal BCRs ranged from a low of 3.79 to a high of 15.22. This means that, at the margin, increasing export promotion expenditures would be profitable for dairy farmers.

6. Soybeans

Williams et al. (2014) have conducted several comprehensive examinations of the economic effectiveness of the United Soybean Board's checkoff program including domestic promotion, export promotion, and production research. The authors used the SOYMOD model to investigate U.S. export promotion impacts. SOYMOD is a 186-equation annual econometric-simulation model of the world soybean and products market. The model includes the major regions associated with soybean trade: U.S., Brazil, Argentina, the E.U., Japan, and the Rest-of-the-World (ROW). In the most recent evaluation, the model was estimated using Nonlinear Iterative Seemingly Unrelated Least Squares with time series data from 1980-2013.

The results indicated that all U.S. export soybean promotion activities had a positive and statistically significant impact on U.S. exports of soybeans, soybean oil, and soybean meal in the E.U., Japan, China, and ROW. In the E.U., the promotion elasticities for soybeans, soybean meal, and soybean oil were 0.027, 0.03, and 0.035, respectively. In Japan, the promotion elasticities for soybeans, soybean meal, and soybean oil were 0.035, 0.044, and 0.047, respectively. In China, the promotion elasticities for soybeans, soybean meal, and soybean oil were 0.035, 0.032, and 0.026, respectively. In the ROW, the promotion elasticities for soybeans, soybean meal, and soybean oil were 0.032, 0.032, and 0.023, respectively. This study simulated market conditions with and without U.S. soybean export promotion. The results indicated that, over the period 1980-2013, U.S. soybean production was higher by 4.3%, exports were higher by 6.4%, and U.S. market share was 1.3% higher due to U.S. export promotion of soybean products conducted over this period. Average BCRs were computed for three time periods and were equal to 16.3 (1980-92), 8.3 (1992-2013), and 10.1 (1980-2013). The authors also computed the following discounted net BCRs: 10.2 (1980-92), 6.5 (1992-2013), and 7.3 (1980-2013). The fact that all BCRs were well above unity indicated that the export promotion activities for soybean products had positive net benefits to U.S. soybean producers over this time period.

7. Wheat

There have been two studies on U.S. wheat export promotion, including Rusmevichientong and Kaiser (2005) and Kaiser (2010). Since the first is discussed in detail later in this section, here the Kaiser (2010) study will be summarized. Kaiser (2010) estimated an export demand model for U.S. wheat. In addition to export promotion expenditures, this study included the following other demand determinants in the demand equation: U.S. wheat price, all other competing countries wheat price, world (less U.S.) GDP, and Special Drawing Rights, which is a measure of the value of the U.S. dollar relative to other major currencies (Euro, Yen, and Pound Sterling).

The study found that U.S. wheat export promotion had a positive and statistically significant impact on U.S. wheat export demand. The estimated export promotion elasticity was 0.295. That is, holding all other demand factors constant, a 1% increase in U.S. wheat export promotion expenditures resulted in a 0.295% increase in U.S. exports. The estimated export demand equation was simulated for two scenarios: (1) a baseline scenario in which export promotion programs were in effect and expenditures on promotion were set at actual levels; and (2) a counterfactual scenario where U.S. wheat export promotion were set at 50% of their actual levels. The 50% reduction in U.S. wheat export promotion expenditures would have decreased U.S. wheat exports by a total volume of 37.4 million metric tons from 2000 through 2007, or an average of 4.7 million metric tons per year. In percentage terms, this represented a reduction of 17.1% over this period.

Kaiser (2010) also estimated an ABCR and MBCR for wheat export promotion over a range of assumed export supply elasticities. The average ABCR was computed to be 12.29, while the average MBCR was computed to be 10.52.

