



Corn Trade Report: Trend and Risk Analysis

Saleem Shaik, Professor and Director
Kwame Asiam Addey, Ph.D. Candidate
Kekoura Sakouvogui, Ph.D.

Center for Agricultural Policy and Trade Studies
Agribusiness and Applied Economics
North Dakota State University
Fargo, N.D., 58108

NDSU NORTH DAKOTA
STATE UNIVERSITY

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Glossary

Average/mean	This is the sum of a collection of numbers divided by the count of numbers in the collection. For past historical data as in this report, this gives an idea of what the producer or decision maker should expect.
BWC	Corn bran, waste and cakes.
Coefficient of variation	This is also known as the relative standard deviation. It is a statistical measure of the dispersion of data points around the mean. While it performs a similar function to the standard deviation, it is advantageous because it can be used to compare dispersion of data between distinct series of data. Furthermore, it is a unitless measure. Generally, a decision maker seeks a lower value because it provides an optimal risk-to-reward ratio with low volatility but high returns.
Descriptive statistics	These are brief descriptive coefficients that summarize given data sets. These are classified into the measures of central tendency (mean/average) and measures of variability (minimum, variance/standard deviation and maximum variables).
Ex-ante	These are inferences based on forecasts.
Export	Goods or services that are sent out of a specific geographical location to another spatially demarcated jurisdiction. This is represented as nominal dollars.
Ex-post	These are inferences based on actual results.
GF	Glucose and fructose
GHS	Groats, hull and starch
Harmonized system code	Commonly represented as harmonized system (HS) code. This is a standardized numerical method of classifying traded products. Primarily, it is used by customs authorities around the world to identify products when assessing duties/taxes and for collecting data for statistical analysis.
Import	Goods or services that are brought into a specific geographical location from another spatially demarcated jurisdiction. This is represented as nominal dollars.
Net farm income	Net farm income refers to the return to farm operators for their labor, management and capital after all production expenses have been paid. This is the gross farm income minus production expenses.
Period	A period is defined as a five-year interval in this report.
Prices	Price is computed as the ratio of export value and quantity. This is represented as nominal dollars per metric ton (\$/MT).
Production efficiency	Production efficiency is concerned with producing goods and services with the optimal combination of inputs to produce maximum output for the minimum cost.
Production	Quantity of commodity produced. This is measured as bushels for both commodities (corn and soybeans).
Productivity	Productivity is the measure of output from a production process per unit of input.
Risk	A risk is the possibility of loss or gain of an event with known probabilities.
Shares	Representative proportion of the total of a variable/indicator.
Standard deviation	This is a quantification of the amount of variation or dispersion of a set of data values. This is most often a complementary information to the mean. Given any mean, there are chances of gain or a loss. Hence, knowing the possible variation can allow the decision maker or producer to plan with bounds.
Trade	This is basically computed as the sum of imports and exports. However, in this report, trade is used generically to represent either imports or exports.
Trend	A general course or prevailing tendency to take a particular direction or move in some indicated direction. In this report, the trend defines the direction of growth of the respective variable.
Uncertainty	Uncertainty refers to the occurrence of an event for which probabilities cannot be assigned.

Executive Summary

This report presents organized and structured information on corn trade indicators across geographical space and through time. The indicators considered are exports, imports and prices. These also are presented at the byproduct level. The levels of aggregation are global, U.S. and North Dakota.

The information is presented in the form of trends and descriptive statistics. The former reveals the direction of the growth, while the latter reveals the magnitude of expectations. The descriptive statistics are represented by the mean, standard deviation, coefficient of variation and share contribution to the total.

The report is presented in six sections: (I) global temporal corn trade, (II) global spatial corn export, (III) global spatial corn import, (IV) U.S. temporal corn export, (V) U.S. spatial corn export and (VI) U.S. state level corn export. At the global level, the trends of the indicators are presented in addition to the descriptive statistics of the top 15 exporting and importing countries. The trends and descriptive statistics for the top 15 exporting states also are provided at the U.S. level.

This report is important because it serves as an informational guide on exports, our competitors for exports and potential markets for corn to our producers. In the current environment, the success (productivity and net farm income stability) of agricultural business depends on the accurate prediction of potential demand for corn and their products to help producers in making decisions for domestic or foreign markets. Hence, having a comprehensive and accurate database on exports and imports at the global, national and state levels will enable producers in decision-making with confidence.

To formulate trade policies related to the international market, the trends and the descriptive statistics are useful to producers in identifying variations in demand for corn and their products. For decision makers, this information is helpful in the development of risk management tools for potential export losses due to risky events such as politically driven tariffs and uncertain events such as COVID-19. Finally, in the years of decline, identifying sources of variation or risk in changing consumer preferences, genetically modified restrictive index, trade facilitation and prosperity indexes is important. The study reveals that:

Global Trade

- Despite having an increasing trend, the proportion of corn grain relative to processed products has decreased through time.
- Corn grain, ethyl alcohol, corn meals (bran, residues, waste and cake) are the major traded corn products.
- Brazil, Argentina, Uruguay and France are the major competitors of the U.S. in global corn markets.
- Japan, Mexico, South Korea, Egypt and Spain are the major destinations for corn grain.
- Global corn prices have been on the decline in recent years.

U.S. Trade

- Mexico, Japan, South Korea, Colombia and Peru are the major destinations for U.S. corn grains.
- Italy, Iran, Netherlands, Malaysia, Algeria and Germany are among the top 15 importers but not part of the top 15 U.S. export destinations.

U.S. State Trade

- The U.S. Department of Agriculture (USDA) Foreign Agricultural Service (FAS) under- and overestimates state exports because they are based on the location of the port.
- Our production-adjusted state exports estimates suggest the major exporters of corn are Illinois, Iowa, Minnesota, Indiana, Nebraska, Ohio, Missouri, South Dakota, North Dakota and Kansas.

North Dakota Trade

- North Dakota corn exports are underestimated by the USDA FAS.
 - For instance, the production adjusted export value predicts a value of \$652,594,412 in 2018, while the FAS method presents a value of \$134,183,209. On the other hand, the ERS method predicted \$337,701,587, which is two times less than the production adjusted estimate.

Future Research

Exports are particularly important for every economy. In the case of North Dakota, where production mostly exceeds domestic consumption, the need to explore foreign market potentials is essential. From this report, we can observe that the current trends of corn trade for North Dakota have been increasing. We must not only evaluate the determinants of North Dakota corn exports but also explore potential markets.

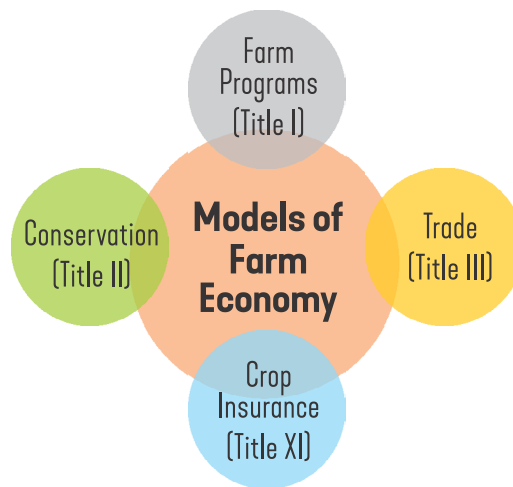
- The next stage of this research seeks to evaluate the efficiency of U.S. state agricultural exports and their determinants. Of particular interest are the impact of genetically modified restrictive index, tariffs and other transportation costs. The expected outcome of the estimation is to provide the requisite knowledge that will give North Dakota corn farmers a comparative advantage in the international markets, given that these variables have become very instrumental drivers of international trade in recent years.
- The second objective will be to examine the determinants of commodity price volatilities and their impact on North Dakota production and exports.

About the Center

Center for Agricultural Policy and Trade Studies

The vision of the Center for Agricultural Policy and Trade Studies (CAPTS) is to enhance the sustainability of the net farm income of North Dakota producers through in-depth trade and agricultural policy research. After carefully considering stakeholder inputs, interests, risks and uncertainties, the concept of efficiency, technology assessment and productivity growth¹ also are embedded into the center's research.

To address this vision, the center aims to develop a “*model of farm economy*” to conduct ex-post and ex-ante evaluations for North Dakota. The model will evaluate agricultural and trade policies with its implications on North Dakota producers' net farm income. Additionally, the implications of policy on North Dakota producers' efficiency, technology assessment and productivity growth also will be evaluated.



The model of farm economy based on multiple theoretical frameworks will not only evaluate the implications of existing agricultural and trade policies (Title I, II, III and XI) but also future policies to meet efficiency, productivity and net farm income sustainability goals of North Dakota producers. Our perception of the challenges and the choices made at this juncture in history will determine how to protect farmers in our state and secure our future. The center keeps detailed records of all activities and publishes the information that will be of value to the clientele, including commodity groups and decision makers of the state and region.

Center and Current Project

The center, in collaboration with North Dakota Soybean and Corn councils, is evaluating measures of improving net farm income sustainability for producers in the state. The project is in three dimensions; these are the production indicator report, trade report and policy report.

The phase 1 outcomes of the project include detailed and comprehensive development of databases and the presentation of trends and risks in the production indicator, trade and policy reports. These reports are useful to the producers, commodity groups and decision makers.

Also, this information will form the basis for the development of the “*model of farm economy*” to evaluate the implications of agricultural and trade policies on North Dakota producers' net farm income. Additionally, the implications of technology and policies on North Dakota producers' efficiency and productivity growth will be evaluated.

¹ The efficiency concept allows producers to evaluate input resources (cost) to produce output (revenue). The producers' efficiency will improve through time with adoption of innovative technologies to minimize cost and maximize revenue.

About the North Dakota Corn Utilization Council

The North Dakota Corn Utilization Council (NDCUC) was established in 1991 by the North Dakota Legislature to administer the state corn checkoff. The checkoff is one-fourth of 1% of the value of corn sold at elevators and processing facilities in North Dakota.

The NDCUC consists of a board of seven corn producers elected by their peers. North Dakota is divided into seven corn districts.

Each county within the district elects a county representative. County representatives elect a district representative to serve on the council. Council members are responsible for the investment of corn checkoff in programs to solve production problems, create new market opportunities, provide educational programming and promotion of the corn industry domestically and internationally.

Corn production in North Dakota has grown significantly since the late 1990s because genetic advancements have led to hybrids suitable for northern climates. Corn is one of the top three crops in North Dakota by acreage. Yield increases have made corn highly profitable during periods of price volatility.

Thanks to corn farmers' investments in checkoff programming, production of renewable fuels has grown in North Dakota to create demand for approximately 50% of our bushels produced. Checkoff investments also are utilized to create market demand internationally. This has led to approximately 40% of the corn grown in North Dakota leaving the state by rail because it is destined to go to ports in the Pacific Northwest and shipped to buyers in Asia.

North Dakota's corn processing facilities are a vital component of the state's rural economy. Our five ethanol plants employ more than 230 workers in high-paying positions such as chemists, engineers, accountants and managers, as well as support staff. Each North Dakota ethanol plant is in a community with a population of less than 2,500 and contributes an average of 46 jobs to these rural communities.

The NDCUC works toward expanding new markets, invests in research to meet current and future needs of farmers, and works to ensure a profitable business climate for northern corn.

The NDCUC serves more than 6,000 corn farmers in North Dakota.

To learn more about the North Dakota Corn Utilization Council, please visit www.ndcorn.org or follow it on social media.

Trade Report

Rationale for This Report

In recent years, discussions on global trade have become a delicate topic among world leaders. Each country seems to seek out its interest at the expense of others.

However, a theoretically established fact is that international trade is a positive-sum game rather than a zero-sum game for partner countries involved. What also is well known is that governments are more likely to form free trade areas if the benefits outweigh the costs.

The U.S. has been at the center of many of these trade disputes in recent times. This can be primarily attributed to its efficiency of production. The U.S. agricultural sector consistently has produced more than its domestic needs. Hence, international trade and food aid supplies have been the two major outlets for excess agricultural produce of the U.S.

Considering this, the recent turn of geopolitical events has been unfavorable for farmers in the U.S. To remedy this issue, we have the need to understand the factors that hinder or promote U.S. agricultural exports.

Several studies have been conducted on the determinants of U.S. agricultural exports. Meanwhile, crop production is spatially specialized in the U.S. For instance, the Midwestern states are the major producers of U.S. grains.

To formulate policies concerning current trade events, the understanding of the determinants of U.S. agricultural exports alone may not be sufficient. A need exists to dissect the determinants of state-level agricultural exports.

However, research on U.S. state-level agricultural exports is limited. This can be attributed to the nature of available data on U.S. state-level agricultural exports. The current data on state-level exports do not reflect the major producing states. This is because of the dual problem of the absence of ports of exit in these states and the USDA Foreign Agricultural Services method of reporting state-level exports based on the ports of exit rather than state of origin.

As part of its commitment to help mitigate the effects of these challenges faced by producers in North Dakota on the international markets, the CAPTS frequently performs research. This report is the output of a collaboration between the CAPTS and NDCUC with the aim of overcoming challenges of corn trade in North Dakota.

To evaluate the possible effects of these challenges and propose plausible solutions, we have a need for accurate and up-to-date data at different levels of aggregation. The objective of this study is to develop a statistical-based method to estimate the corn exports by the individual states within the U.S.

Obtaining this estimate will be useful to examine the actual determinants of corn exports at the state level. Knowing this can help Congress formulate policies with emphasis on states that are major producers of corn.

This report, as the first of a series of research in line with the

collaborative objective, presents data on corn trade indicators. This trade report presents data on the following variables through time (temporal) and across geographical space (spatial):

- Export value
- Import value
- Price

Why is This Report Important?

This report presents systematically aggregated trade information for corn producers. First, it is important because it contains details of exports and imports based on corn byproducts through time. This information reveals the shifting demand for these byproducts through time.

For U.S. corn producers, this information is relevant for them to identify major competitors and potential new markets. Identifying the competitors will aid in policy formulation to increase market dominance, while identifying new markets will help increase total market share (and subsequently revenue) through exploring these new destinations.

Secondly, the report presents information on corn prices during the period in addition to its statistical risk. The financial markets (prices) form the bedrock of profit maximization and income sustainability. These trends and statistical risks are important because they reveal the volatilities and possible losses or gains.

For North Dakota corn producers, this report presents a set of accurate state-level exports that eliminates the port bias problem. Typically, the demand for state production incentives can be boosted with higher historic exports.

However, under situations where the exports for certain states are underestimated due to the port bias problem, the representatives have difficulty in obtaining the necessary incentives for their producers. These accurate state-level exports can be used for negotiations by state representatives or commodity groups for incentives for corn producers in North Dakota.

Data and Methods

The U.S. national and state-level exports and imports from the world and individual countries are available from the Global Agricultural Trade System (GATS), U.S. Department of Agriculture, Foreign Agricultural Service (USDA FAS). These trade data are presented at bulk and byproduct levels identified by their harmonized system (HS) codes. The corn trade data were obtained from this website at the byproduct level. The groups (with their HS codes) obtained are:

- Corn and seeds (100510 and 100590)
- Corn ethyl alcohol (220710 and 220720)
- Corn bran, residues, waste and cake (230210, 230310, 230330, 230670 and 230690)

- Corn flour, groats, hulled and starch (110220, 110313, 110423 and 110812)
- Corn sugars; glucose and fructose (170240 and 170260)
- Corn crude and refined oil (151521 and 151529)

To compute the production-adjusted state-level exports, production data was obtained from the USDA National Agricultural Statistical Services (NASS). The Statistical Analysis System (SAS) software was used in the generation of tables and graphs. These are presented at::

- World (aggregate and countries)
- U.S. (aggregate and states)

The empirical framework for this report includes annual trends, five-year changes and summary statistics (mean, risk/deviations and coefficient of variation) and intensity of trade (market share) among countries and states. The results presented at various levels would help the corn producers not only evaluate their options for the present but also develop strategies for the future based on the market trends and risks.

- Annual trends: The annual trends of global exports, imports and prices of corn are presented in the report. The export and import values also are presented by trends for the top 15 countries. At the U.S. level, the trends of these indicators are presented for the whole country and top 15 states. At the North Dakota level, the trends are presented and compared for our computed production-adjusted exports, USDA FAS exports and ERS exports. Presenting these trends in the report will provide a framework to gauge the changes through time across countries and states. Furthermore, it will help reveal the extent of bias accumulation attributed to the current USDA FAS method of computing state exports. Knowing these trends can serve as a basis for estimating the volatilities and their sources. This can help forecast future possibilities vs. desired horizons for advance decision making.
- Five-year changes: This report further presents histograms of the five-year sums of the trade indicators at the various levels of aggregation and product group level. Having the indicators in five-year periods in the report will provide a framework to evaluate the increase/decrease or shifts across periods.
- Summary statistics: The summary statistics are provided for the various levels of aggregation for all the trade indicators enumerated. This will provide a framework to evaluate the magnitude of the variables using totals, averages, risks, coefficient of variation and intensity of the trade variables in the form of market share.

Key Findings

Global Trend and Risk

Global corn export quantity and value increased steadily during the period (Figure 1). Between 2014 and 2018, whole grain corn, including seeds, accounted for 65.1% of the global export share of corn products. Ethyl alcohol accounted for 16.2% of the total export share in this period, while corn bran, residues and cake accounted for 10.7%. Corn flour, groats and starched represented 3.5% of the total exports, followed by corn sugars (glucose and fructose) with 2.4%.

The least component of corn exports for this period is corn crude oil and residue, with 2%. Figure 7 presents the global export share of corn byproducts from 2014 to 2018. The trends of export value, quantity and price for the six groups of byproducts are presented in Figures 8, 9 and 10.

The top 15 exporters of corn and seeds (export value share) based on the period between 2014 and 2018 are:

1. U.S. (35%)
2. Brazil (14.3%)
3. Argentina (12.6%)
4. Ukraine (10.3%)
5. France (5.89%)
6. Romania (3.12%)
7. Hungary (2.68%)
8. Russia (2.01%)
9. Serbia and Kosovo (1.23%)
10. India (1.07%)
11. Mexico (1.04%)
12. Paraguay (0.92%)
13. Bulgaria (0.87%)
14. Burma (0.82%)
15. South Africa (0.77%)

The trends of the export values for the top 15 countries are presented from Figure 11 to Figure 13. Figures 14 to 28 present trends for the top 15 exporters for the other byproducts. The details for the descriptive statistics can be found in the **appendix**.

The top 15 importers of corn grain (import value share) based on the period between 2014 and 2018 are:

1. Japan (11%)
2. Mexico (8.97%)
3. South Korea (7.05%)
4. Egypt (5.84%)
5. Spain (5.06%)
6. Vietnam (3.99%)
7. Italy (3.39%)
8. Iran (3.25%)
9. Colombia (3.13%)
10. Netherlands (3.06%)
11. Malaysia (2.65%)
12. Taiwan (2.34%)
13. Algeria (2.24%)
14. Saudi Arabia (2.23%)
15. Germany (2.06%)

The trends of the import values for the top 15 countries are presented from Figure 29 to Figure 31. Figures 32 to 46 present trends for the top 15 importers for the other byproducts. The details for the descriptive statistics can be found in the **appendix**.

U.S. States Trend and Risk

The trend of the share of U.S. corn exports relative to the world is presented in Figure 47. This figure shows that U.S. corn exports are diversified to include processed products. Important by products are corn residue, sugars and oils. The importance of ethyl alcohol continues to grow.

The top 15 U.S. export destinations are:

1. Mexico (12.6%)
2. Japan (11.3%)
3. South Korea (4.37%)
4. Colombia (4.02%)
5. Peru (2.15%)
6. Taiwan (2.10%)
7. Canada (1.70%)
8. Saudi Arabia (1.32%)
9. Egypt (1.17%)
10. Guatemala (0.80%)
11. Venezuela (0.69%)
12. Costa Rica (0.64%)
13. Dominican Republic (0.54%)
14. Vietnam (0.46%)
15. China (0.56%)

The trends of the import values for the top 15 U.S. export destination countries are presented from Figure 48 to 50. Figures 51 to 65 present trends for the top 15 U.S. exporting destinations for the other byproducts. The details for the descriptive statistics can be found in the **appendix**.

The production-adjusted export trends of the top 15 states are:

1. Illinois (14.6%)
2. Iowa (12.9%)
3. Minnesota (8.54%)
4. Indiana (7.70%)
5. Nebraska (6.71%)
6. Ohio (6.30%)
7. Missouri (6.11%)
8. South Dakota (5.49%)
9. North Dakota (5.07%)
10. Kansas (4.01%)
11. Arkansas (4%)
12. Mississippi (2.80%)
13. Michigan (2.38%)
14. Wisconsin (2.30%)
15. Kentucky (2.29%)

The trends of the indicators for all the exporting states are presented from Figure 66 to Figure 72. The details for other indicators at the global level can be found in the **appendix**.

North Dakota Corn Excluding Seed Exports

The USDA FAS reports state export values based on reported port values. Hence, the data obtained from the USDA FAS website do not reflect the actual performance of the individual states in terms of their export and production. To that effect, state representatives have difficulty in negotiating for incentives and farm programs for domestic farmers.

To solve this problem, this report employs a production accounts method to estimate North Dakota corn exports. For consistency, the cash receipts-based method employed by the USDA ERS to estimate state level exports also is obtained. The export value for these three methods are presented in Tables 1, 2 and 3.

A comparison of the three data types is shown in Table 4 for the total export value during the period. We can see that the production accounts method and cash-receipts method yield similar results.

The data from USDA FAS underestimates North Dakota corn exports by about five times relative to the production accounts method. For instance, the production adjusted export value predicts a value of \$652,594,412 in 2018, while the FAS method presents a value of \$134,183,209. On the other hand, the ERS method predicted \$337,701,587 for North Dakota, which is two times less than the production adjusted estimate.

Future Research Proposal

Exports are particularly important for every economy. Furthermore, in the case of North Dakota, where production mostly exceeds domestic consumption, the need to explore foreign market potentials is essential. From this report, we can observe that the current trends of corn trade for North Dakota have been increasing. Evaluating the determinants of North Dakota corn exports is essential.

- The next stage of this research seeks to evaluate the efficiency of U.S. state agricultural exports and their determinants. Of particular interest are the impact of genetically modified restrictive index, tariffs and other transportation costs. The expected outcome of the estimation is to provide the requisite knowledge that will give North Dakota corn farmers a comparative advantage on the international markets, given that these variables have become very instrumental drivers of international trade in recent years.
- The second objective will be to examine the determinants of commodity price volatilities and their impact on North Dakota production and exports.

■ Section I

Global Temporal Corn Trade

Figure 1: Global Corn and Seed Exports, Annual Trends

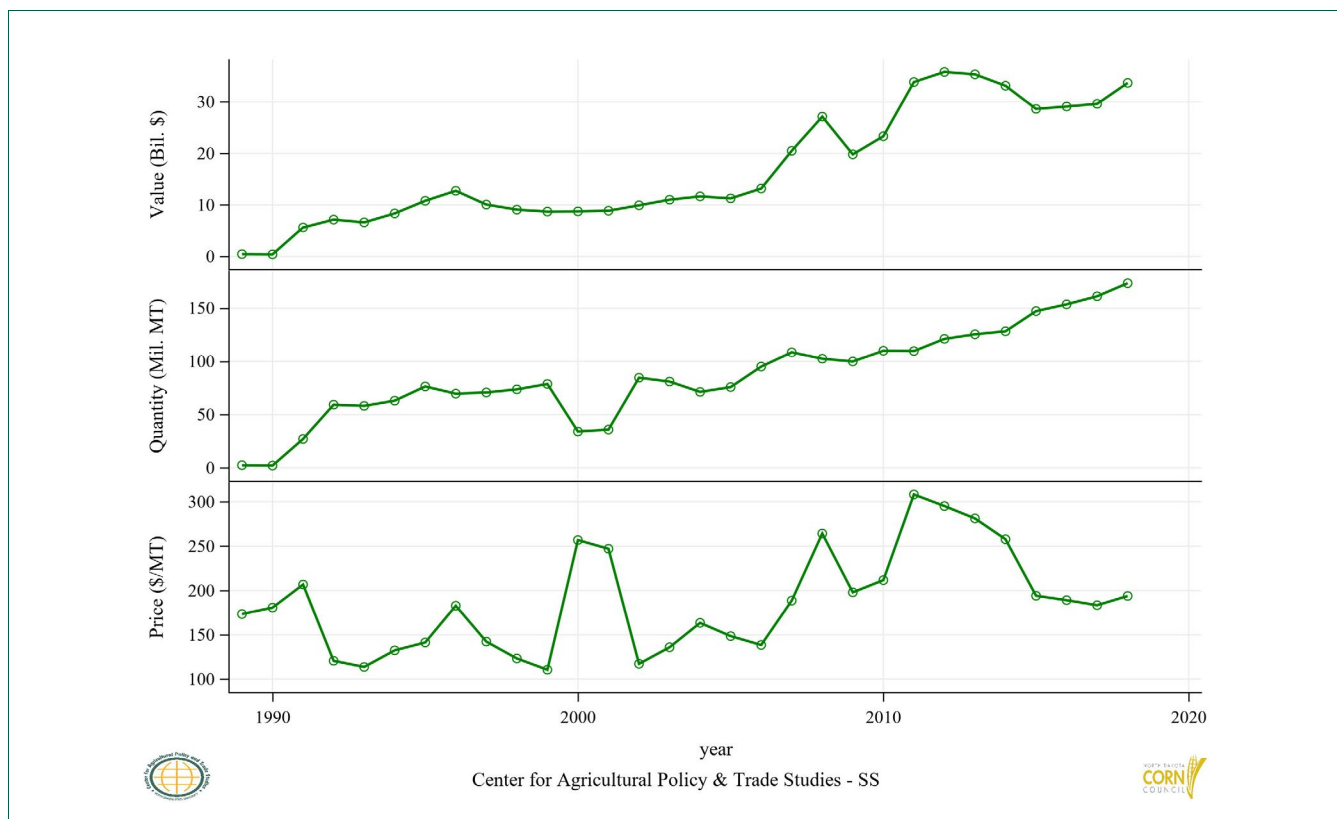


Figure 2: Global Ethyl Alcohol Exports, Annual Trends

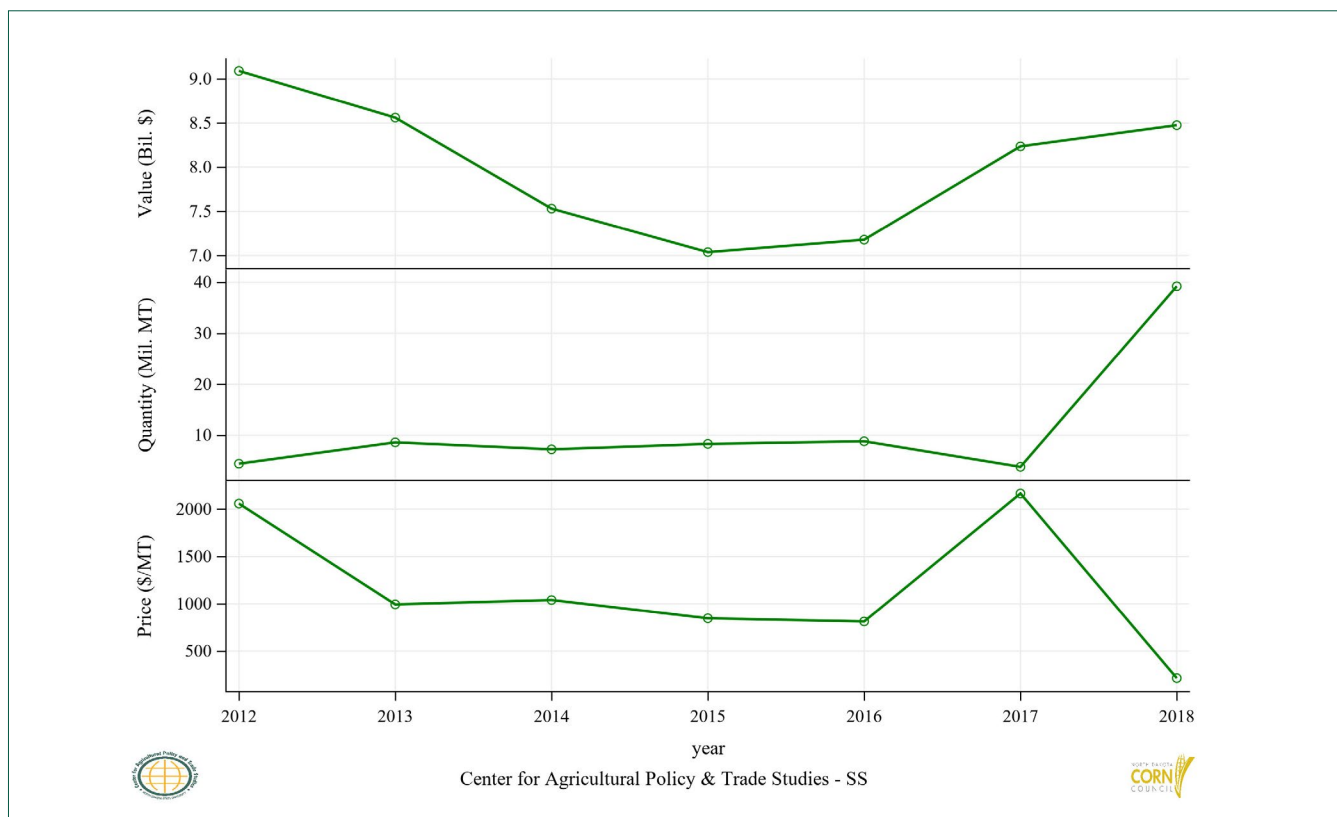


Figure 3: Global Corn Residue (BWC) Exports, Annual Trends

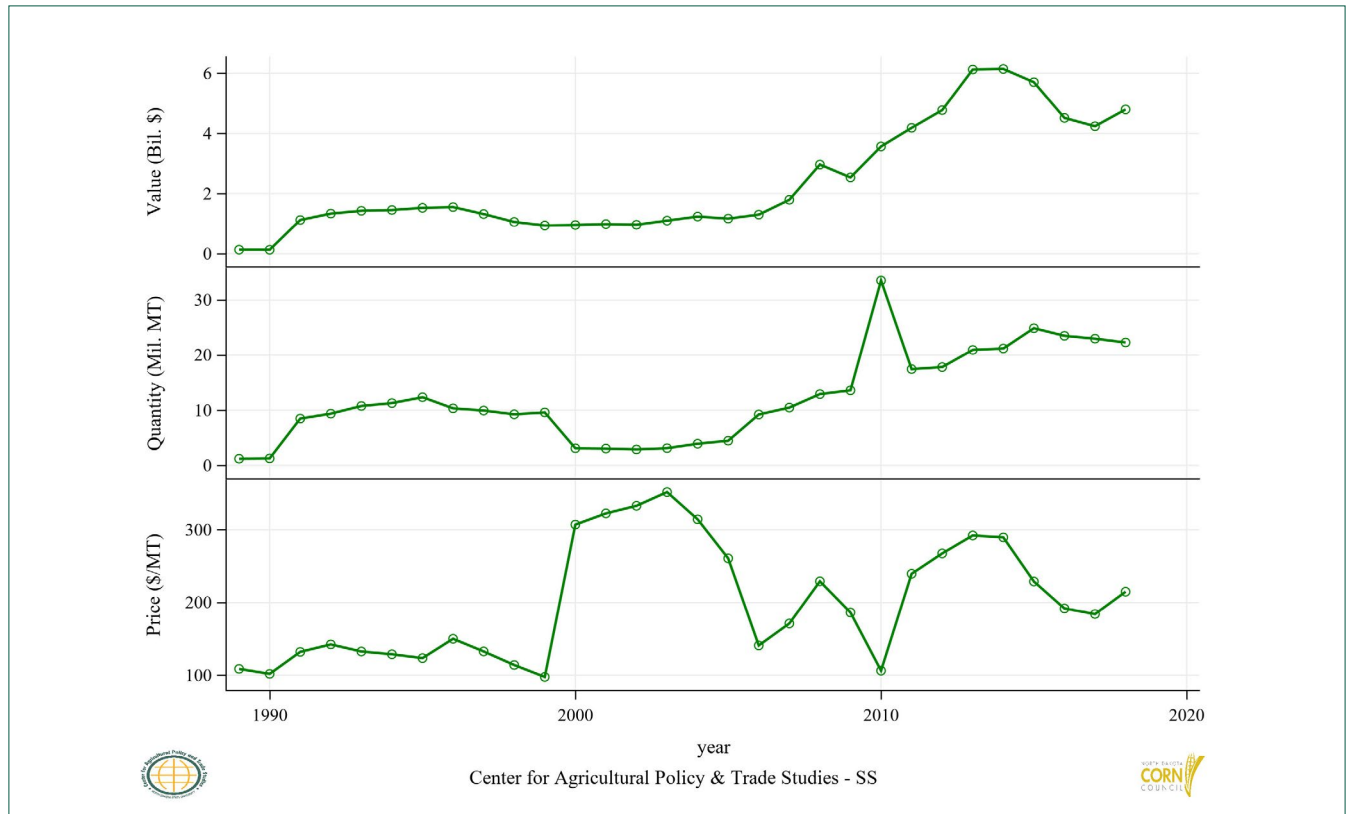


Figure 4: Global Corn Flour (GHS) Exports, Annual Trends

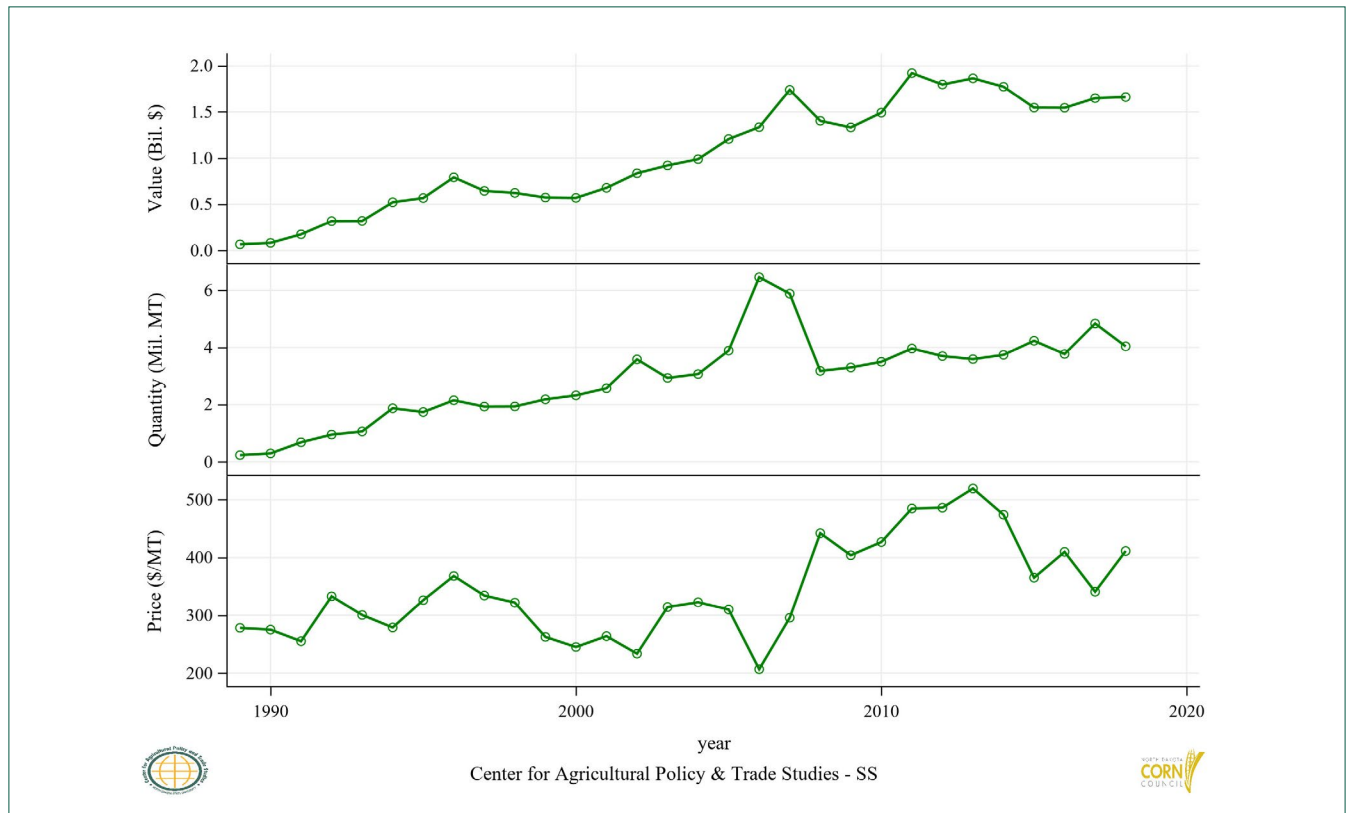


Figure 5: Global Glucose and Fructose Exports, Annual Trends

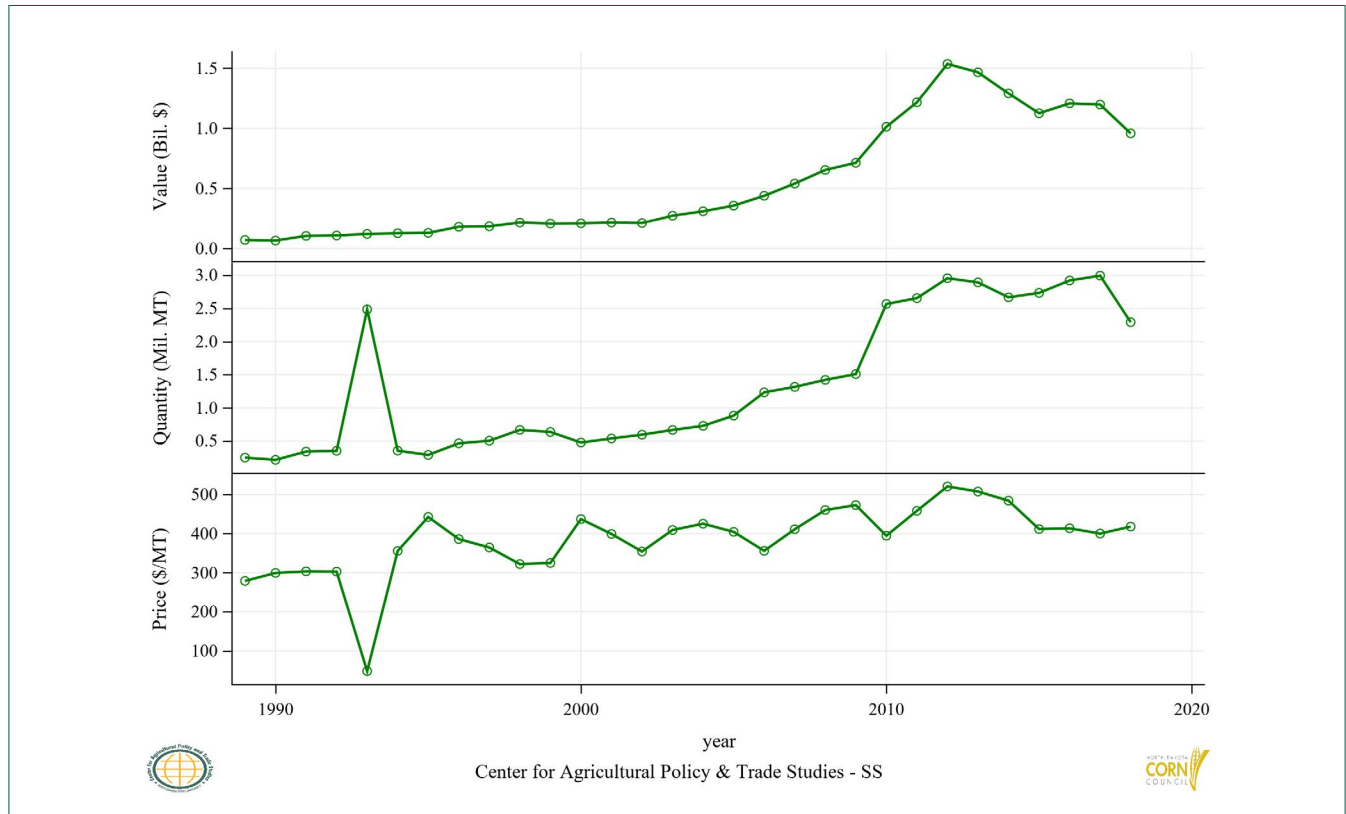


Figure 6: Global Corn Oil (CR) Exports, Annual Trends

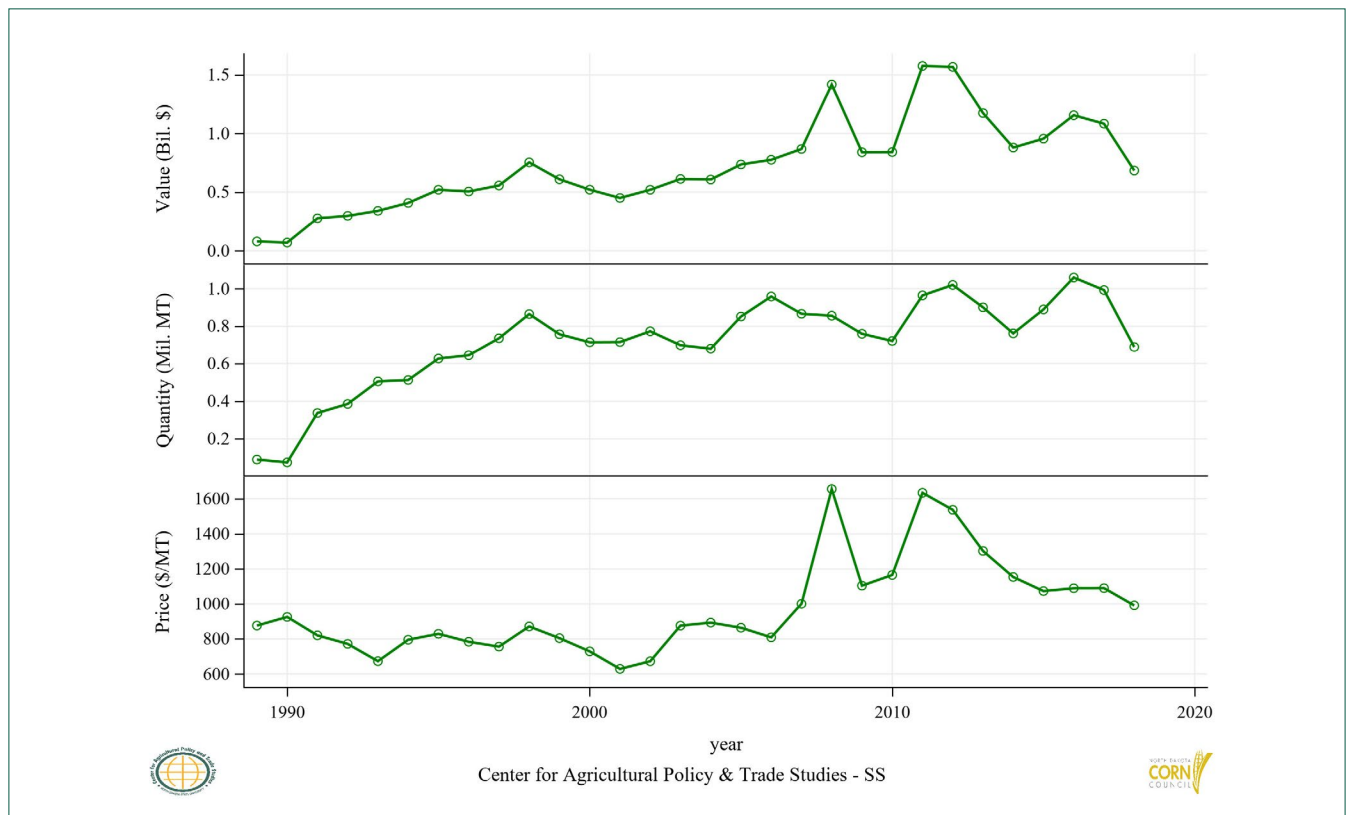


Figure 7: Global Export Share of Corn Products, 2014-2018

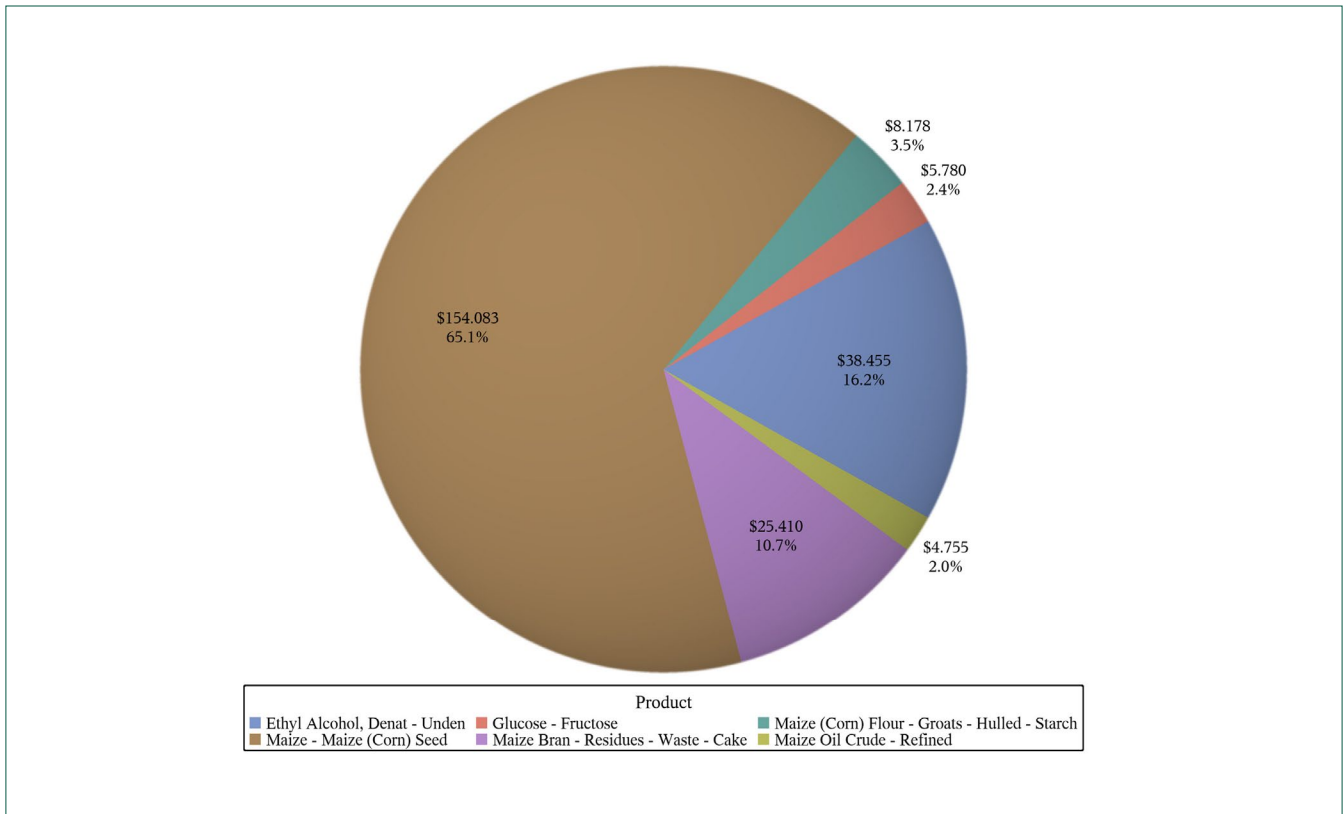


Figure 8: Global Export Value of Corn Products, Annual Trends

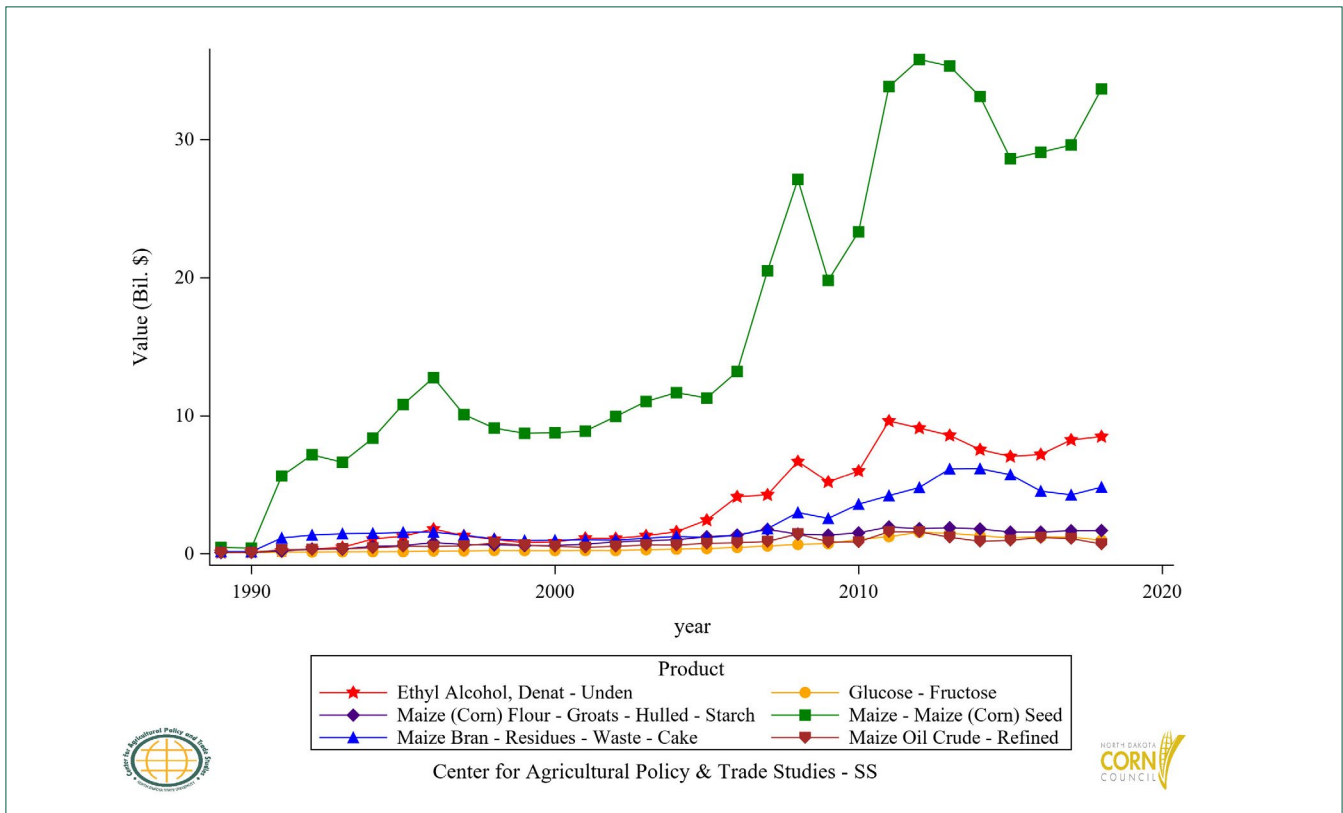


Figure 9: Global Export Quantity of Corn Products, Annual Trends

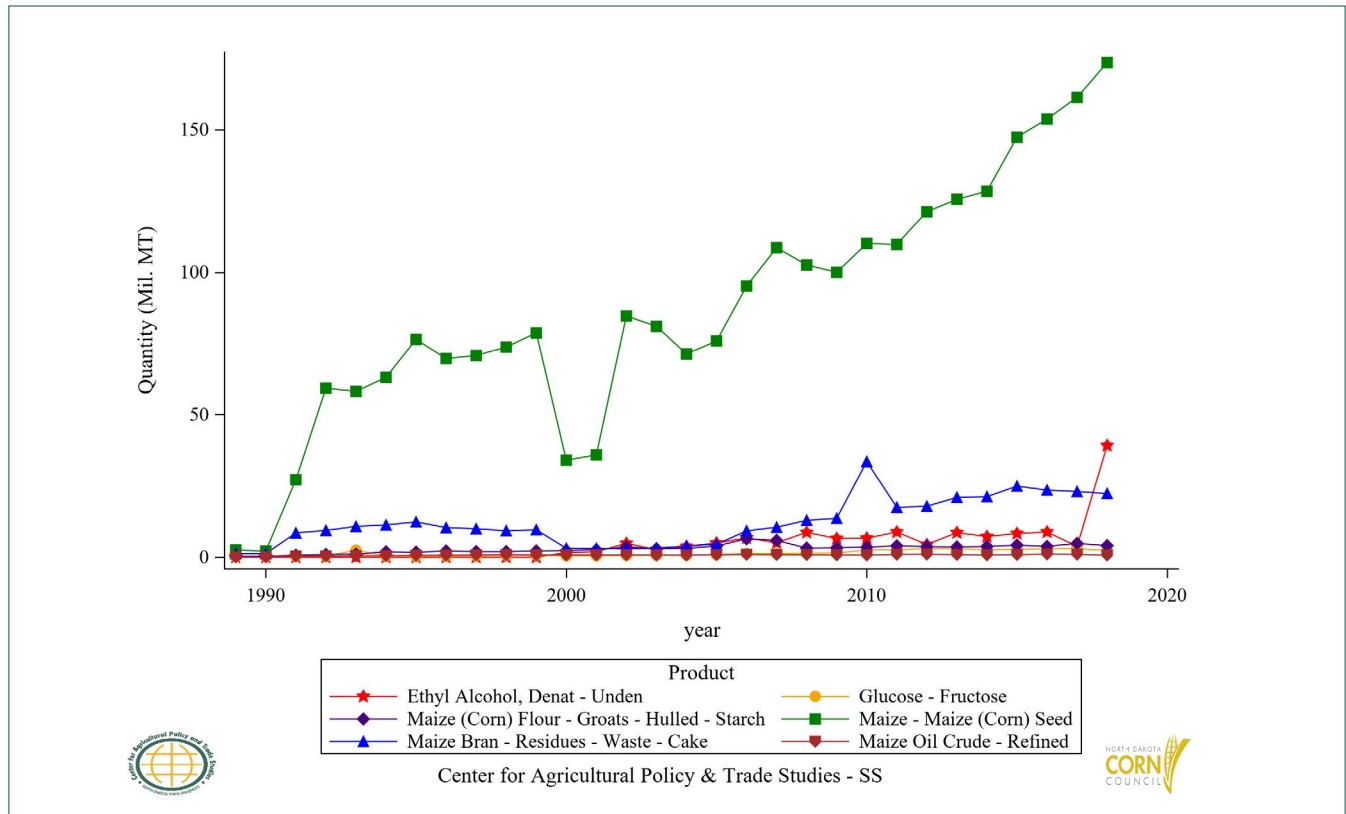
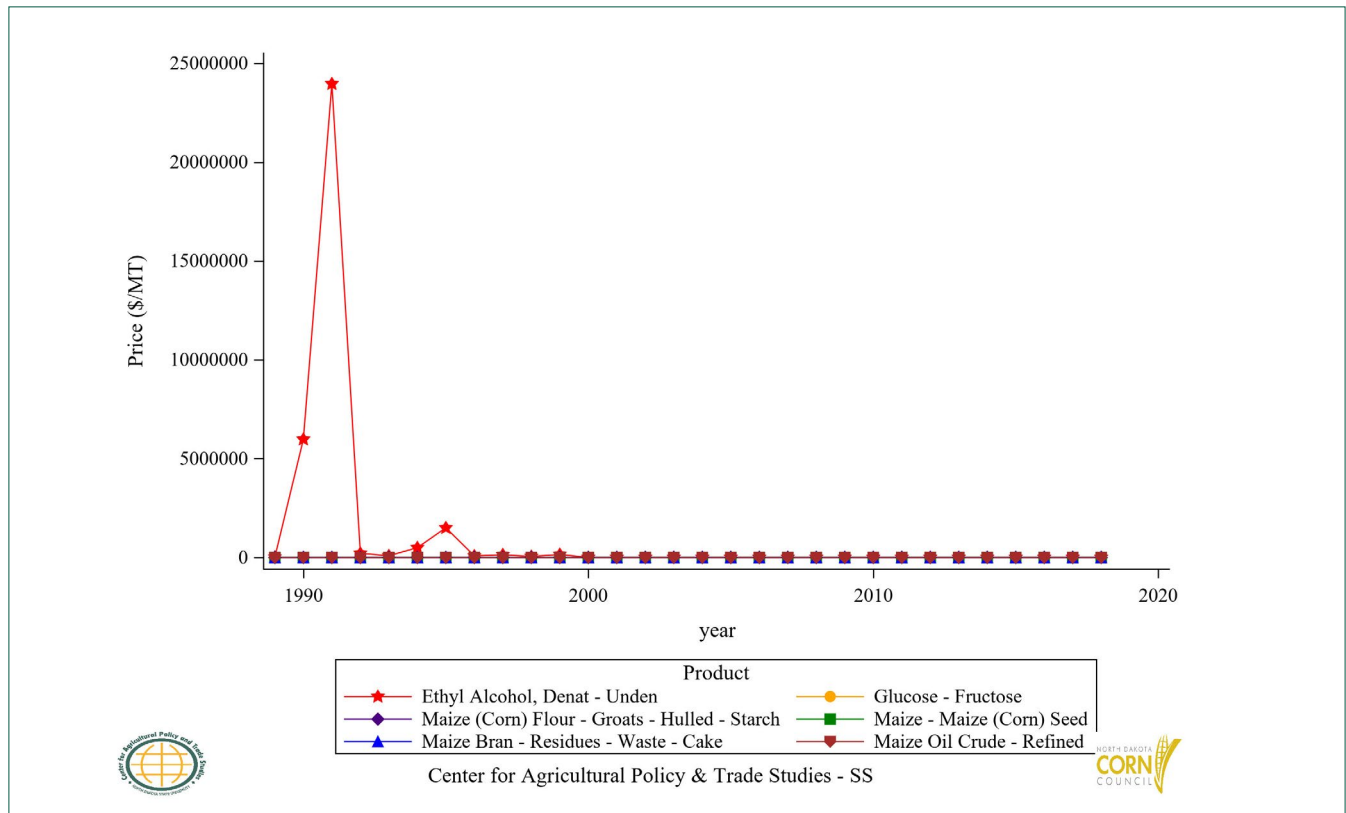