8. Halo Effects of Export Promotion

The promotion of one commodity can increase or decrease the demand for the commodity in question depending on the nature of demand interrelationships. In instances where the spill-in effect is positive, a "halo effect" is said to exist. The hypothesis of a halo effect was most recently tested in a study by Rusmevichientong and Kaiser (2005). Rusmevichientong and Kaiser (2005) estimated a linear approximation of an Almost Ideal Demand System applied to U.S. grain export demand in order to examine whether U.S. promotion had halo effects. U.S. grain export promotion was found to have a positive and significant direct (own) impact on U.S. grain exports for rice, wheat and sorghum. U.S. wheat promotion had the largest estimated direct effect, with a short-run elasticity of 0.287 and a long-run elasticity of 0.616. U.S. rice promotion had short-and long-run elasticities of 0.186 and 0.205 and U.S. sorghum promotion's impact on U.S. sorghum market share had a short-run elasticity of 0.148 and a long-run elasticity of 0.269.

However, Rusmevichientong and Kaiser's (2005) results indicate that there were no halo effects of U.S. export promotion on other U.S. grains. U.S. rice export promotion had a positive impact, but not statistically significant on U.S. wheat market share, but a negative and statistically significant impact on U.S. sorghum market share. U.S. wheat export promotion had no significant impact on either U.S. rice or sorghum market share. And, U.S. sorghum promotion had a negative and statistically significant impact on U.S. rice, but not statistically significant impact on U.S. wheat market share. These authors also addressed whether there was a halo effect of U.S. promotion for other countries. Their results indicated that U.S. export promotion actually hurt competing country exports. U.S. rice export promotion had a negative and statistically significant impact on rice and sorghum market share for competing countries, and a positive and statistically significant impact on wheat market share for competing countries. Collectively, these three estimated cross elasticities summed to a negative halo effect of U.S. rice promotion on non-U.S. grain demand. U.S. wheat export promotion had a negative and statistically significant effect on rice and sorghum market share of non-U.S. countries, and a negative, but not statistically significant impact on wheat market share of non-U.S. countries. U.S. sorghum export promotion had a negative and statistically significant impact on wheat market share of non-U.S. countries, and a positive, but not statistically significant impact on rice and sorghum market share of non-U.S. countries. Hence, there appears to be no international free-riding off of U.S. grain export promotion.

9. Global Insight (2006 and 2010)

Two comprehensive economic evaluations of all FAS programs were completed by

Global Insight, Inc. in 2006 and later updated in 2010. The study had four main objectives: (1) determine whether export promotion and foreign market development spending had an impact on U.S. agricultural market share; (2) estimate the impact of FAS export promotion on U.S. agricultural exports; 3) examine whether increases in resulting agricultural exports due to export promotion improved the welfare of the farm sector and aggregate economic welfare based on benefit-cost analyses in compliance with OMB Circular A-94; and 4) provide empirical evidence for any market failures and externalities that would justify a federal role in this activity.

The objectives were addressed by developing an econometric trade model and using a computable general equilibrium model called GTAP. The econometric model consisted of two Armington Trade models, one for bulk plus intermediate exports and the other for high value products. The dependent variable in each model was U.S. market share, while the independent variables included U.S. market share lagged one year, Special Drawing Rights, which was a proxy for the value of the U.S. dollar, a trend variable, and a binary variable to account for the negative impacts of the 2003 and 2006 Bovine Spongiform Encephalopathy (BSE) cases and avian influenza (AI) on U.S. high-value product trade. The 2006 study used annual time series data from 1975-2004 and the 2010 study used time series data from 1975-2008 to estimate the models. The study found all demand factors to have a statistically significant impact on U.S. market share for high value products and for bulk plus intermediate products. The results indicated that promotion elasticities were 0.199 for high value and 0.144 for bulk in the 2006 study, and 0.186 for high-value products and 0.192 for bulk commodities in the 2010 study. All promotion elasticities were highly statistically significant.

The study simulated the impact of the increase in MAP and FMD funding authorized under the 2002 Farm Bill, which almost doubled funding from $125 million per year to $234.5 million per year. Together with cooperator funding, combined funding under this scenario was more than $570 million per year. The study found a significant positive impact of this increase on both total U.S. trade and market share. By 2009, it was estimated that the increase in funding boosted market share of foreign imports by 1.3 percentage points and increased the value of U.S. agricultural exports by $6.1 billion.