Figure 10: Global Export Price of Corn Products, Annual Trends



■ Section II

Global Spatial Corn Export

Figure 11: Top 5 Countries Corn and Seed Export Value, Annual Trends

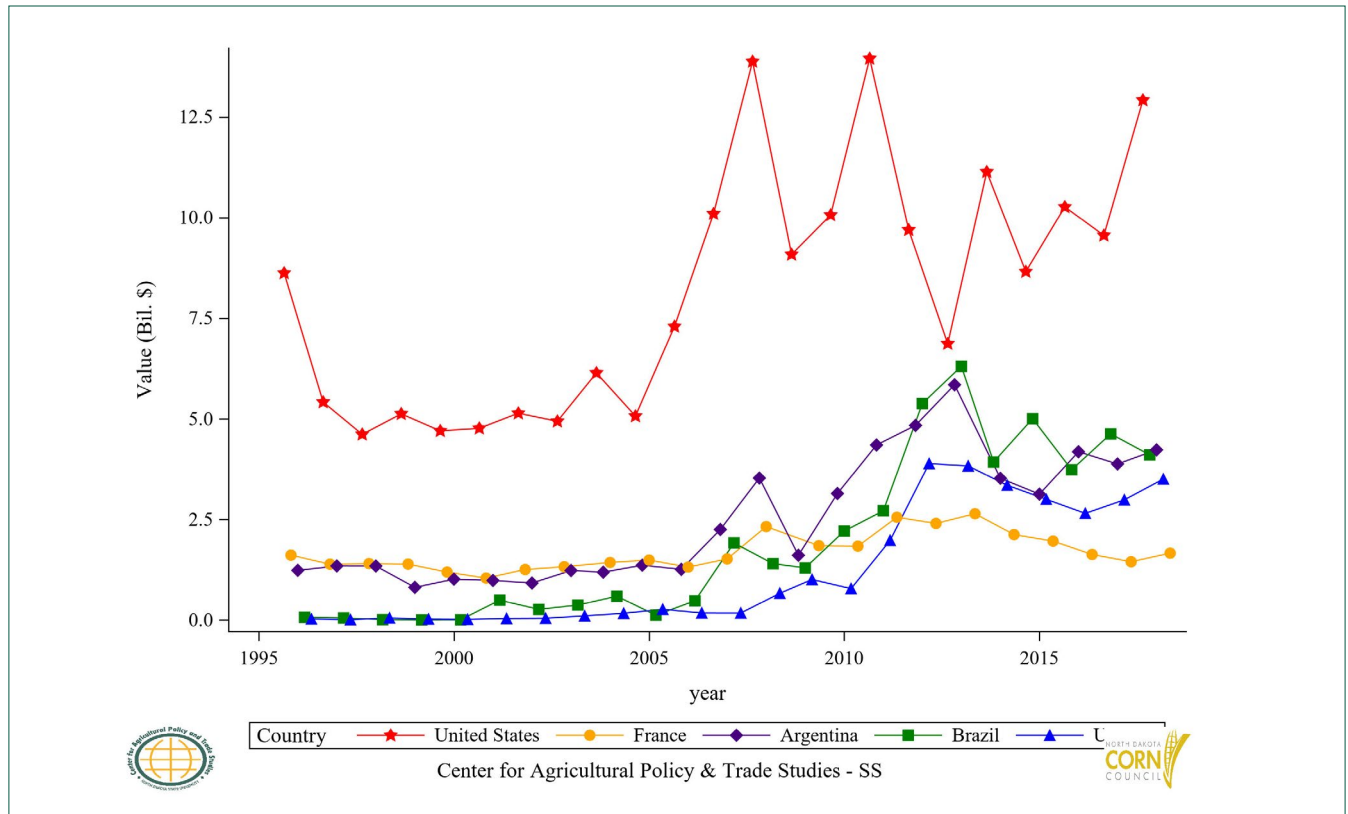


Figure 12: Top 6 to 10 Countries Corn and Seed Export Value, Annual Trends

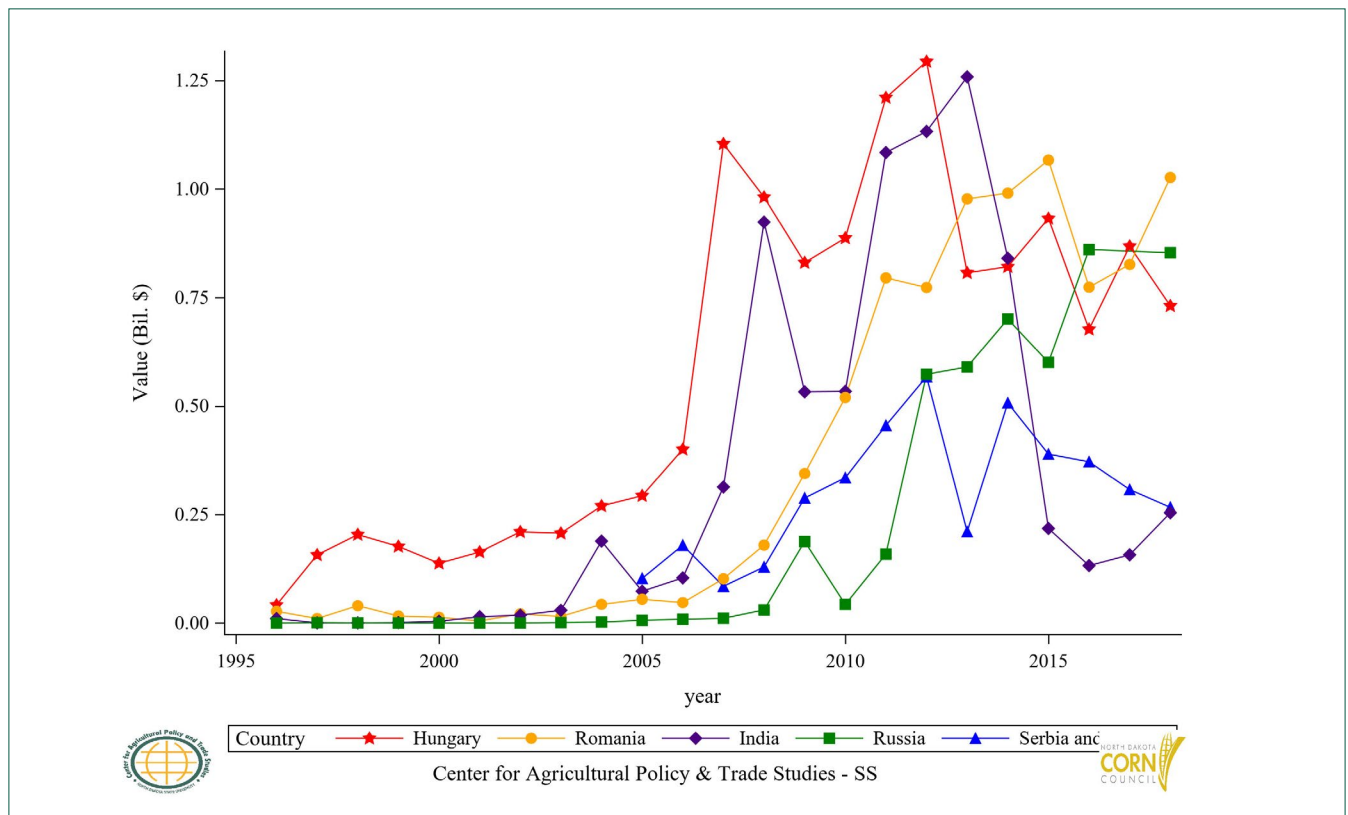


Figure 13: Top 11 to 15 Countries Corn and Seed Export Value, Annual Trends

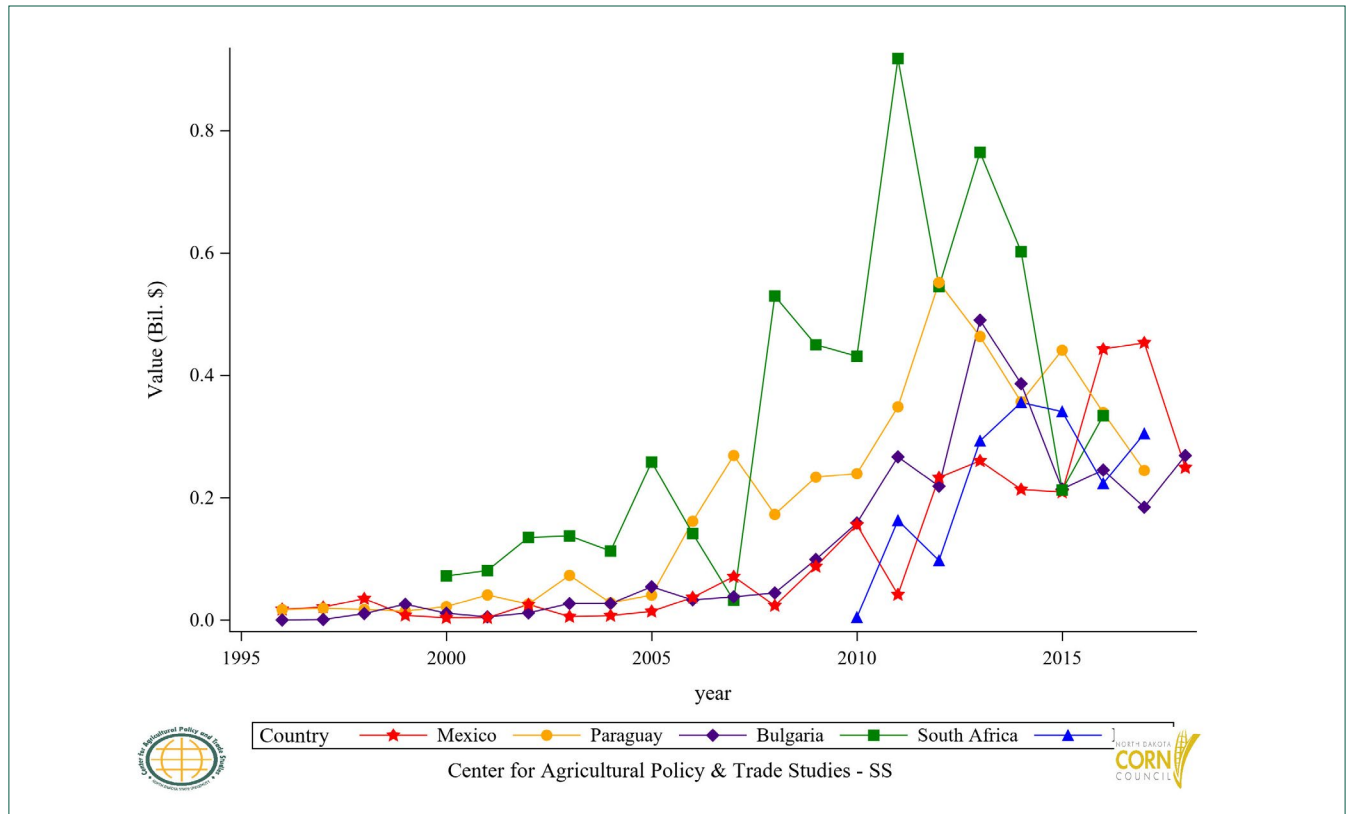


Figure 14: Top 5 Countries Ethyl Alcohol Export Value, Annual Trends

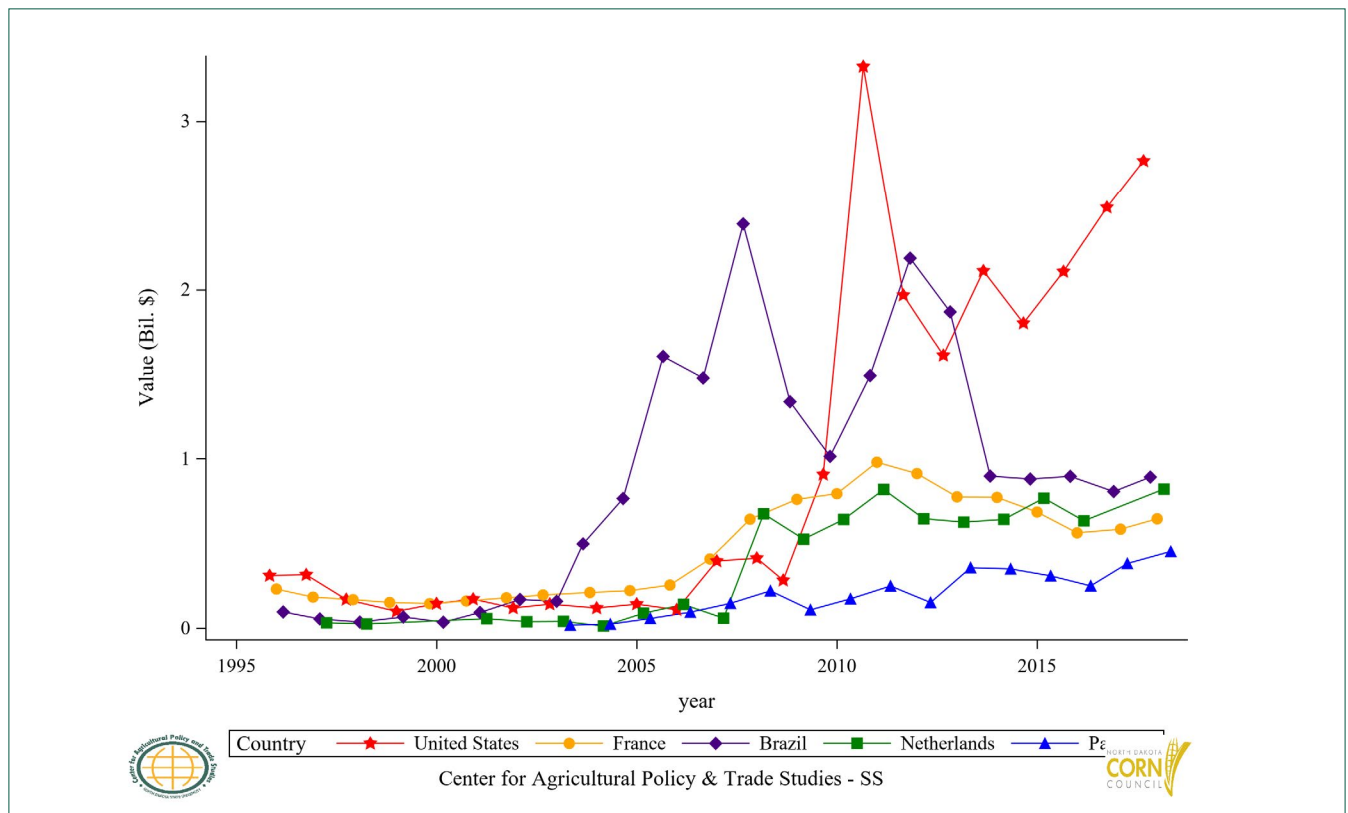


Figure 15: Top 6 to 10 Countries Ethyl Alcohol Export Value, Annual Trends

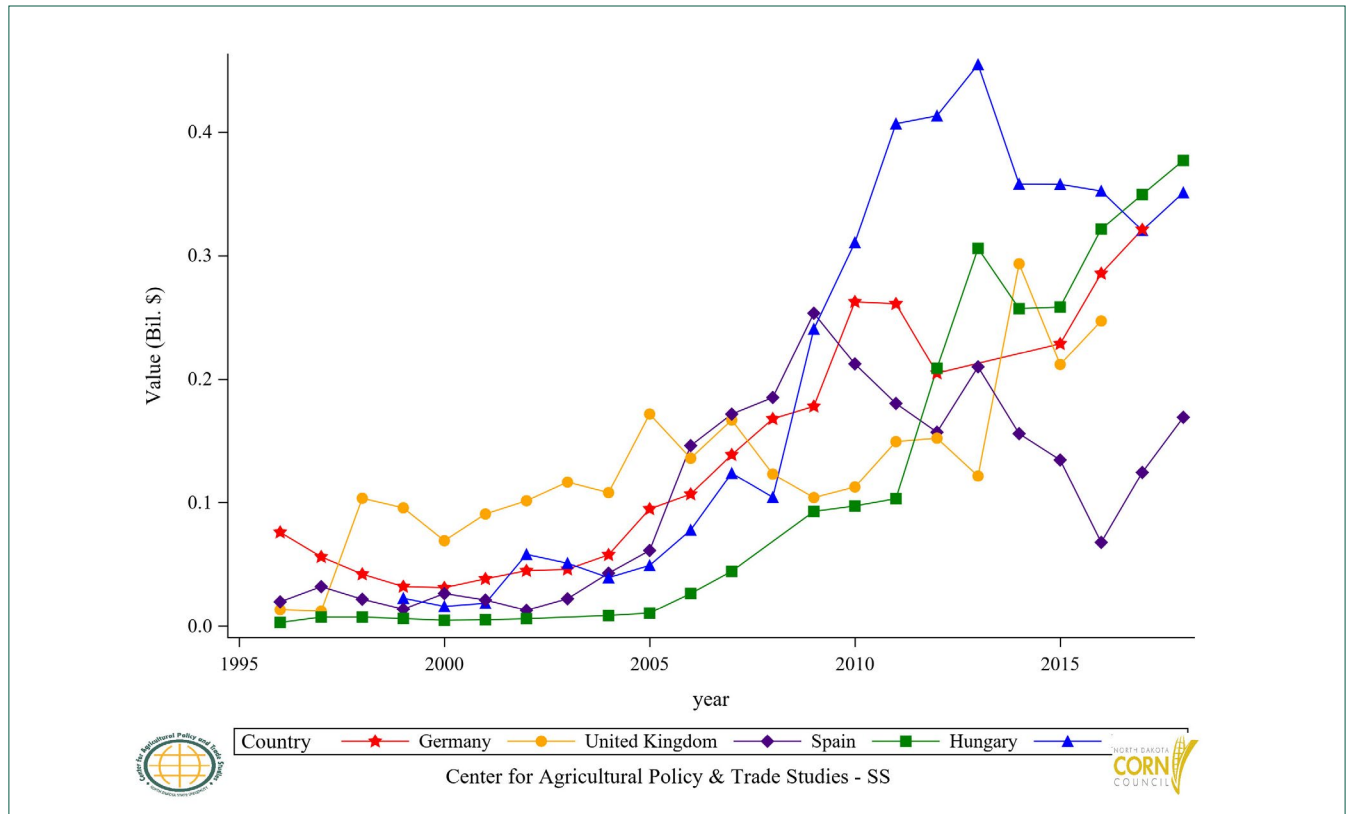


Figure 16: Top 11 to 15 Countries Ethyl Alcohol Export Value, Annual Trends

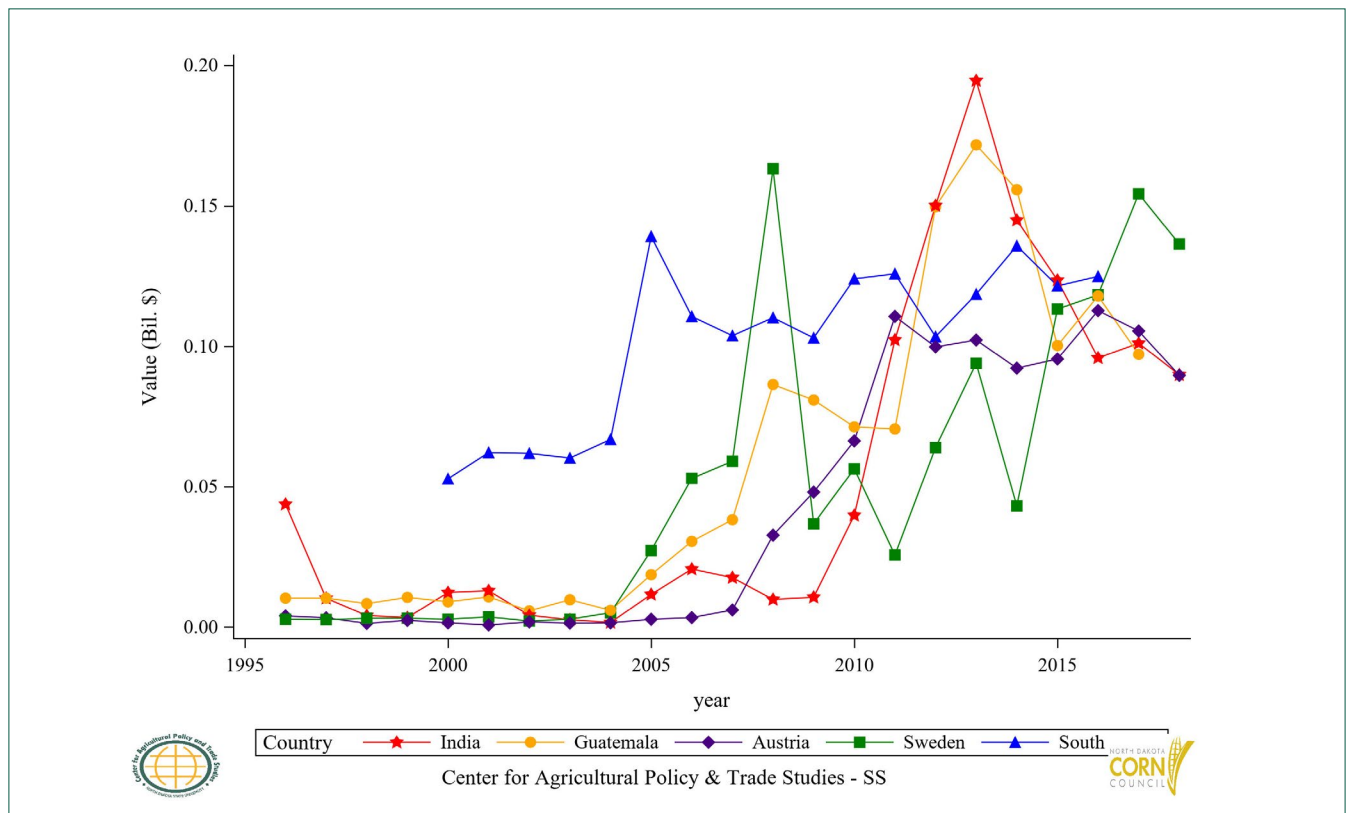


Figure 17: Top 5 Countries Corn Residue (BWC) Export Value, Annual Trends

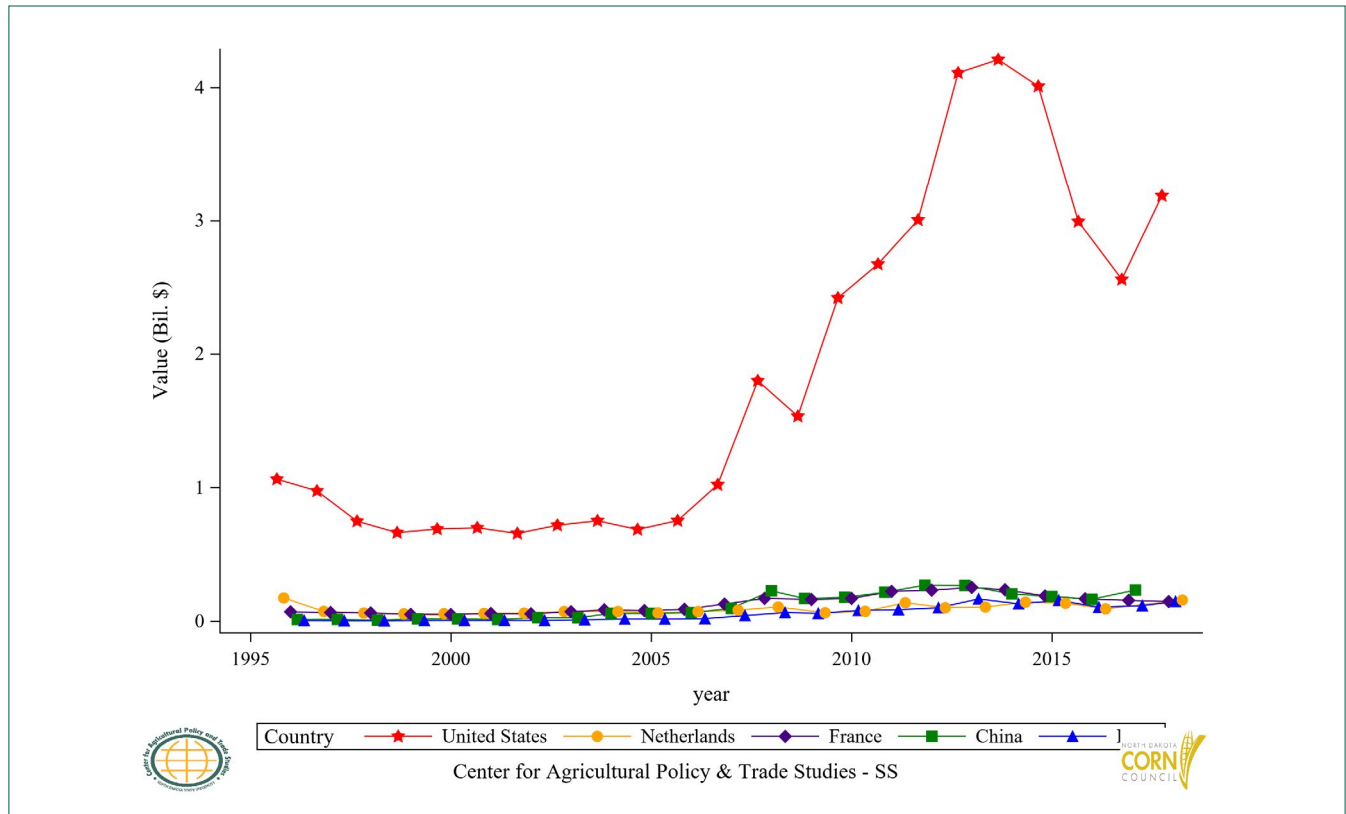


Figure 18: Top 6 to 10 Countries Corn Residue (BWC) Export Value, Annual Trends

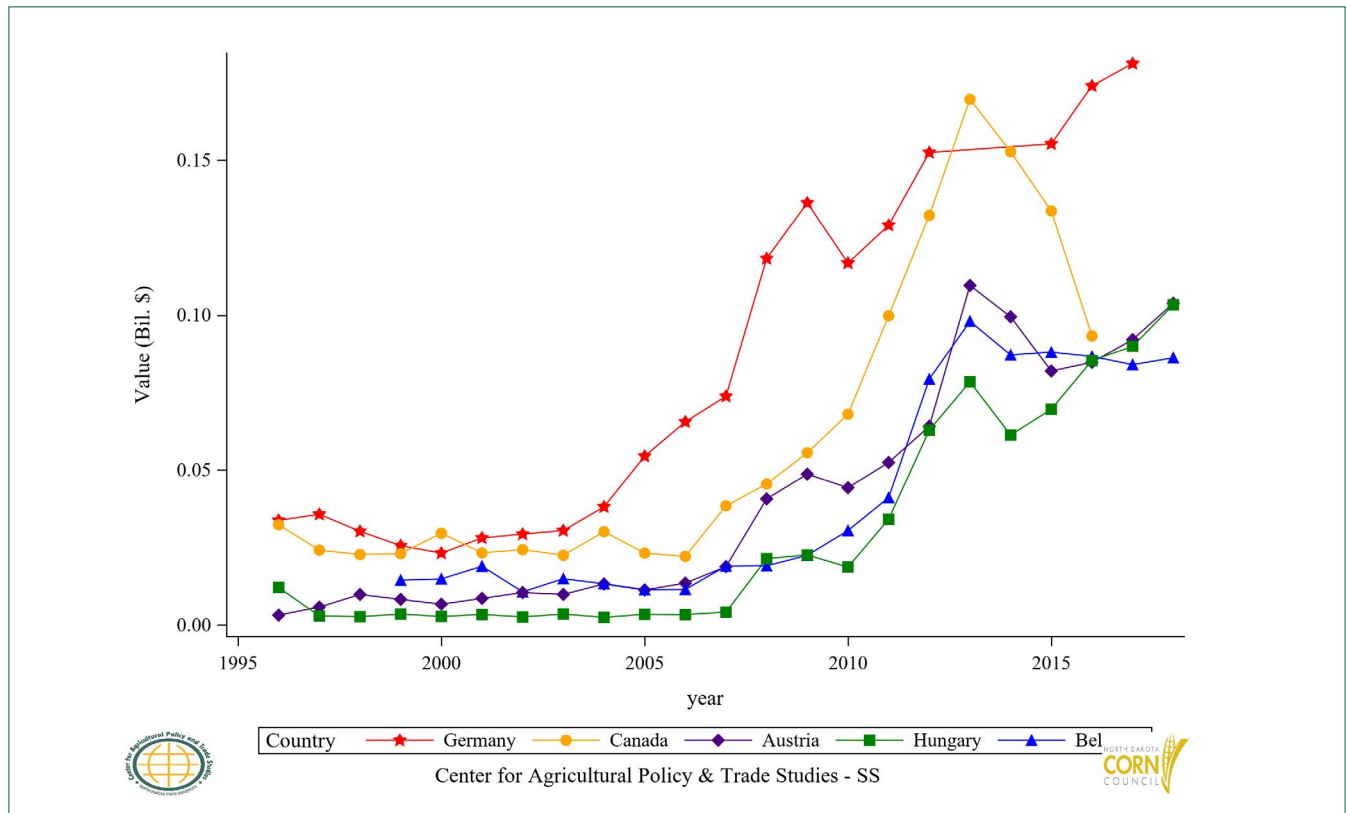


Figure 19: Top 11 to 15 Countries Corn Residue (BWC) Export Value, Annual Trends

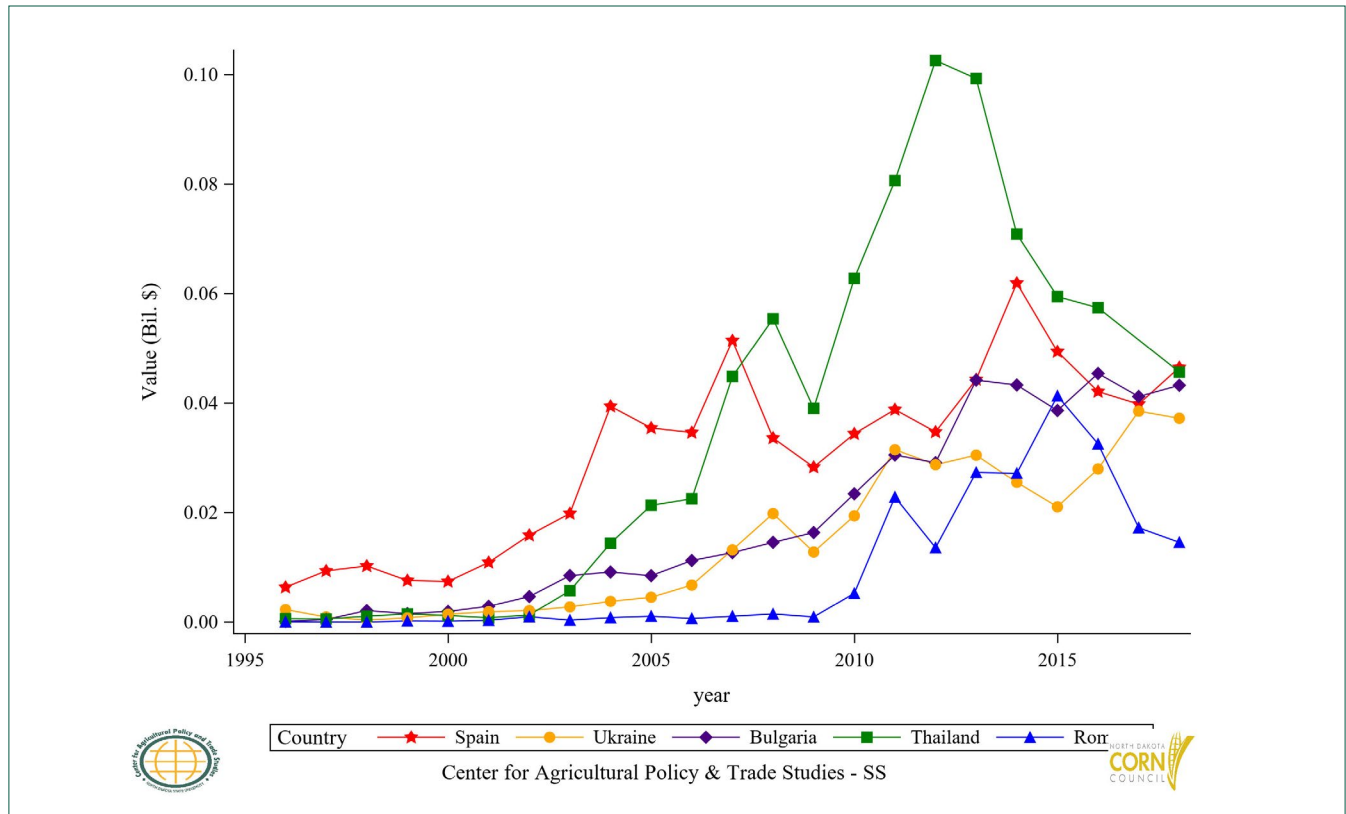


Figure 20: Top 5 Countries Corn Flour (GHS) Export Value, Annual Trends

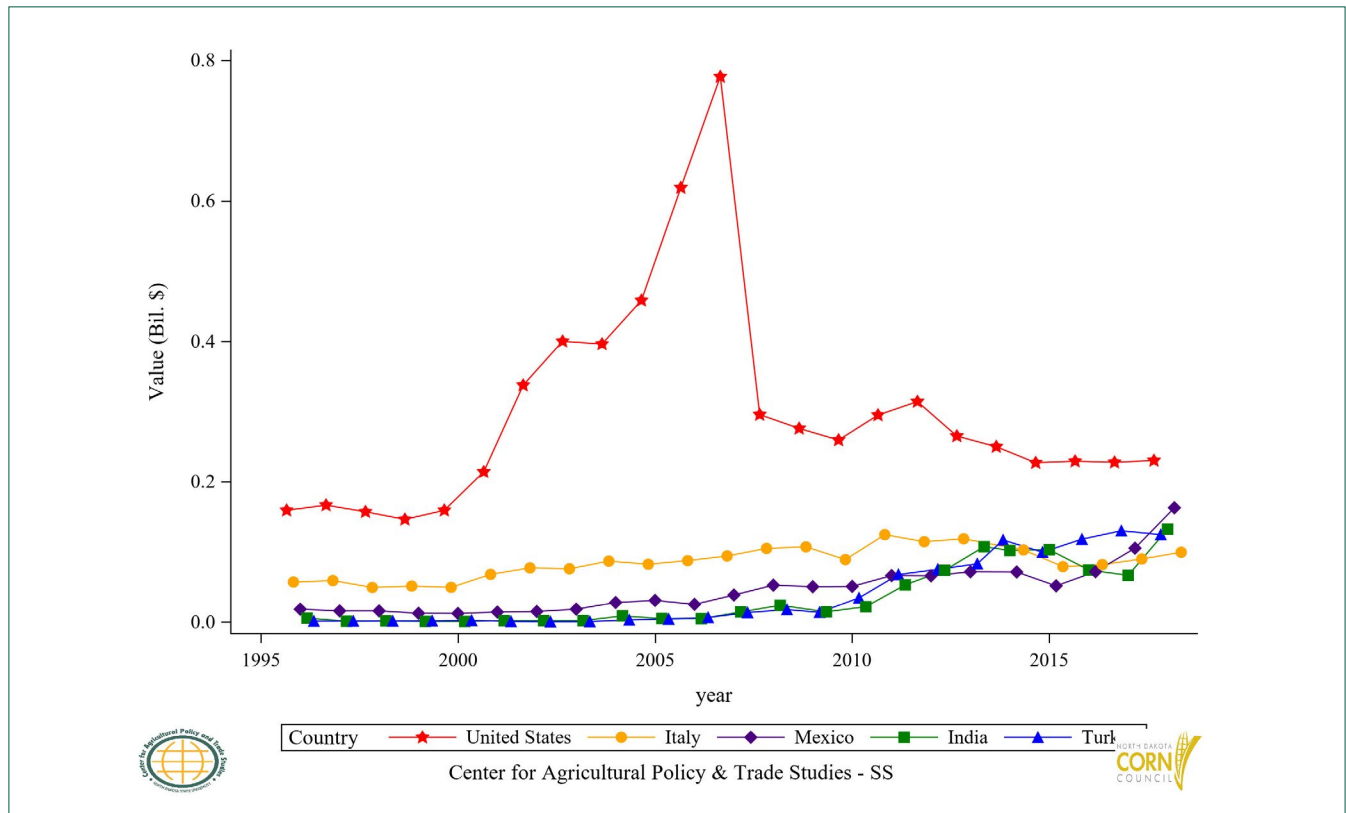


Figure 21: Top 6 to 10 Countries Corn Flour (GHS) Export Value, Annual Trends

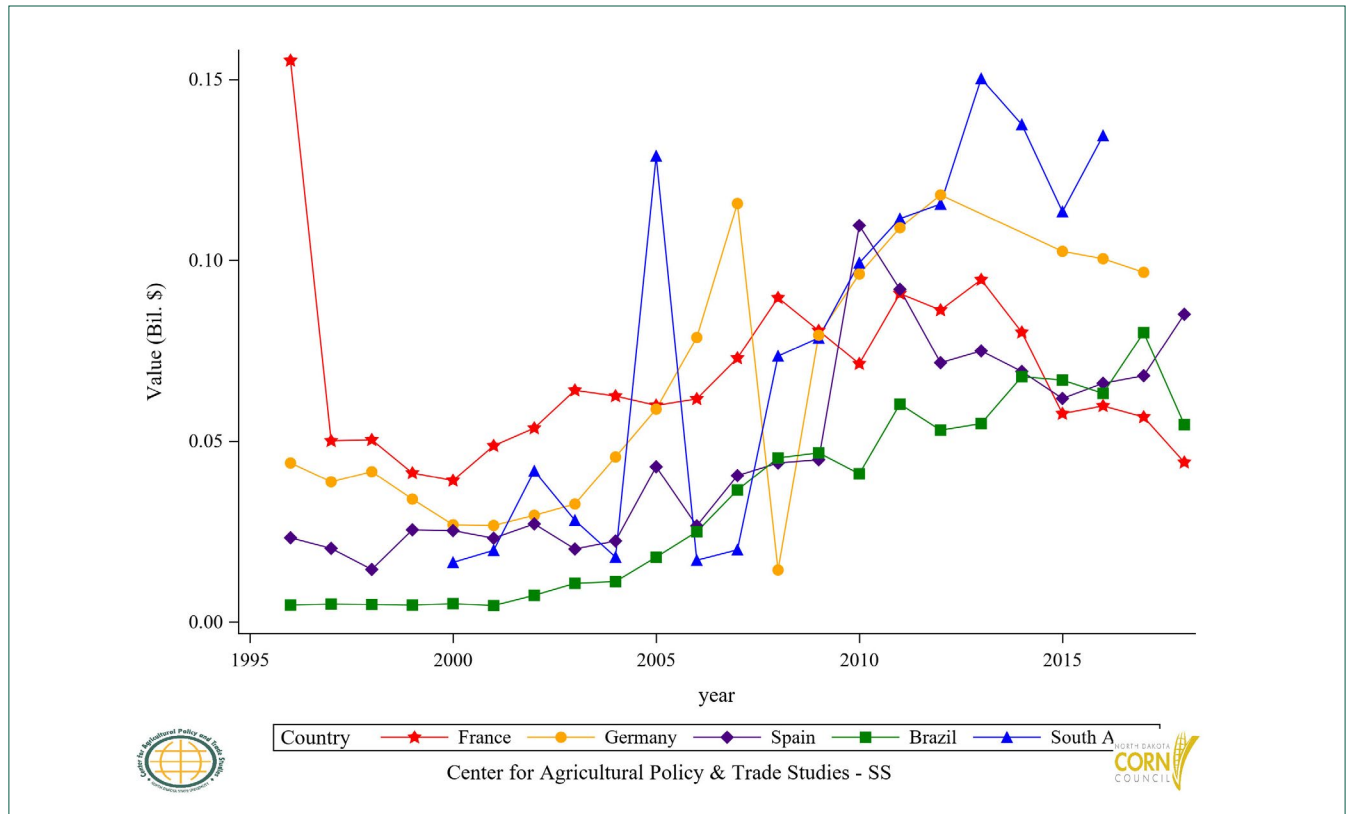


Figure 22: Top 11 to 15 Countries Corn Flour (GHS) Export Value, Annual Trends

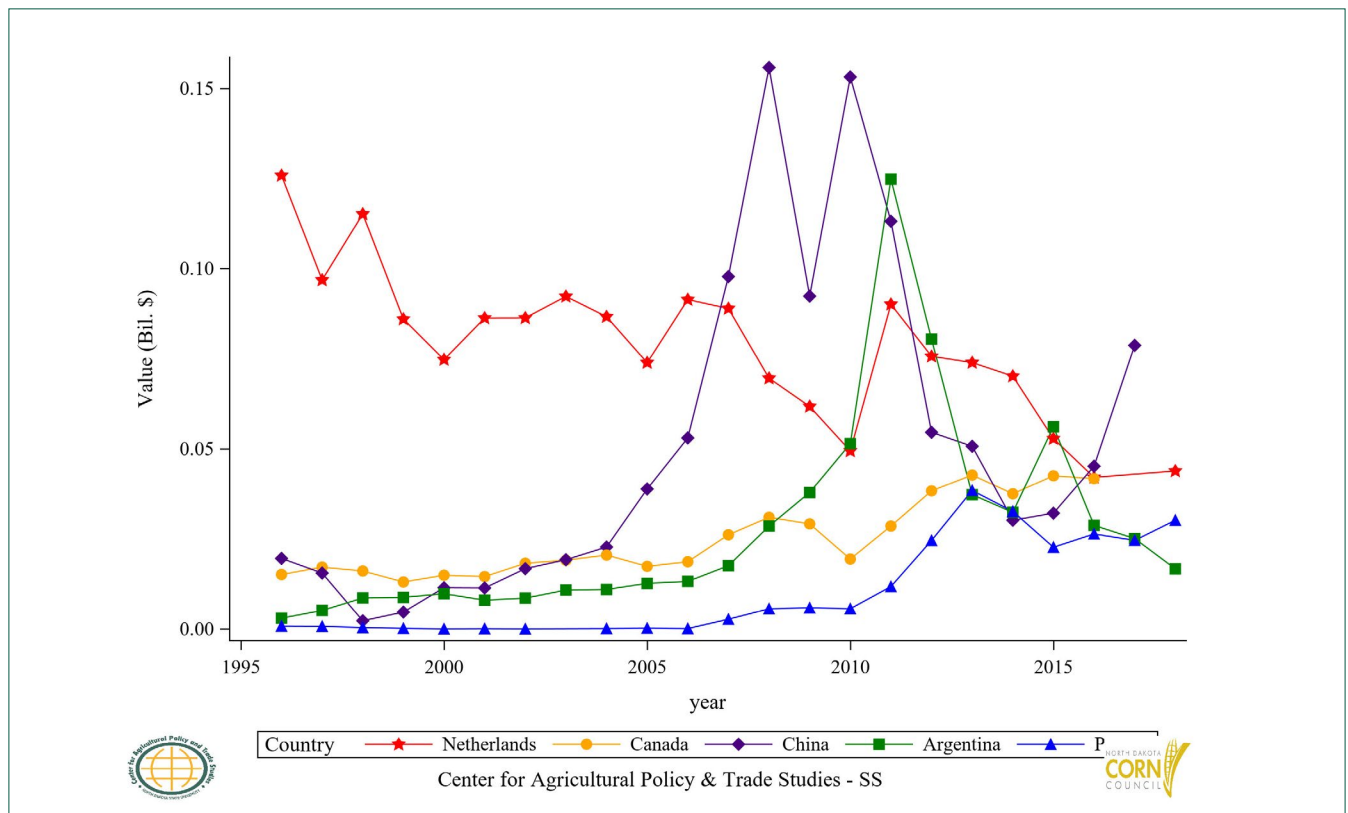


Figure 23: Top 5 Countries Glucose and Fructose Export Value, Annual Trends

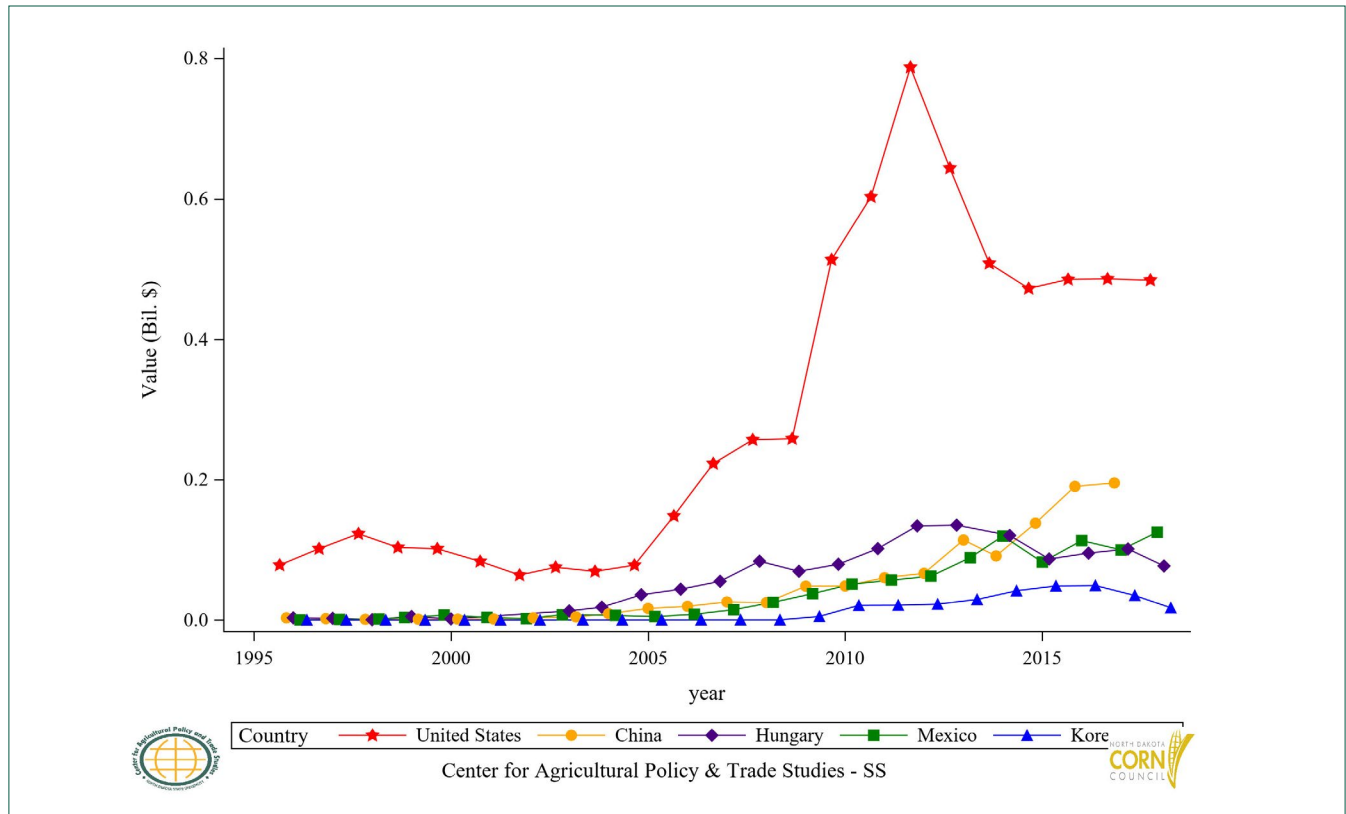


Figure 24: Top 6 to 10 Countries Glucose and Fructose Export Value, Annual Trends