The promotion elasticity estimates were used as inputs in the GTAP model to simulate the impacts on the general economy. The results indicated that U.S. net economic welfare increased by $1.1 billion for the overall economy, which translated into a BCR of 14.6 to one. The increase in competition on the world market due to U.S. export promotion resulted in lower world food costs and improved rest-of-world economic welfare of $2.3 billion, accruing mainly to foreign consumers due to lower food prices. In addition, U.S. producers benefited due to an increase in producer prices for bulk and high valued products, and government spending on farm programs was reduced by $54 million due to the export promotion programs.

The study also looked at other funding level scenarios for the period 2012-2018 including a no increase in promotion expenditures, or status quo scenario ($200 million per year for MAP and $34.5 million per year for FMD), and a 50% decrease in funding scenario. Cooperator funding was held constant in the no increase scenario, and cut in half for the

50% decrease scenario. Not surprisingly, reduced funding was found to decrease U.S. exports and market share. Total farm income would have averaged almost $6 billion lower (1.8%) from 2012-18 under the 50% funding scenario. Moreover, the value of all farm assets was found to decrease by $44 billion (2%) because of the reduction in trade. The total loss in economic welfare to the general economy was estimated at $1.1 billion annually from 2012-18. The loss in welfare was 13.5 times larger than the cost savings of reducing FAS expenditures. Consumer welfare in the rest of the world was found to fall by $2.1 billion due to the increase in food prices globally.

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Exhibit C1: Key Results from Economic Impact Studies on U.S. Export Promotion

	Raisins	**Orange juice**	**Orange juice**	**Grapefruit**
Study	**Kaiser (2010)**	**Armah and Epperson (1997)**	**Lee and Brown (1986)**	**Fuller, Bello, and Capps (1992)**
Activities evaluated	Industry and FAS programs	Industry and FAS programs	Three Party program	FAS Three Party and TEA programs
U.S. export promotion in:	12 regions	France, UK, Germany, Japan Netherlands	13 European countries	Japan, Canada, France, and Netherlands
Period of estimation	1997-2008 (panel data)	1984-92 (panel data)	1973-82 (panel data)	1969-88 quarterly
Type of model	Import demand, single equation	Import demand, single equation	Import demand, single equation	Import demand, single equation
Estimated promotion elasticities	0.204*	Average=0.0776*	Not given	Average=0.165*
MBCR	None	Average=21.94	5.51	Average=10.53
ABCR	3.49	None	None	None
	Apples	**Apples**	**Table grapes**	**Frozen Potatoes**
Study	**Rosson, Hammig, & Jones (1986)**	**Richards, Ispelen, and Kagan (1996)**	**Alston et al. (1997)**	**Lanclos, Devodoss, and Guenthner (1997)**
Activities evaluated	Industry and FAS programs	Industry and FAS programs	Industry and FAS programs	Industry and FAS programs
U.S. export promotion in:	World	Singapore and UK	Asian countries	Japan, Mexico, Philippines, Thailand
Period of estimation	1972-81	1962-93	1976-94	1978-93 panel data
Type of model	Export demand, single equation	Import demand, LES/AIDS demand systems	Export demand, single equation	Import demand, single equation
Estimated promotion elasticities	0.51*	Average=0.036*	0.21*	Average=0.477*
MBCR	60.0	None	Average=4.15	Average=9.81
ABCR	None	None	Average=6.75	None

Notes: * means statistically significant at conventional significance levels, i.e., at least the 10% level.