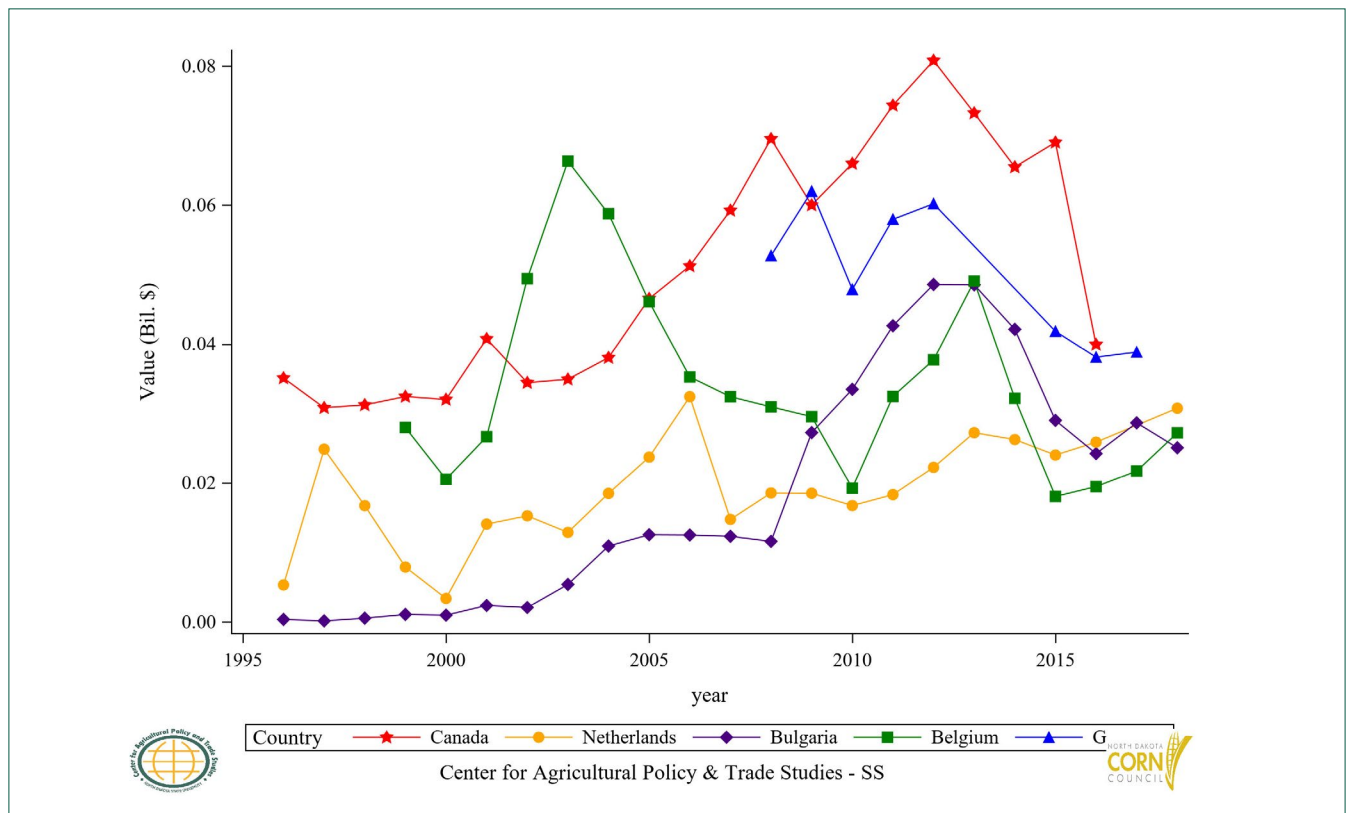


Figure 25: Top 11 to 15 Countries Glucose and Fructose Export Value, Annual Trends

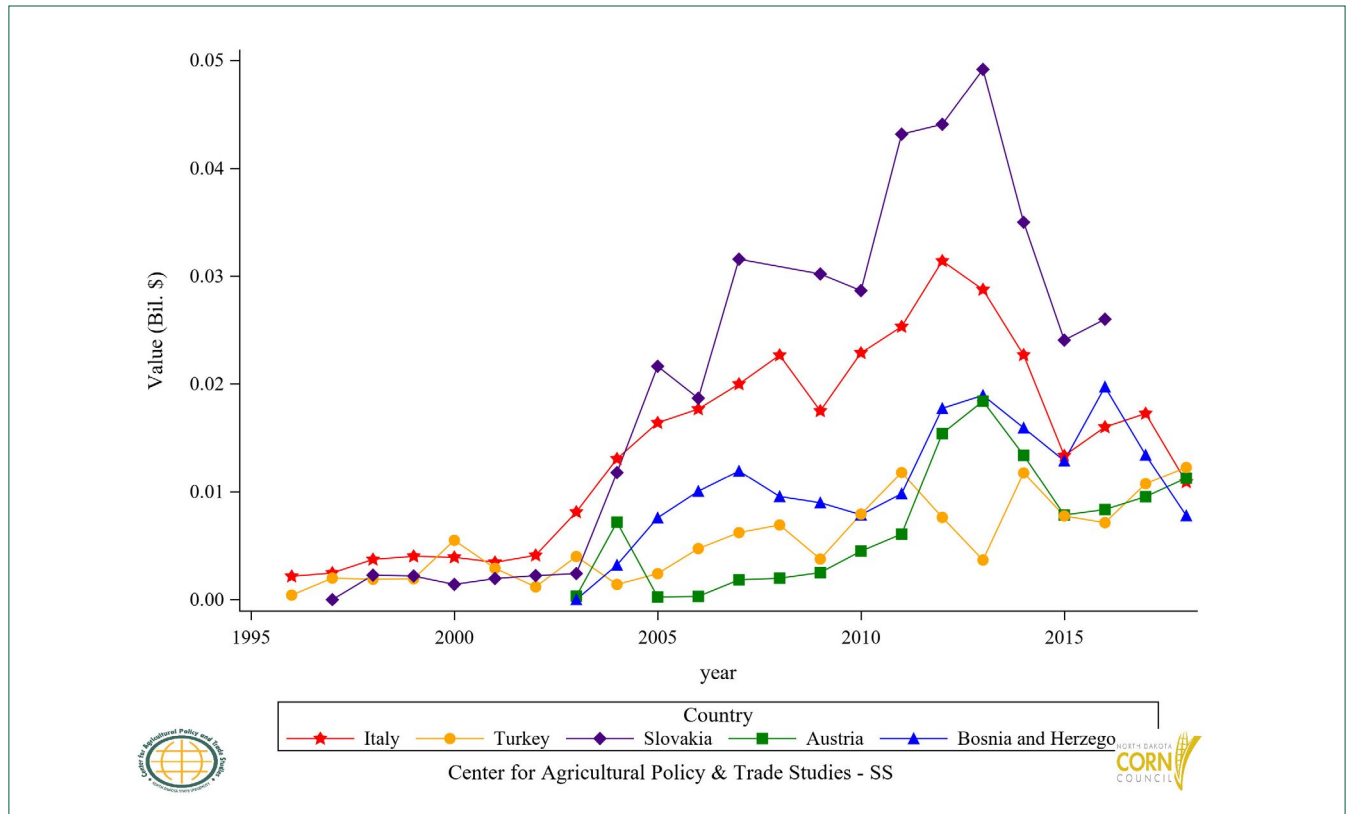


Figure 26: Top 5 Countries Corn Oil (CR) Export Value, Annual Trends

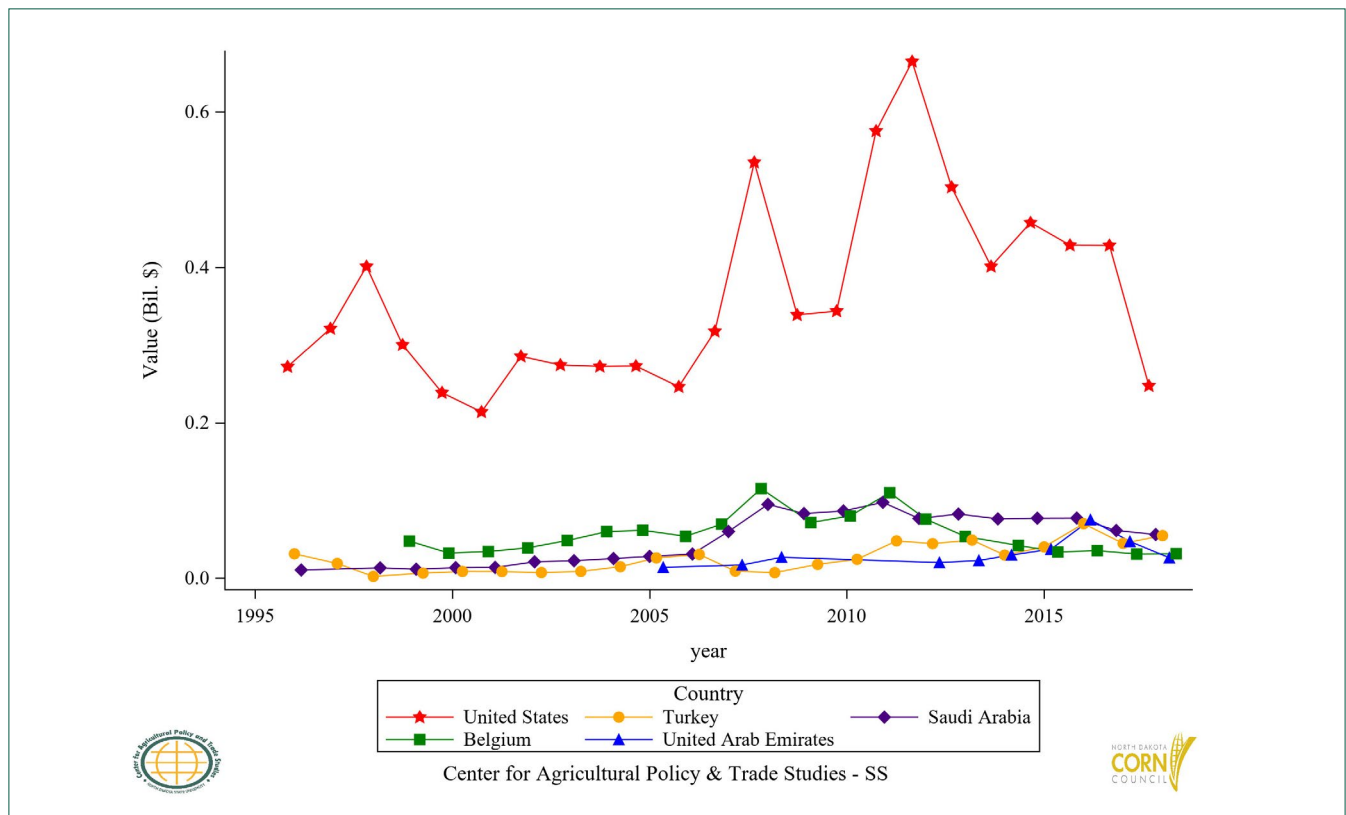


Figure 27: Top 6 to 10 Countries Corn Oil (CR) Export Value, Annual Trends

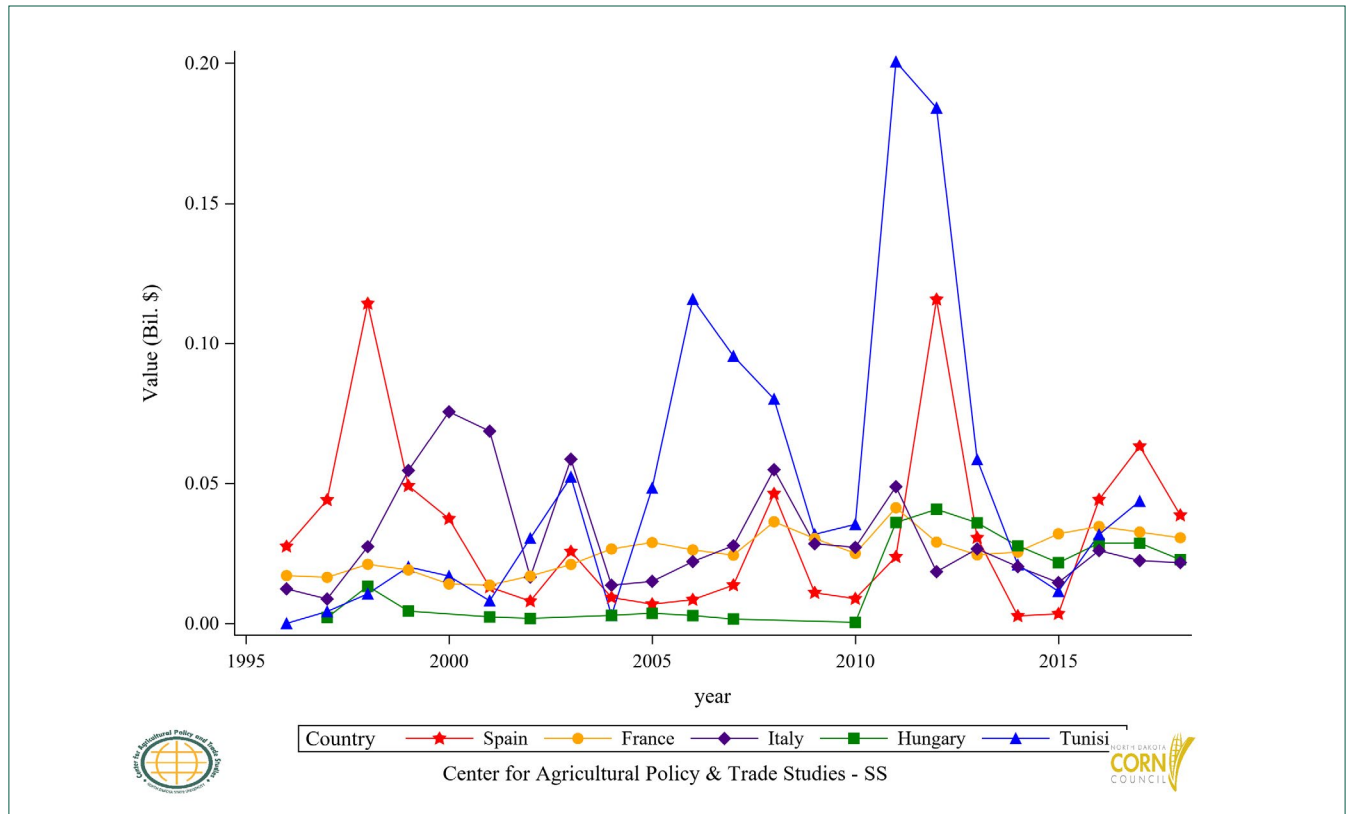
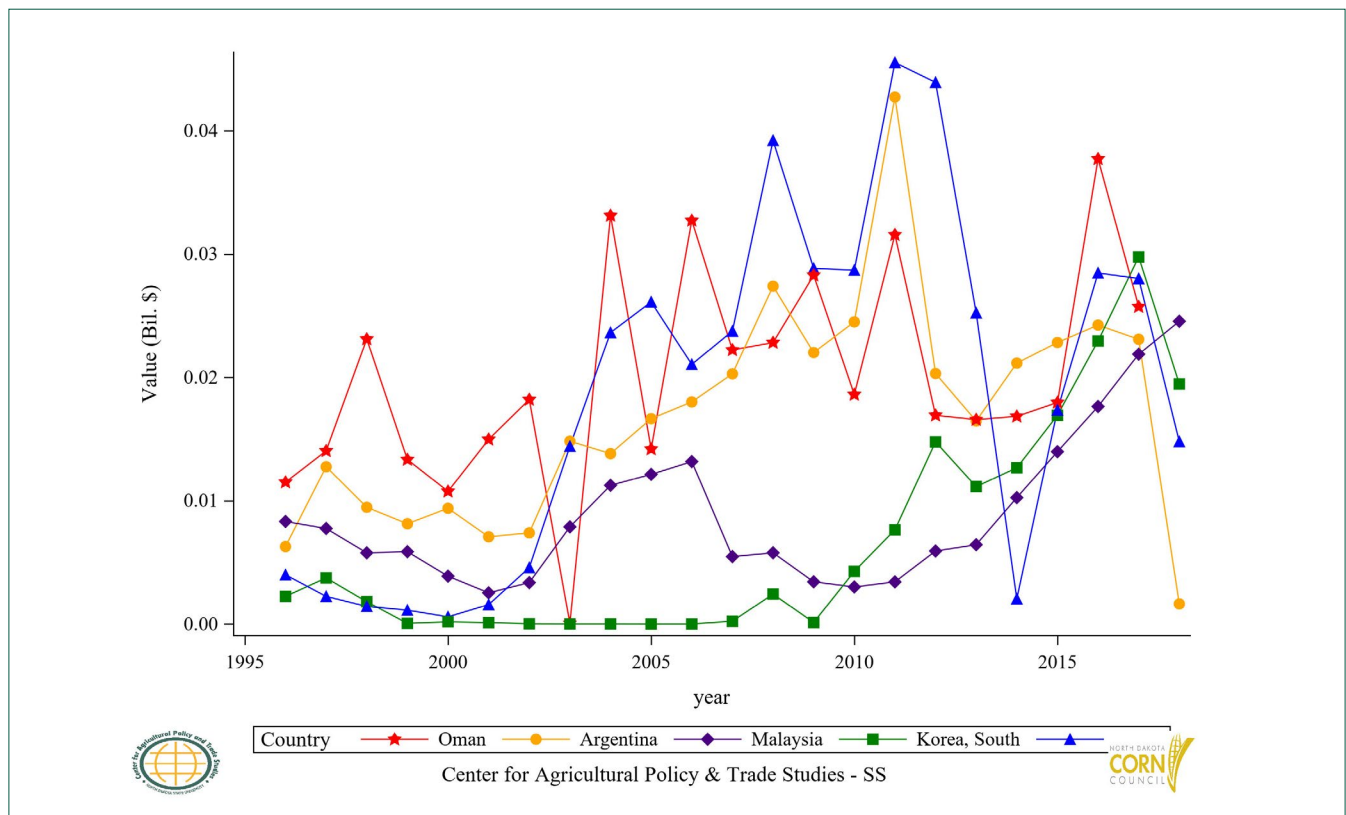


Figure 28: Top 11 to 15 Countries Corn Oil (CR) Export Value, Annual Trends



■ Section III

Global Spatial Corn Import

Figure 29: Top 5 Countries Corn and Seed Import Value, Annual Trends

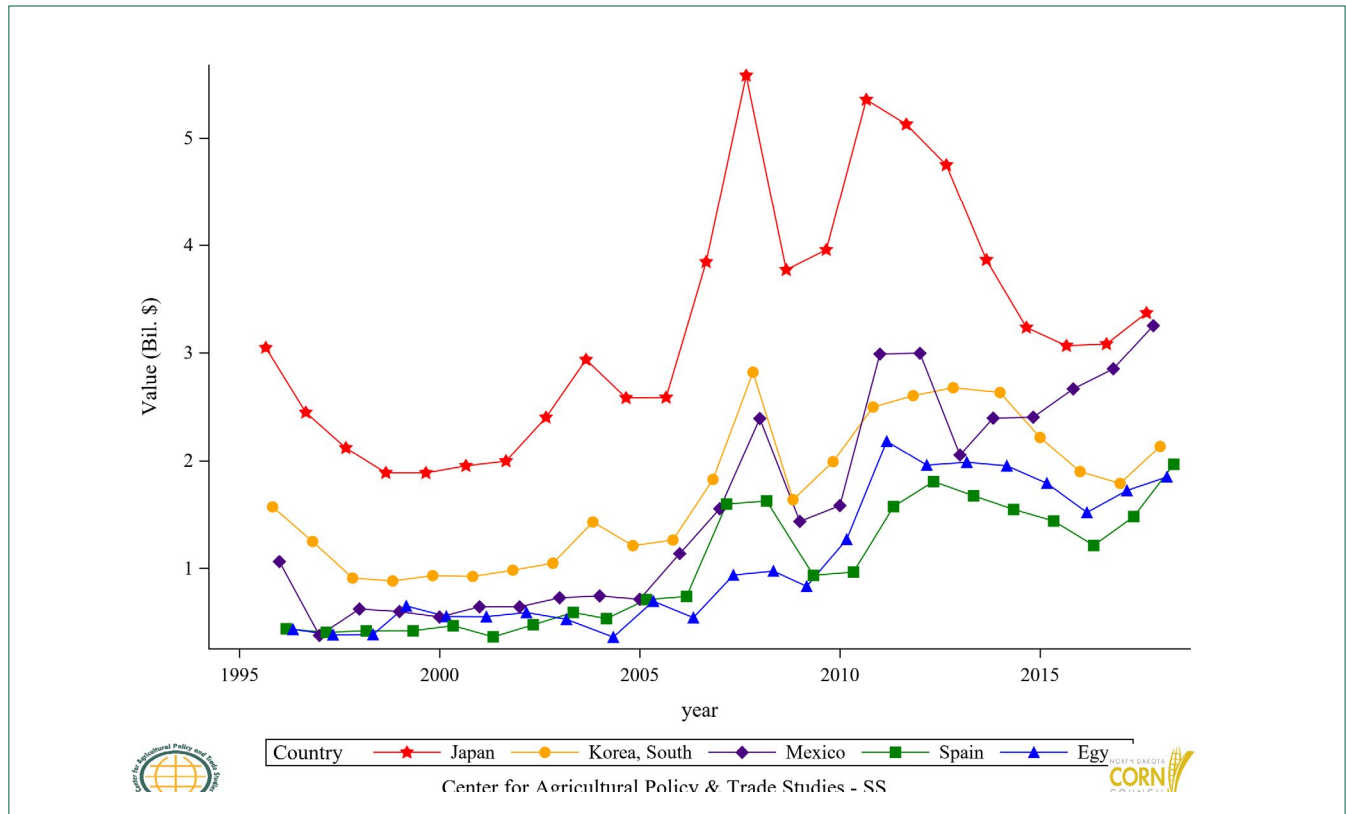


Figure 30: Top 6 to 10 Countries Corn and Seed Import Value, Annual Trends

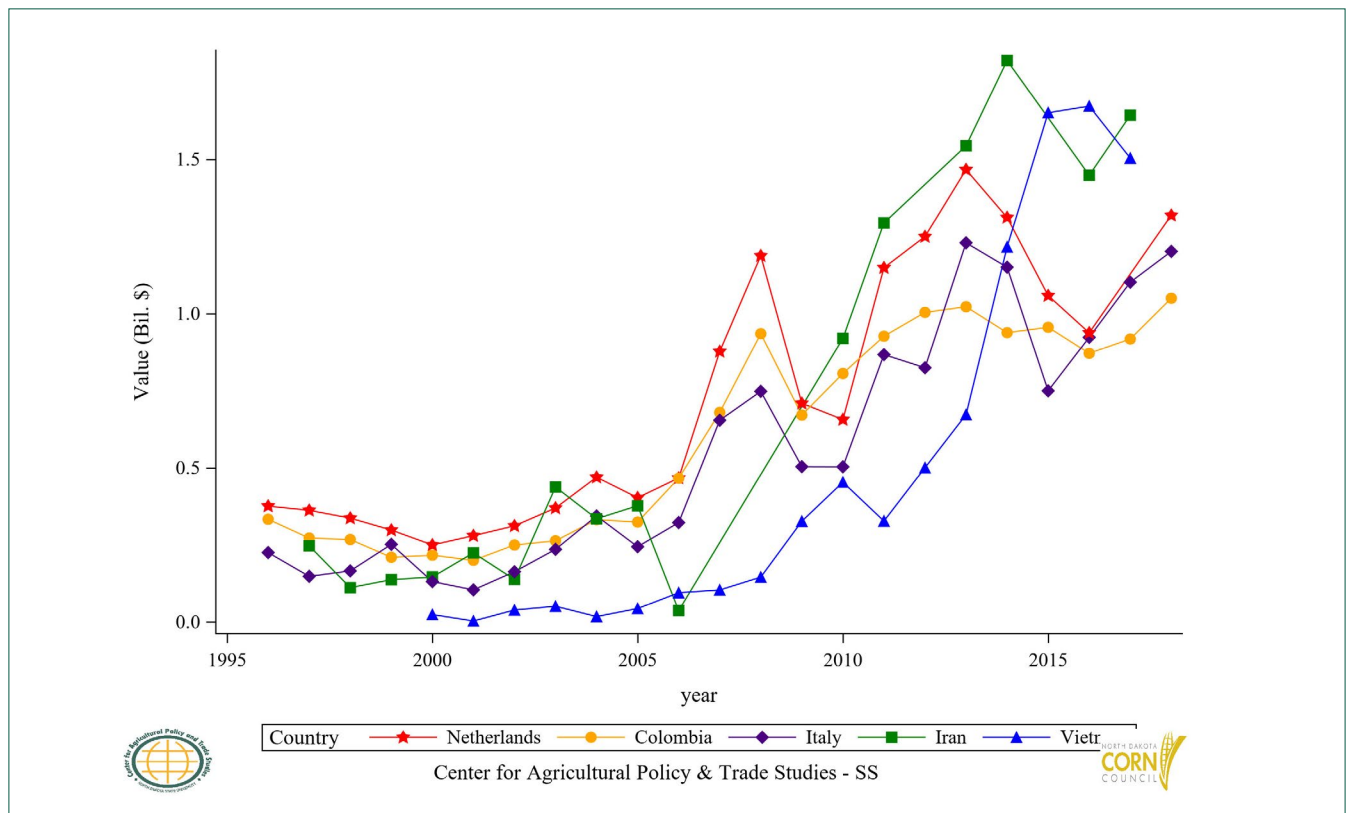


Figure 31: Top 11 to 15 Countries Corn and Seed Import Value, Annual Trends

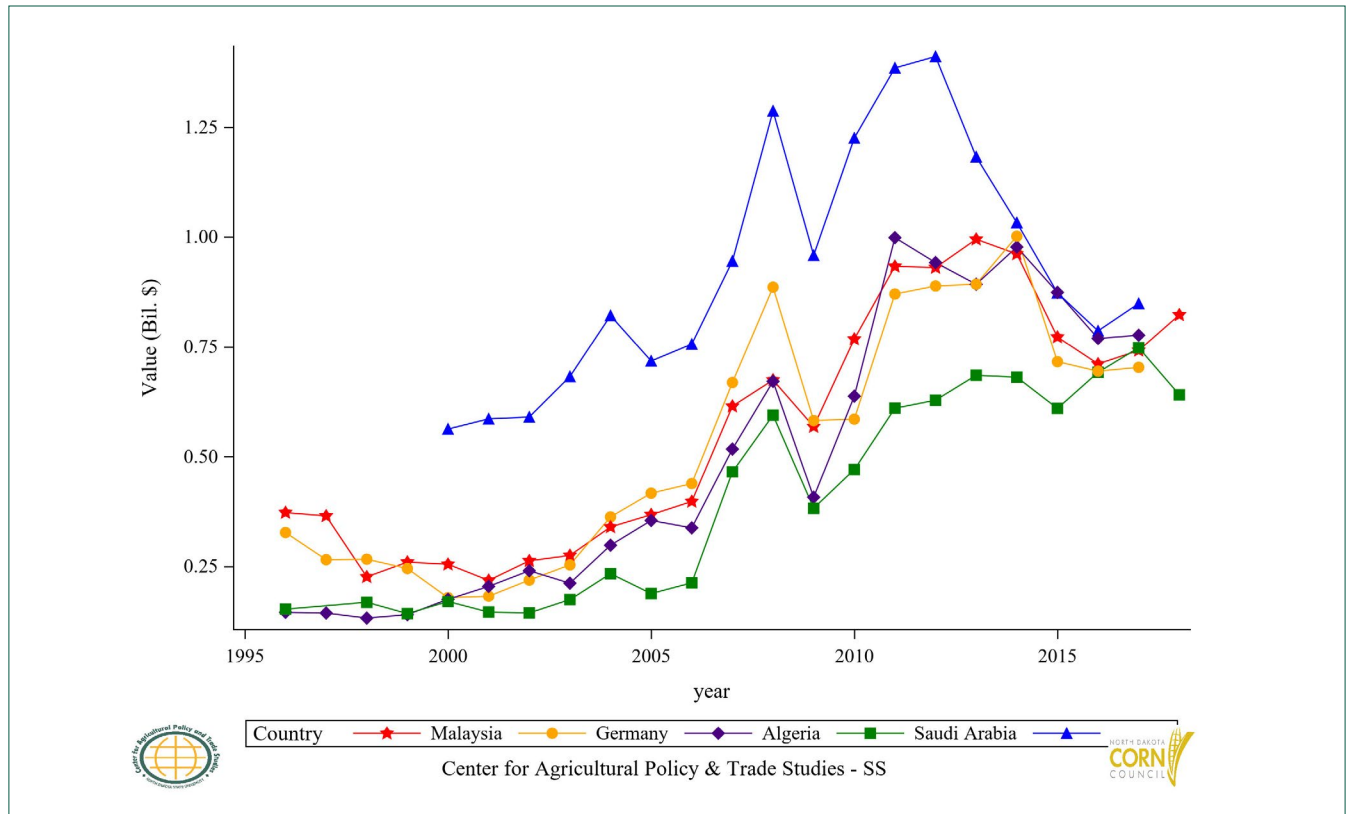


Figure 32: Top 5 Countries Ethyl Alcohol Import Value, Annual Trends

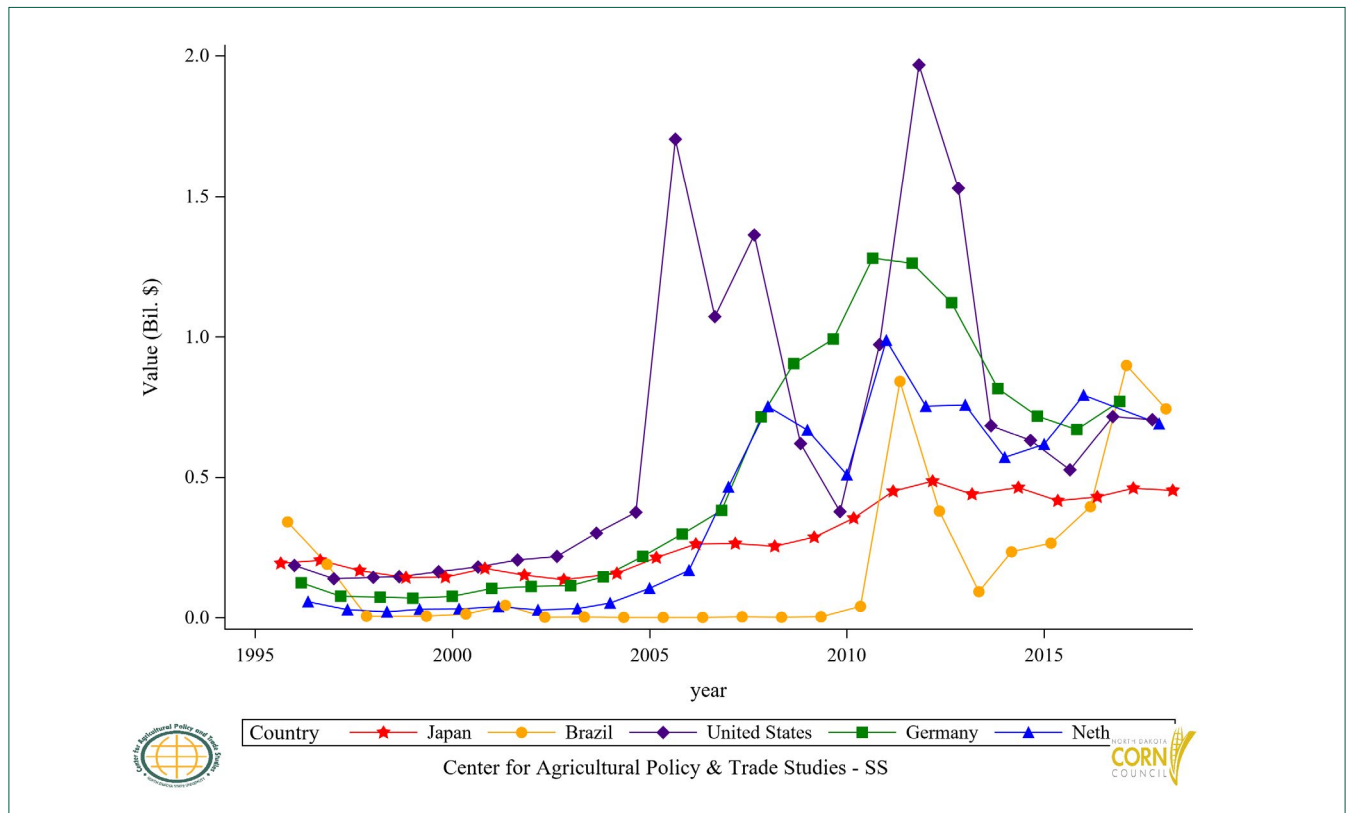


Figure 33: Top 6 to 10 Countries Ethyl Alcohol Import Value, Annual Trends

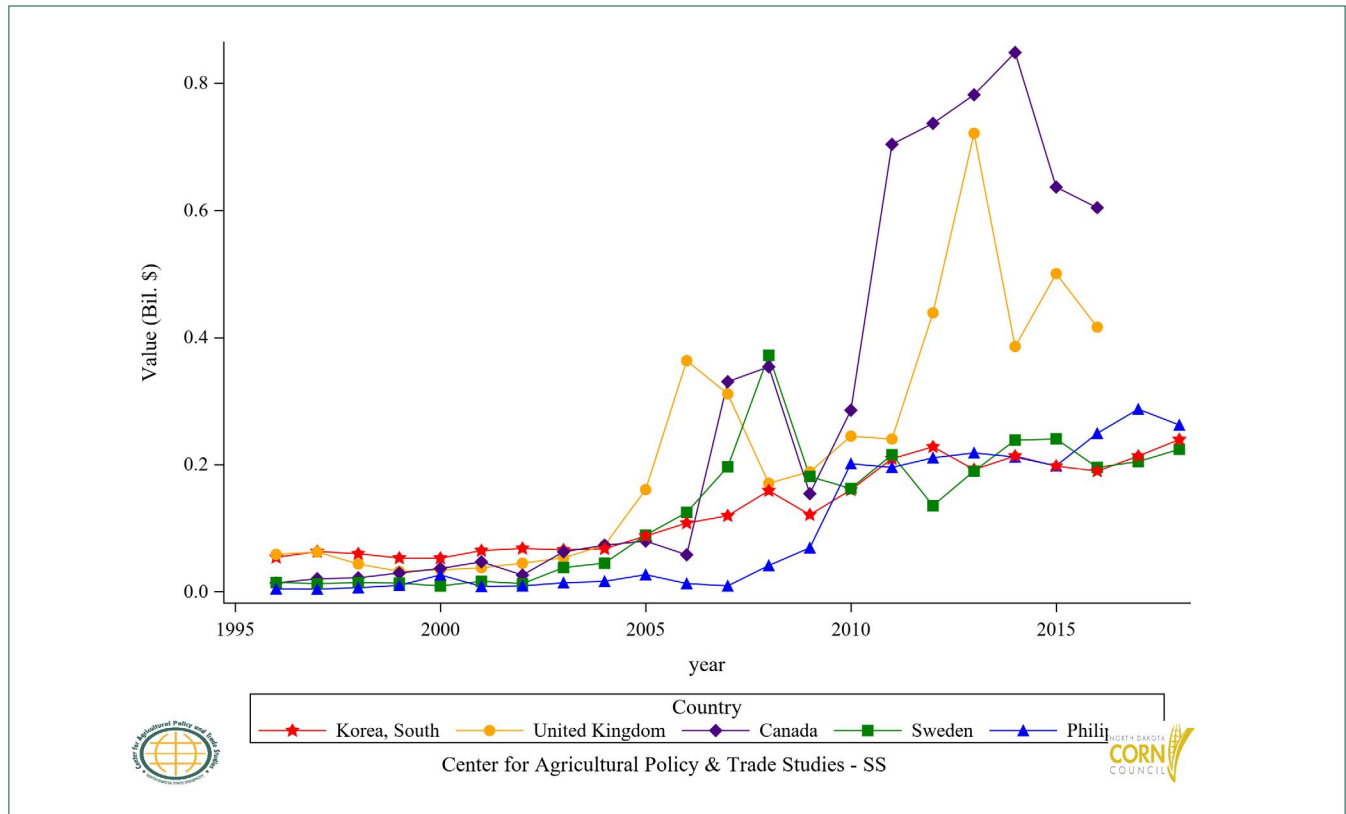


Figure 34: Top 11 to 15 Countries Ethyl Alcohol Import Value, Annual Trends

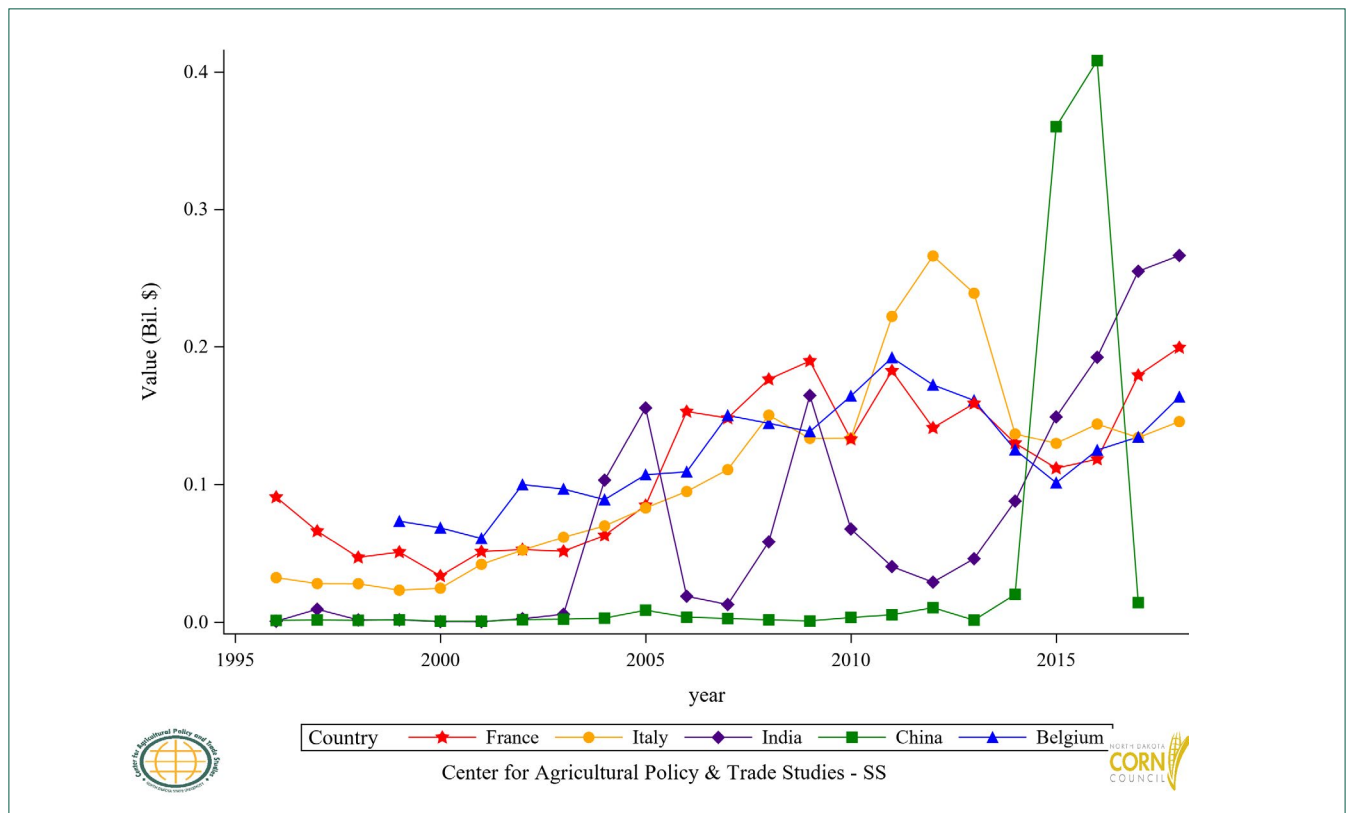


Figure 35: Top 5 Countries Corn Residue (BWC) Import Value, Annual Trends

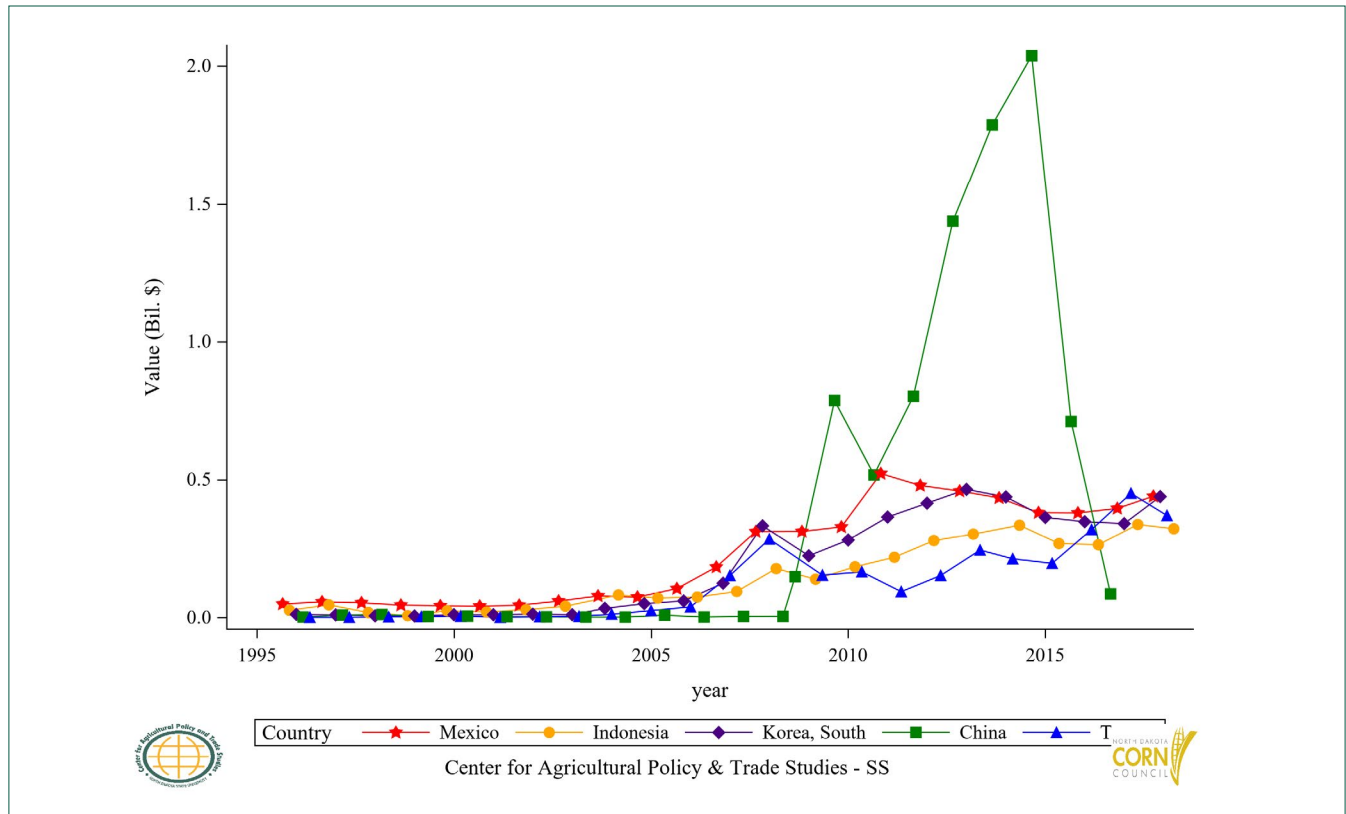