	Potatoes	**Pecans**	**Walnuts**	**Peanuts**
Study	**Richards & Kaiser (2013)**	**Onunkwo and Epperson (2000)**	**Weiss, Green, and Havenner (1996)**	**Boonsaeng and Fletcher (2010)**
Activities evaluated	Industry and FAS programs	Industry and FAS programs	Industry and FAS programs	Industry and FAS programs
U.S. export promotion in:	World	Asia and EU	Japan	Mexico and Canada
Period of estimation	2007-11 panel data	1986-96 panel data	1986-96 (monthly data)	1991-2006 panel data
Type of model	Export demand, single equation	Import demand, single equation	Event analysis	Import demand, single equation
Estimated promotion elasticities	0.063**	Average=0.53*	Not specified	-0.085
MBCR	4.93	Average=6.60	5.85	None
ABCR	None	None	None	None
	Almonds	**Cotton**	**Red meat**	**Red meat**
Study	**Halliburton and Henneberry (1995)**	**Solomon and Kinnucan (1993)**	**Le, Kaiser, and Tomek (1998)**	**Comeau, Mittelhammer, and Wahl (1997)**
Activities evaluated	FAS FMD and MPP programs	FAS programs	FAS FMD and TEA	FAS MPP and TEA programs
U.S. export promotion in:	Japan, Taiwan, Hong Kong, Singapore, South Korea	6 countries in the Pacific Rim	S. Korea, Taiwan, Hong Kong, Singapore	Japan
Period of estimation	1986-92 panel data	1965-85	1984-94 panel data	1973-94
Type of model	Import demand, single equation	Armington trade model	Import demand, single equation	Inverse Almost Ideal Demand System
Estimated promotion elasticities	Average=0.564*	Average=0.092*	Average=0.165*	Price flexibilities wrt promotion ranged from 0.11* to 0.128*
MBCR	Average=4.86	None	Average=15.62	Average=16.84
ABCR	None	None	None	None

Notes: * means statistically significant at conventional significance levels, i.e., at least the 10% level.

	Beef	**Pork**	**Poultry**	**Dairy**
Study	**Kaiser (2014)**	**Kaiser (2012)**	**Shahid and Gempesaw (2002)**	**Song and Kaiser (2015)**
Activities evaluated	FAS FMD and MAP programs	FAS MAP and FMD programs	FAS MAP and FMD programs	Industry and FAS programs
U.S. export promotion in:	World	World	World	World
Period of estimation	1985-2013	1984-2010	1980-1998	1999-2011 panel data
Type of model	Export demand, single equation	Export demand, single equation	Export demand, single equation	Import demand, single equation
Estimated promotion elasticities	0.167*	0.302*	0.625*	0.273*
MBCR	14.2	19.1	None	Average=7.45
ABCR	None	None	None	Average=15.78
	Soybeans	Wheat	Wheat	Rice
Study	**Williams et al. (2014)**	**Kaiser (2010)**	**Rusmevichientong and Kaiser (2005)**	**Rusmevichientong and Kaiser (2005)**
Activities evaluated	Industry and FAS programs	USW and FAS export programs	Industry and FAS programs	Industry and FAS programs
U.S. export promotion in:	World	World	World	World
Period of estimation	1980-2013	1975-2007	1975-2005	1975-2005
Type of model	SOYMOD world market model	Export demand, single equation	Linear approximation of Almost Ideal Demand Systems	Linear approximation of Almost Ideal Demand Systems
Estimated promotion elasticities	Average=0.033*	0.295*	0.616*	0.205*
MBCR	None	10.52	None	None
ABCR	34.8 (gross BCR)	12.29	25.71	4.88

Notes: * means statistically significant at conventional significance levels, i.e., at least the 10% level.

	Sorghum	**All U.S. food exports**	**All U.S. food exports**
Study	**Rusmevichientong and Kaiser (2005)**	**Dwyer (1995)**	**Global Insight (2010)**
Activities evaluated	Industry and FAS programs	FAS programs	FAS programs
U.S. export promotion in:	World	World	World
Period of estimation	1975-2005	1975-92	1975-2010
Type of model	Linear approximation of Almost Ideal Demand Systems	Armington trade model	Armington trade model
Estimated promotion elasticities	0.269*	Average=0.15*	Average=0.189*
MBCR	None	None	None
ABCR	5.10	16.0	14.6

Notes: * means statistically significant at conventional significance levels, i.e., at least the 10% level.