Figure 36: Top 6 to 10 Countries Corn Residue (BWC) Import Value, Annual Trends

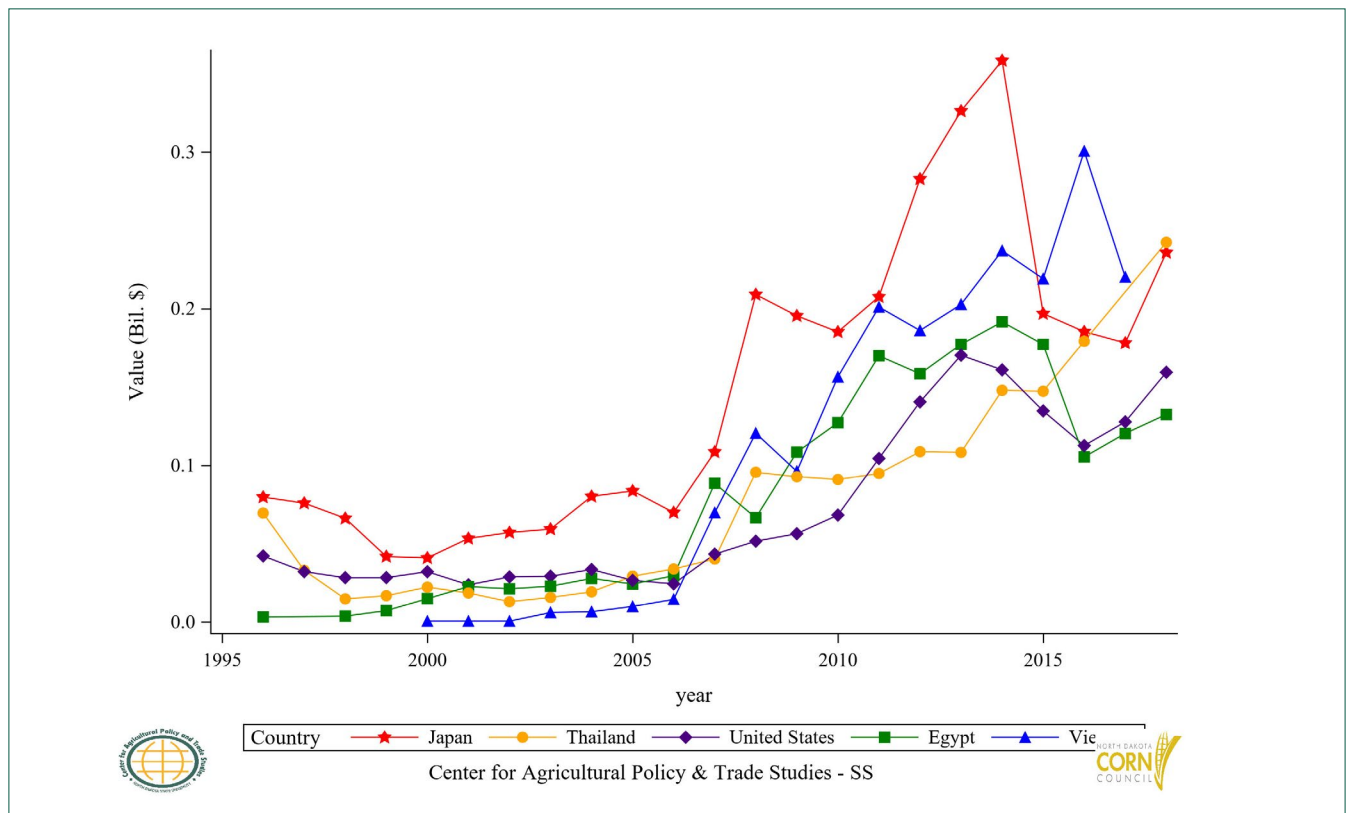


Figure 37: Top 11 to 15 Countries Corn Residue (BWC) Import Value, Annual Trends

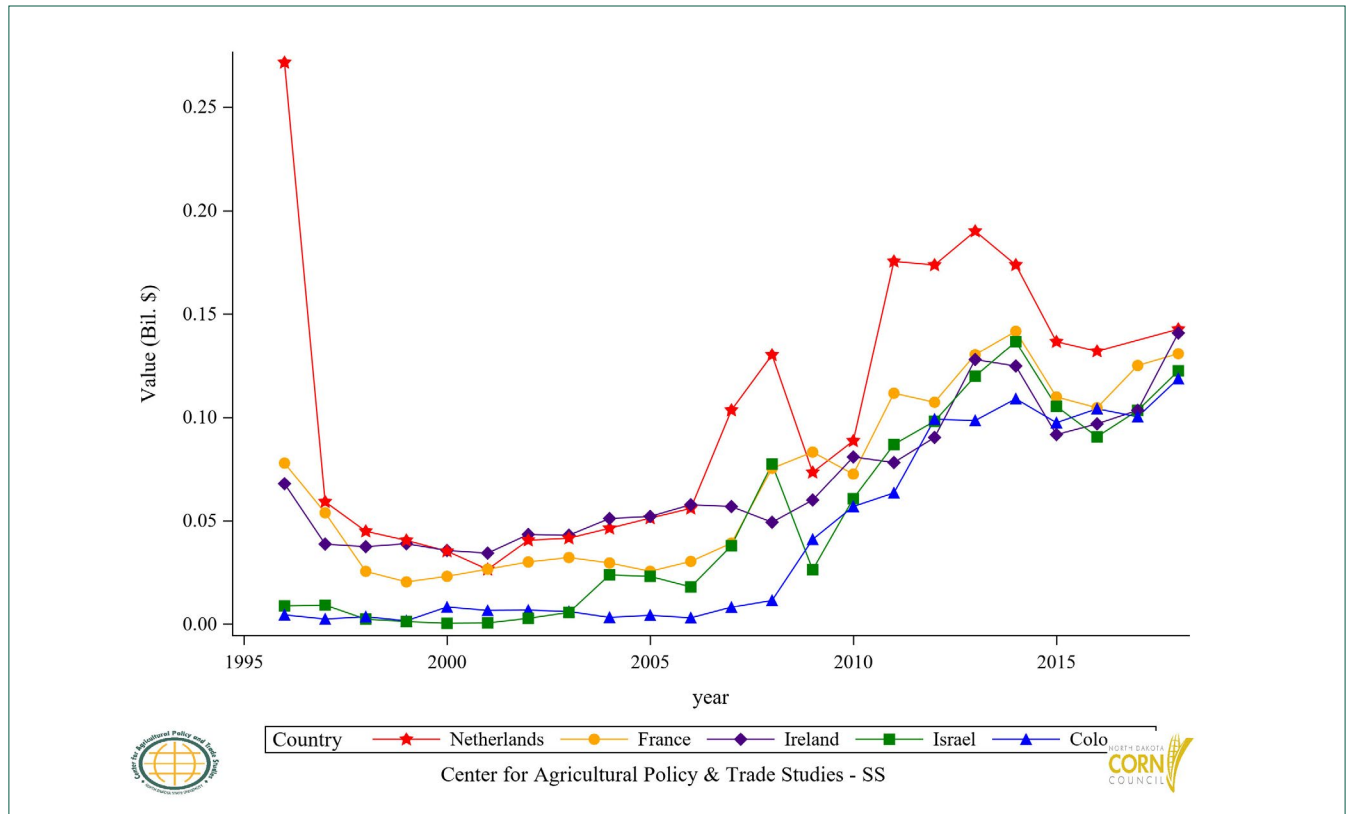


Figure 38: Top 5 Countries Corn Flour (GHS) Import Value, Annual Trends

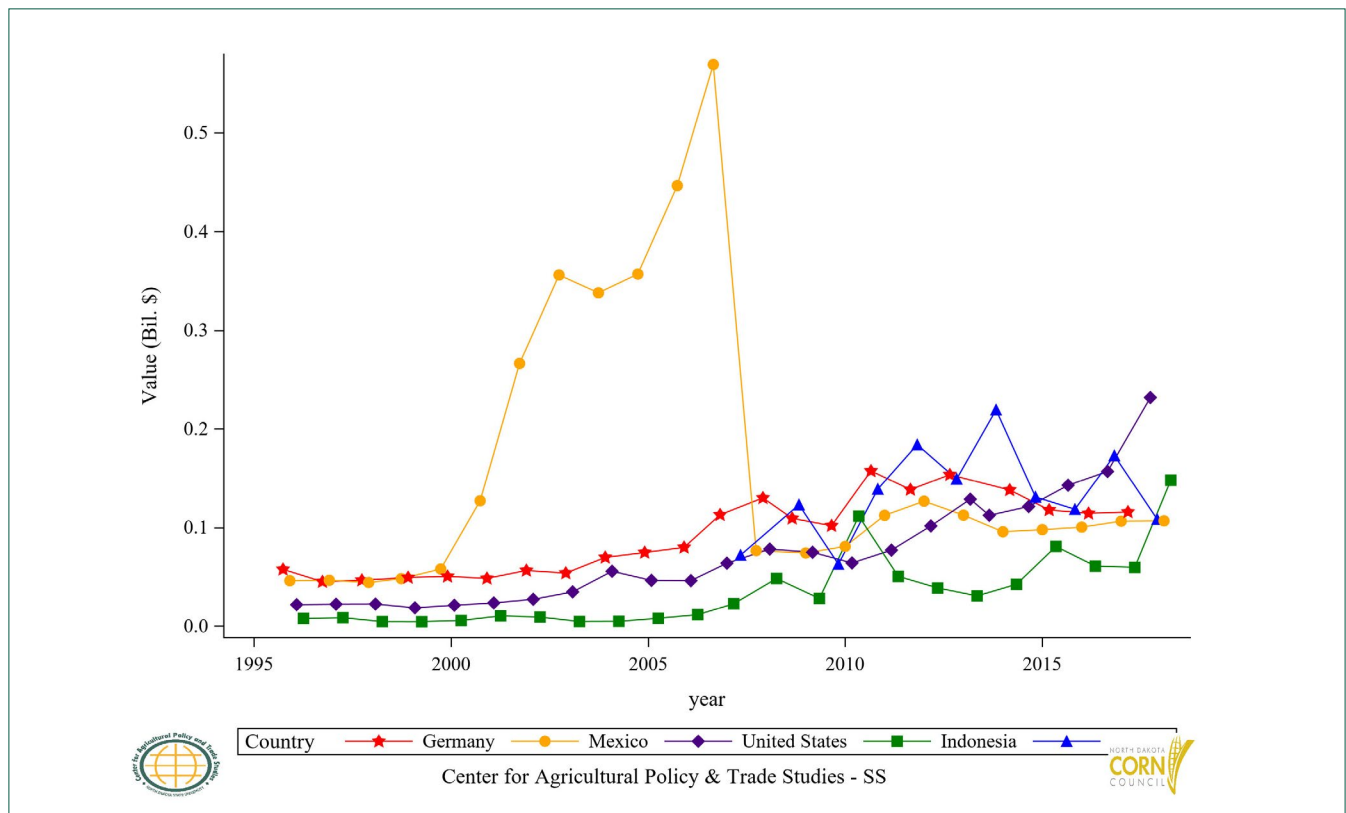


Figure 39: Top 6 to 10 Countries Corn Flour (GHS) Import Value, Annual Trends

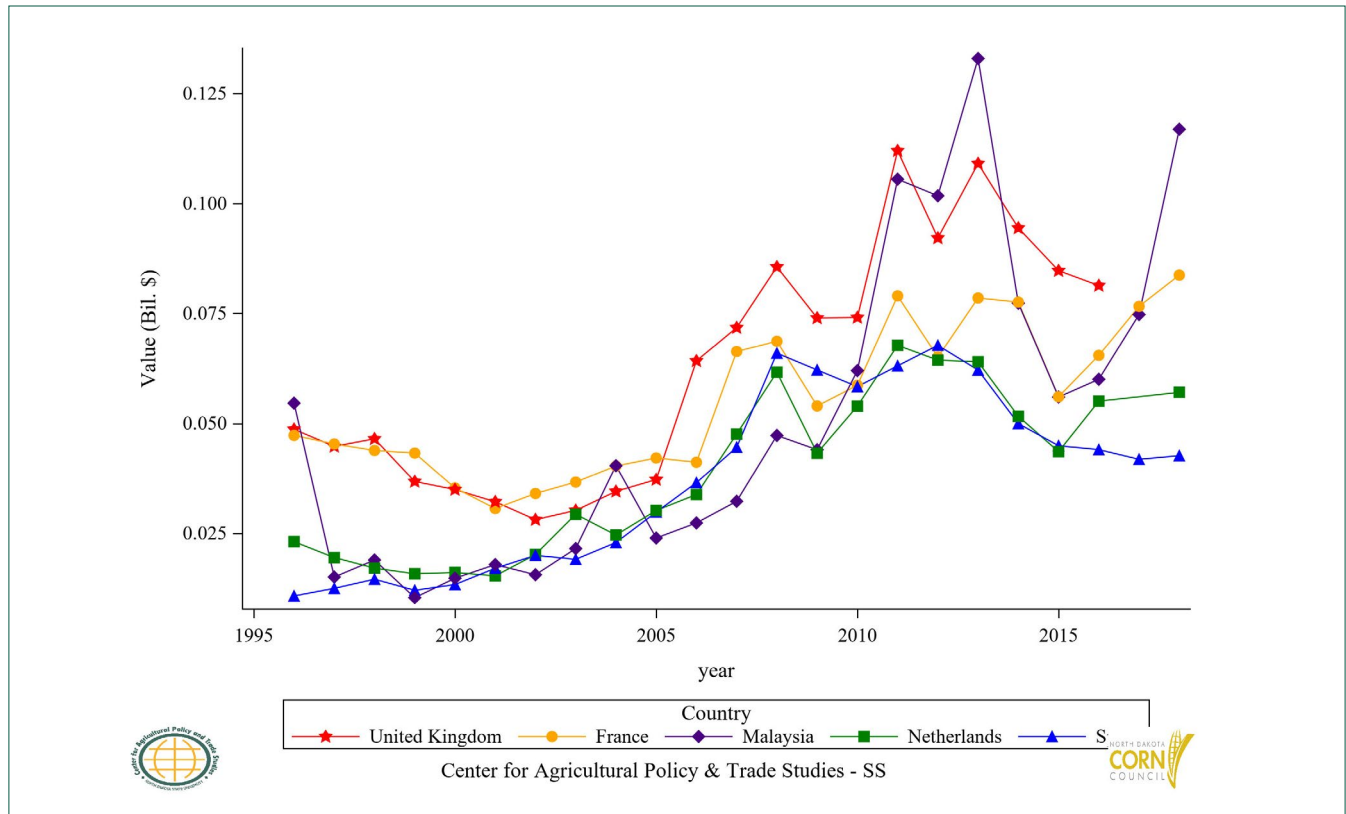


Figure 40: Top 11 to 15 Countries Corn Flour (GHS) Import Value, Annual Trends

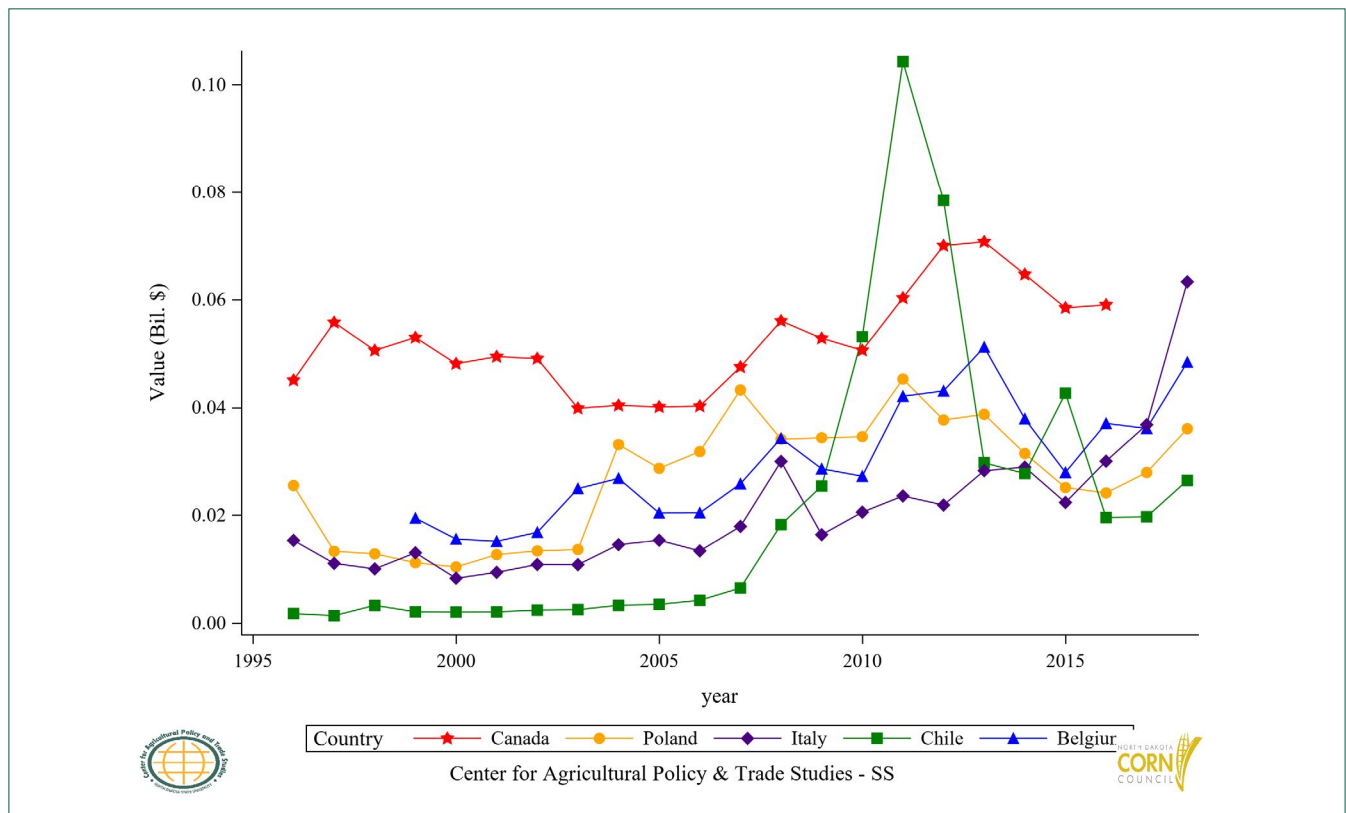


Figure 41: Top 5 Countries Glucose and Fructose Import Value, Annual Trends

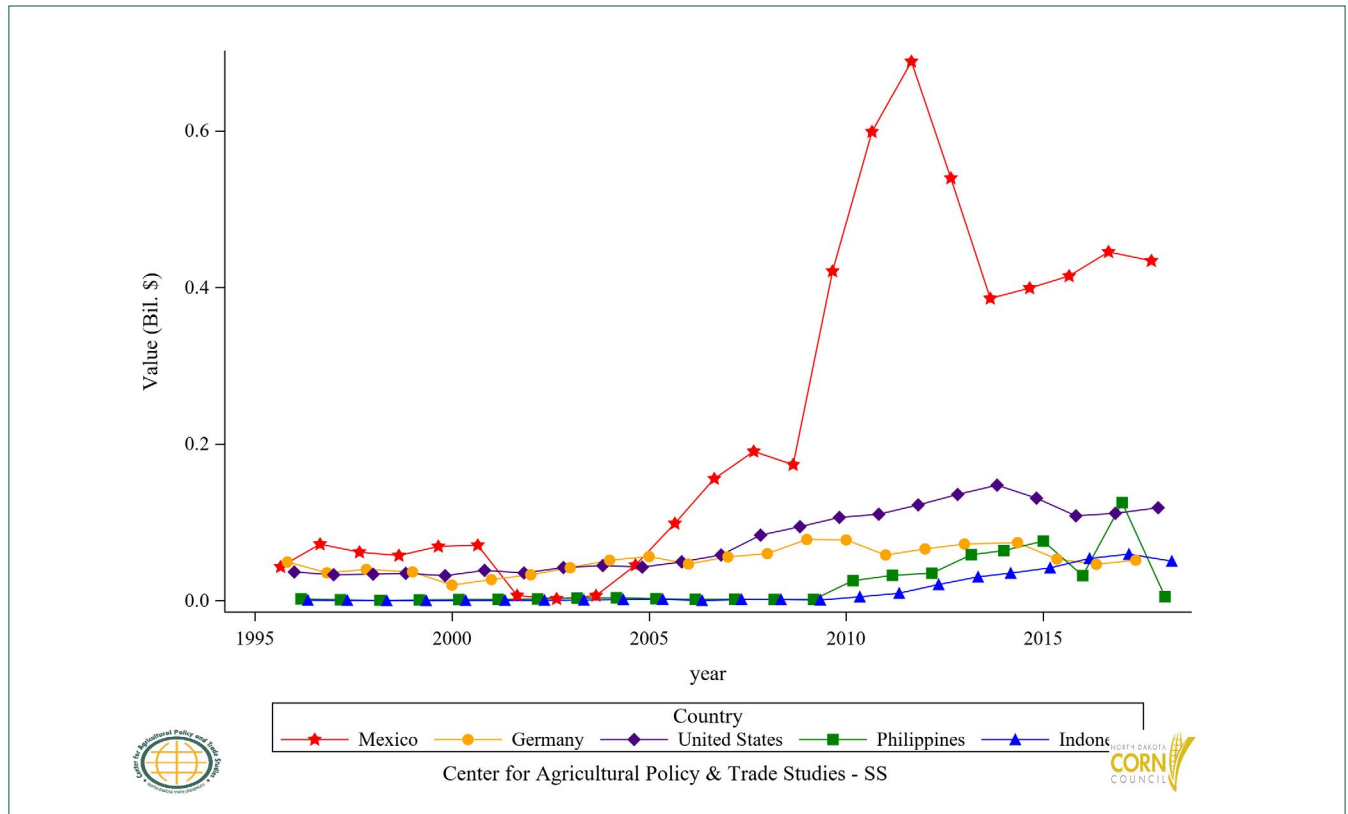


Figure 42: Top 6 to 10 Countries Glucose and Fructose Import Value, Annual Trends

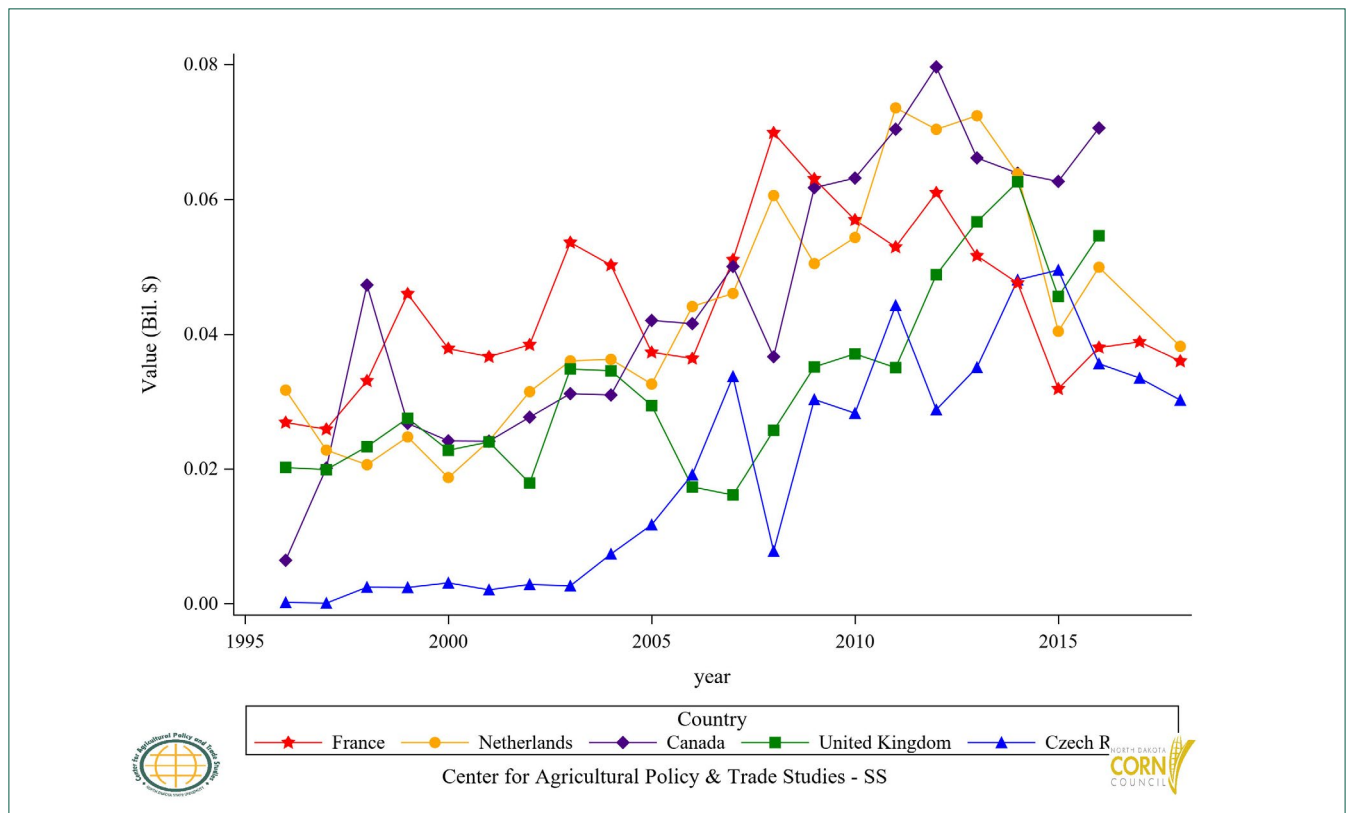


Figure 43: Top 11 to 15 Countries Glucose and Fructose Import Value, Annual Trends

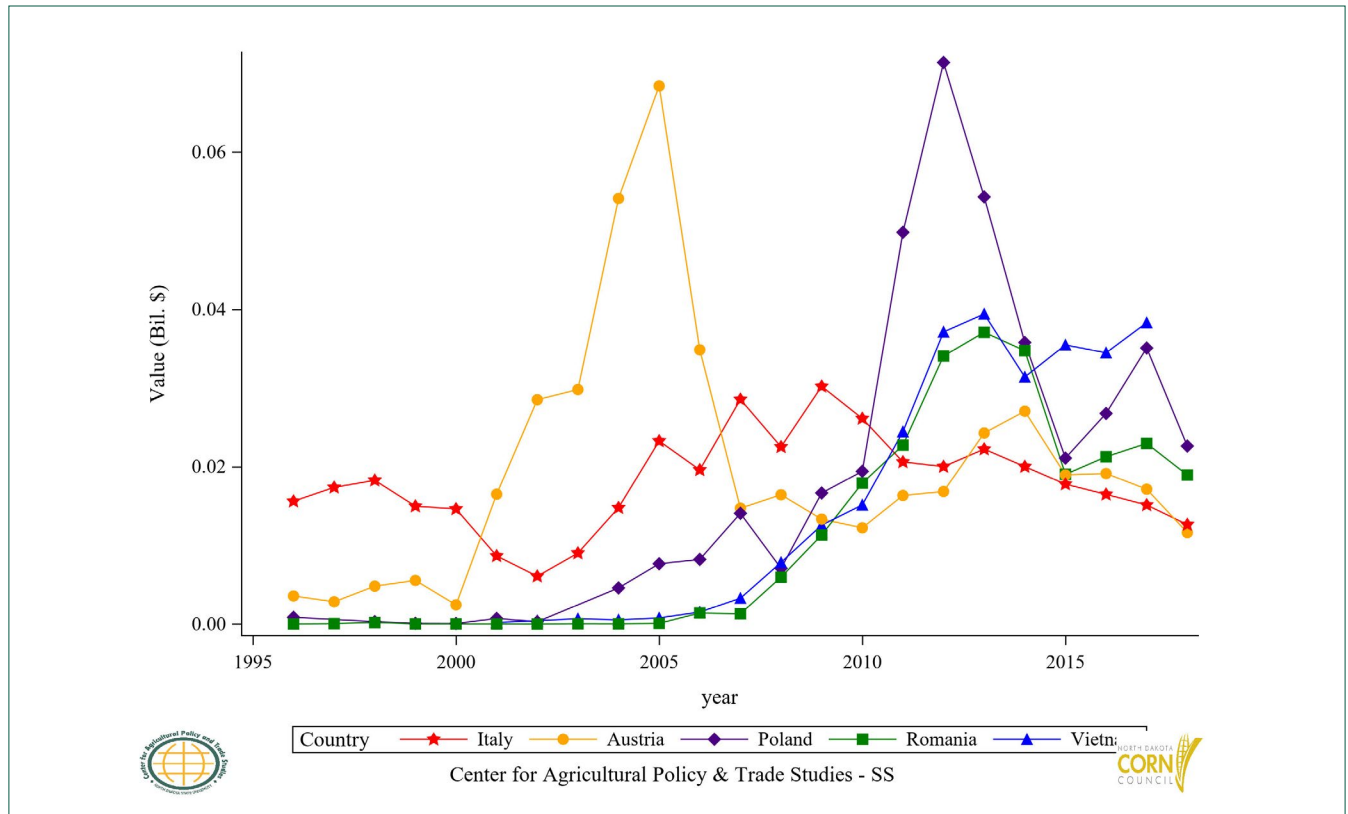


Figure 44: Top 5 Countries Corn Oil (CR) Import Value, Annual Trends

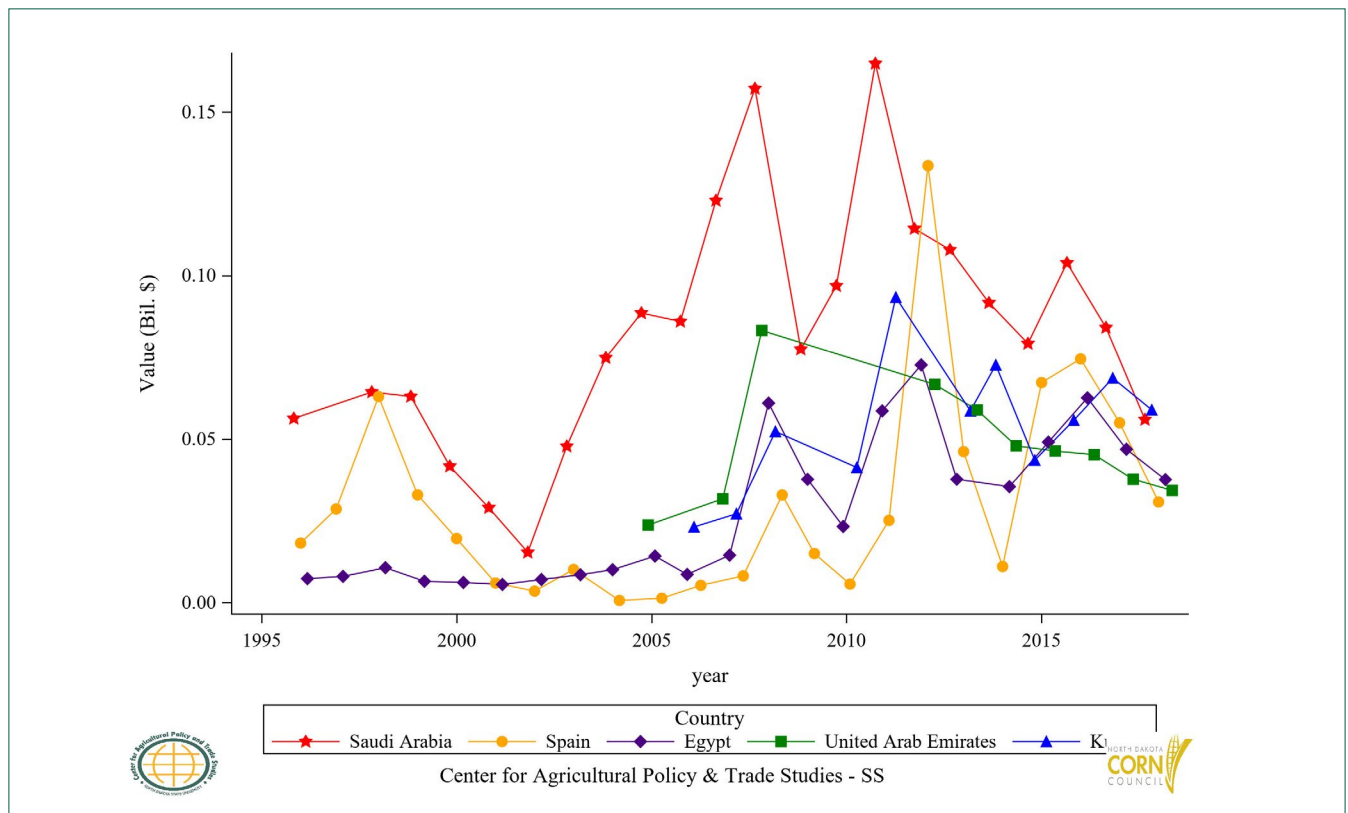


Figure 45: Top 6 to 10 Countries Corn Oil (CR) Import Value, Annual Trends

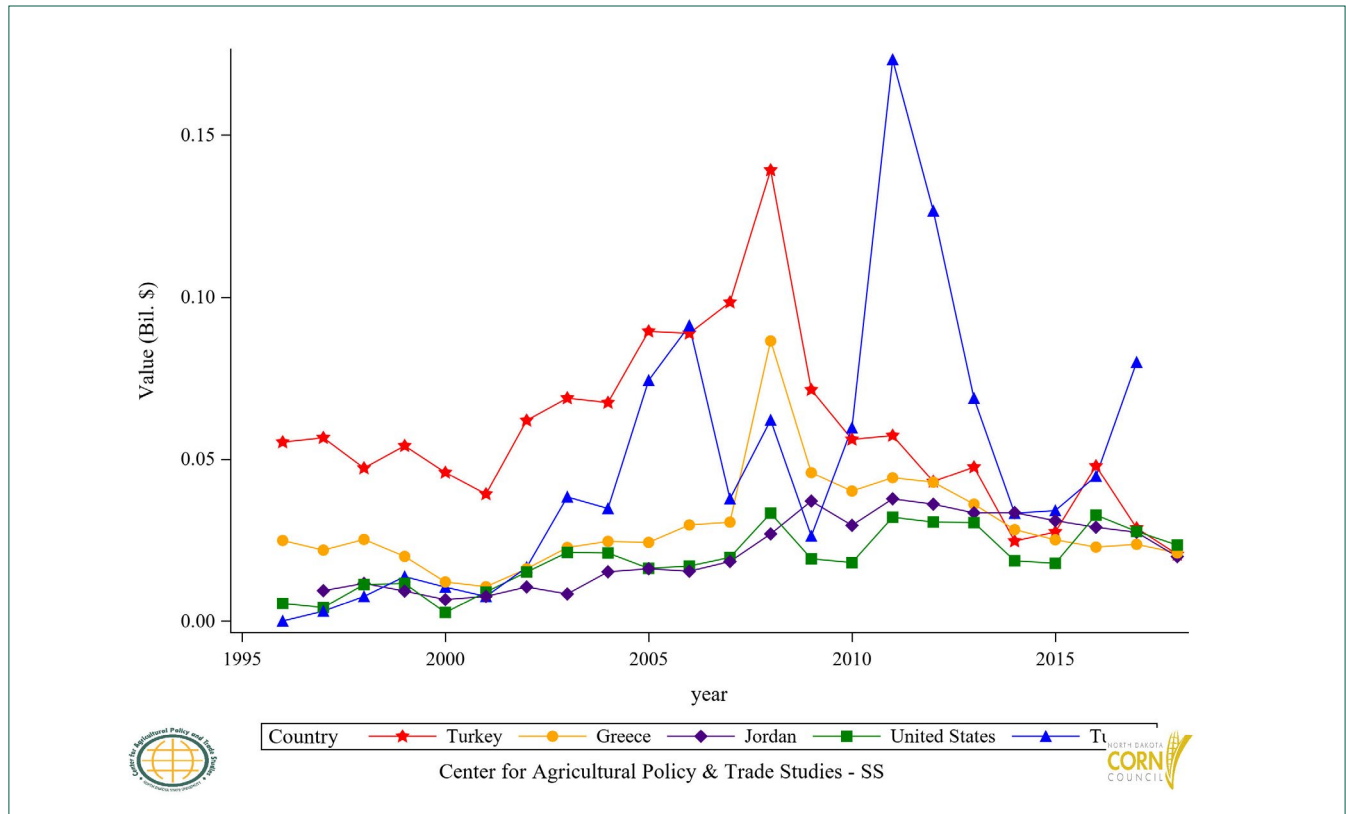
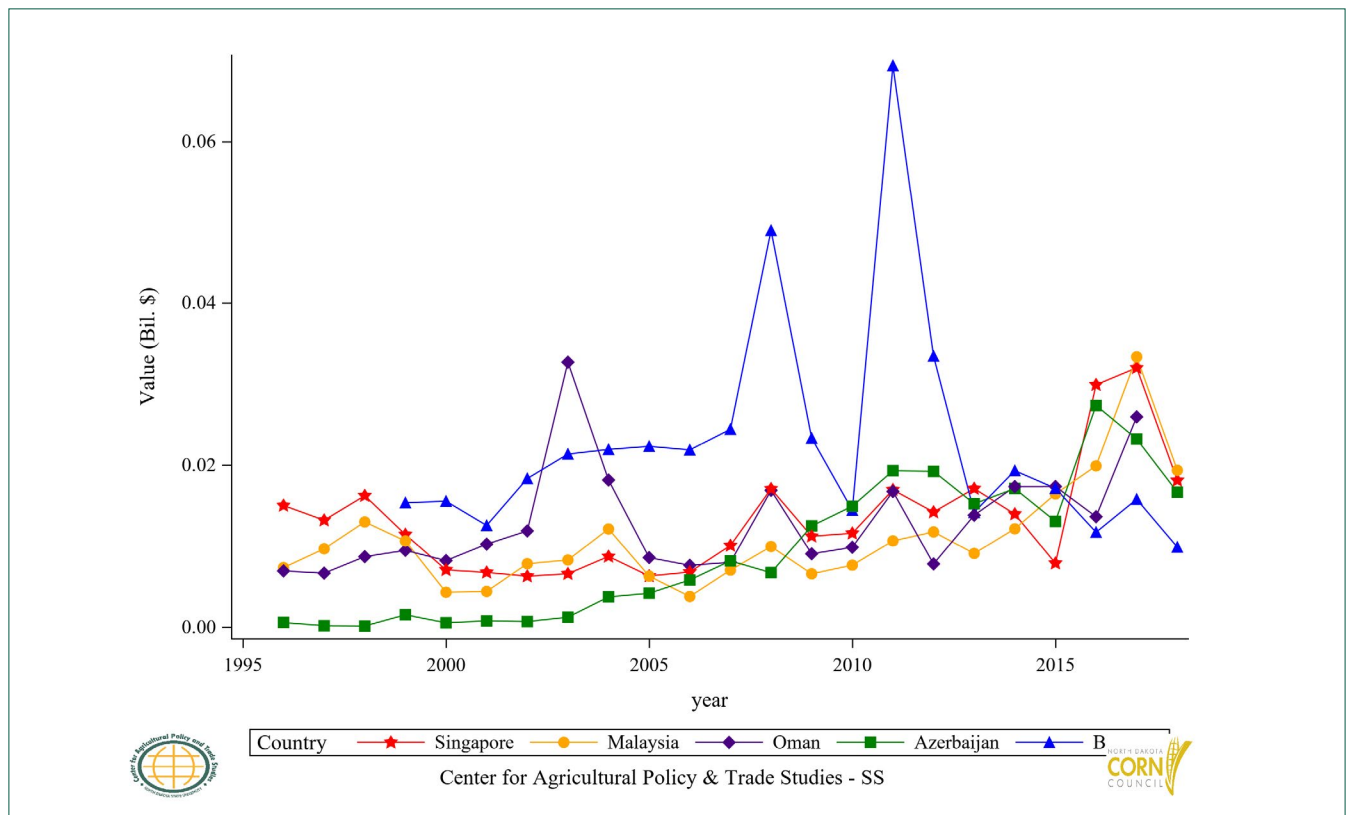


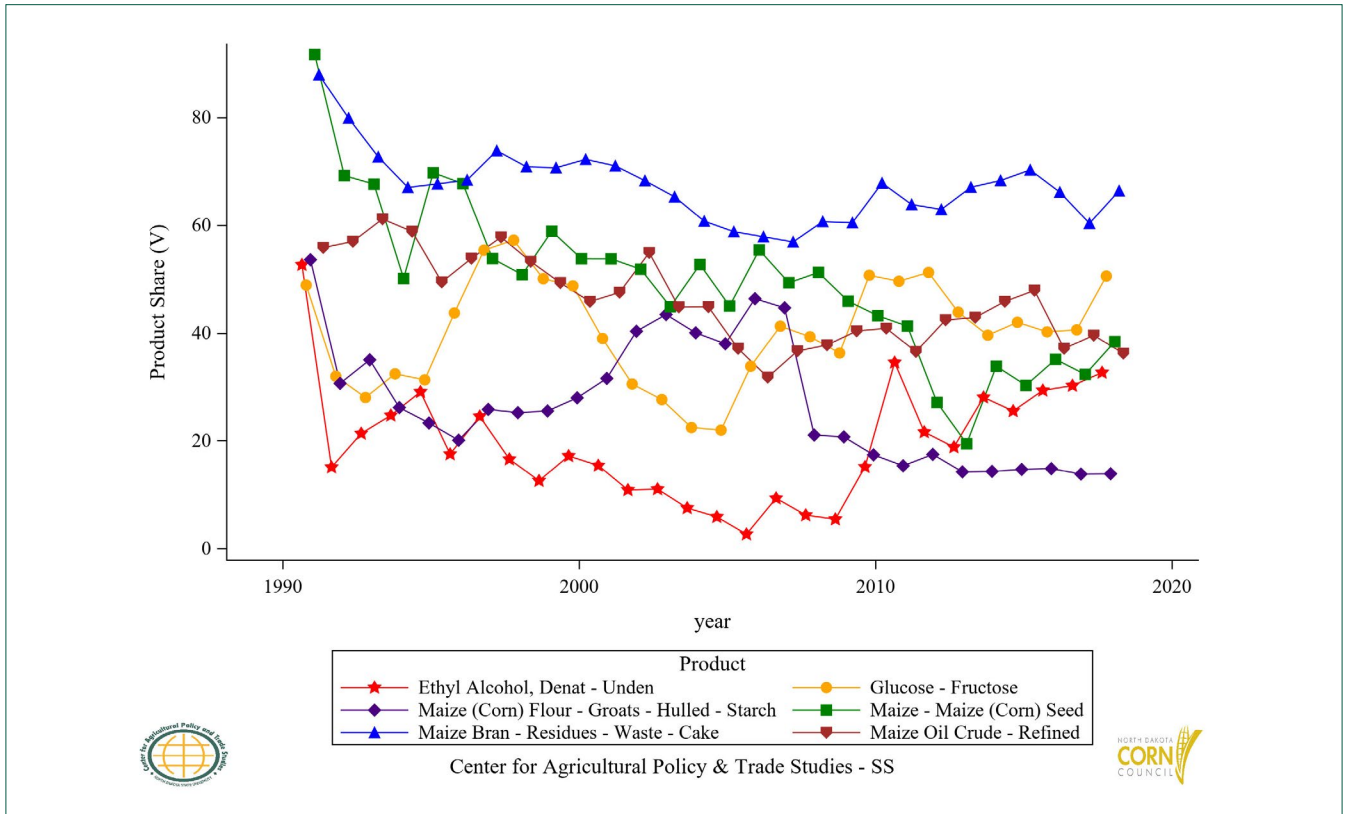
Figure 46: Top 11 to 15 Countries Corn Oil (CR) Import Value, Annual Trends



■ Section IV

U.S. Temporal Corn Export

Figure 47: U.S. Share of Exports Relative to the World, Annual Trends



■ Section V

U.S. Spatial Corn Export

Figure 48: U.S. Corn and Seed Export Value to Top 5 Countries, Annual Trends

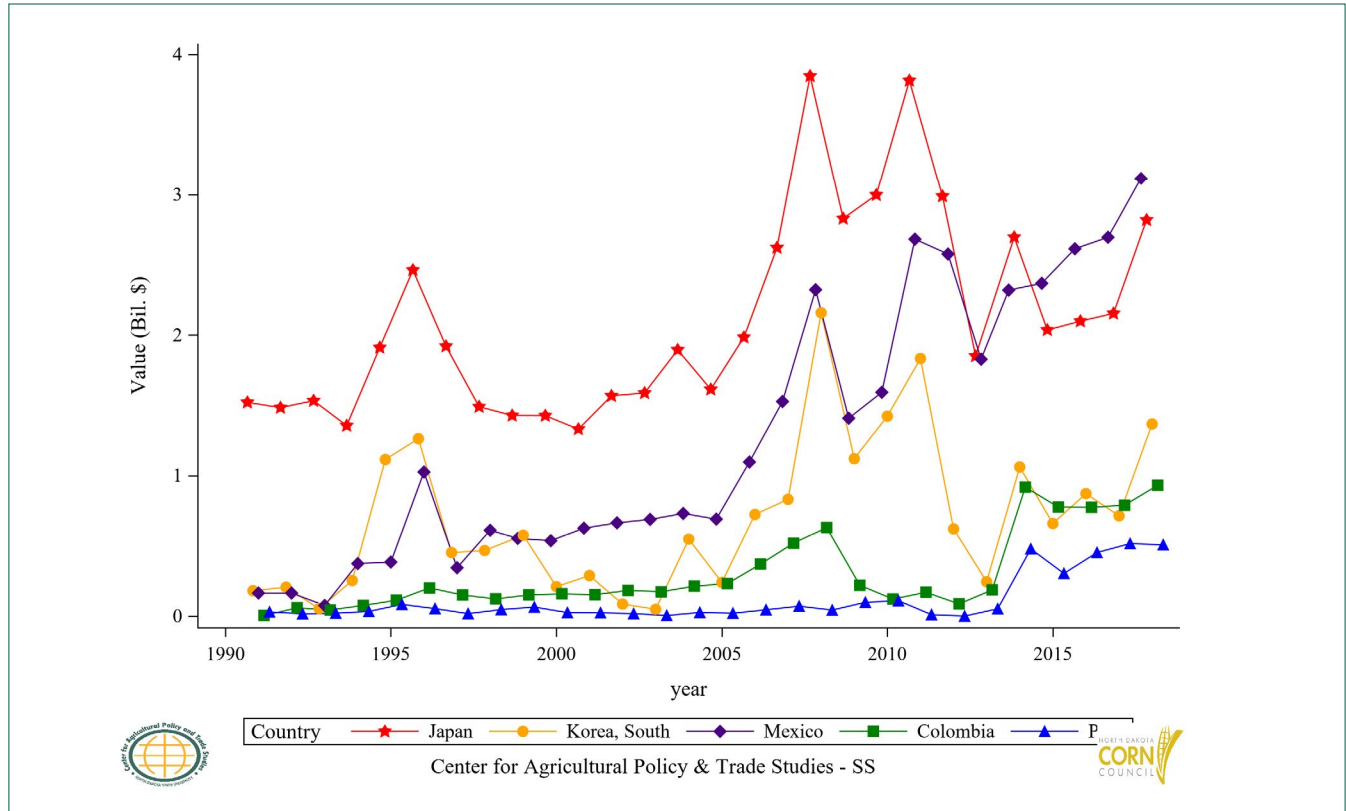


Figure 49: U.S. Corn and Seed Export Value to Top 6 to 10 Countries, Annual Trends

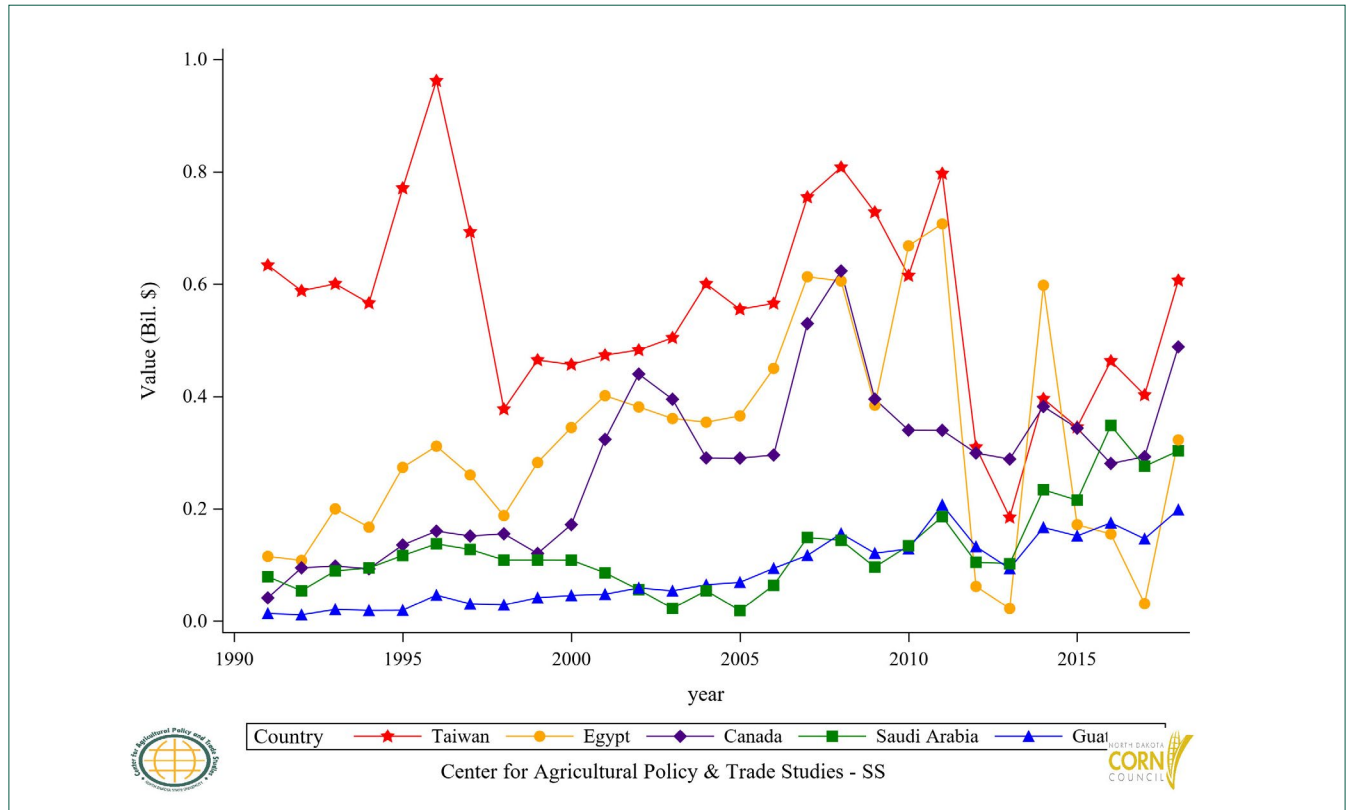


Figure 50: U.S. Corn and Seed Export Value to Top 11 to 15 Countries, Annual Trends

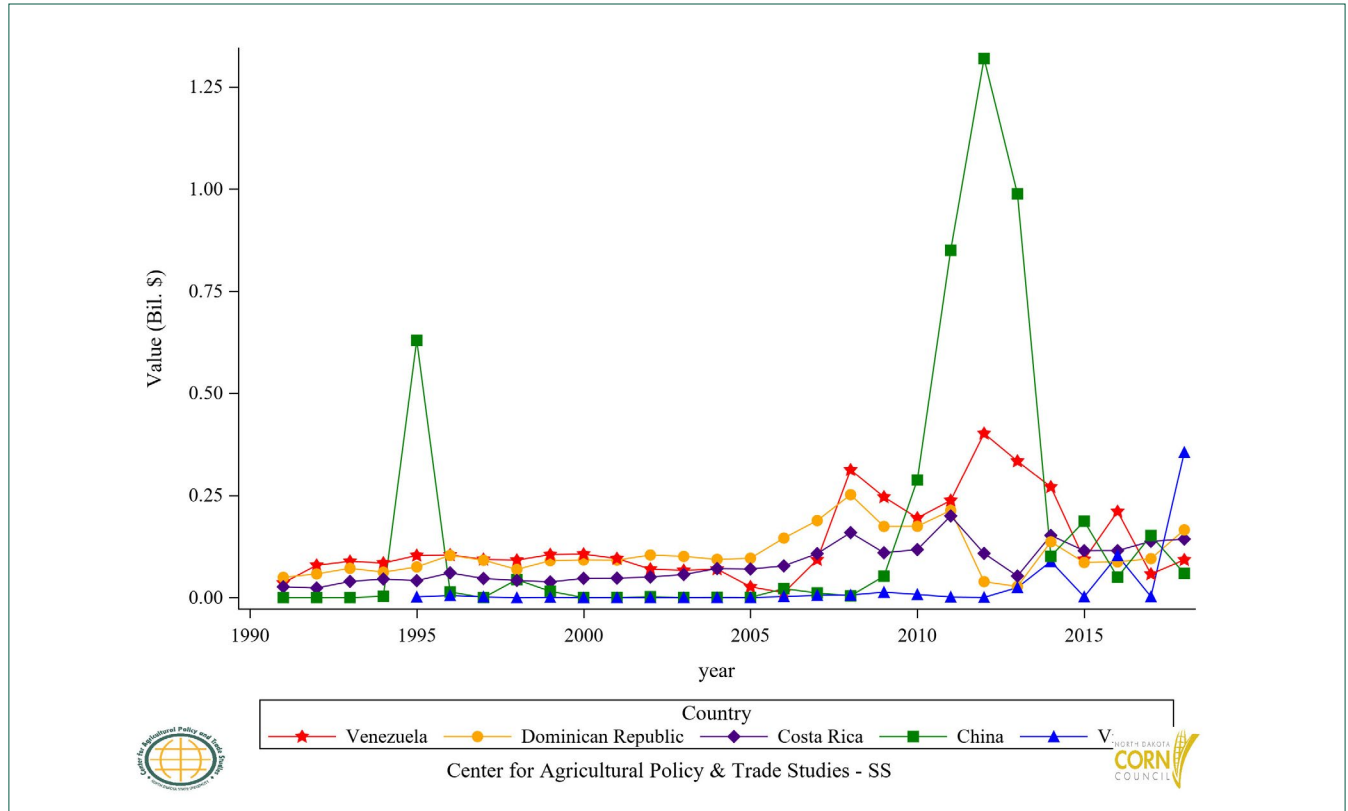


Figure 51: U.S. Ethyl Alcohol Export Value to Top 5 Countries, Annual Trends

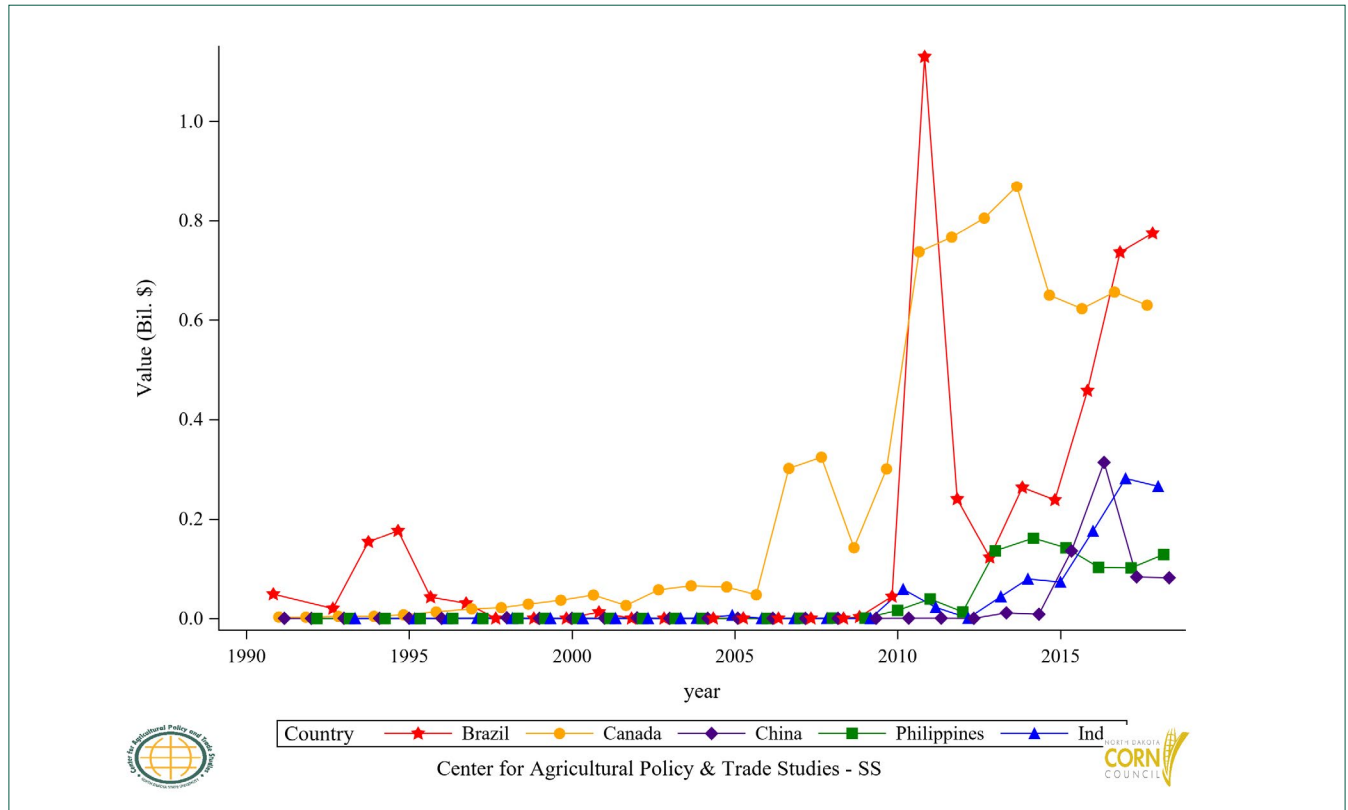


Figure 52: U.S. Ethyl Alcohol Export Value to Top 6 to 10 Countries, Annual Trends

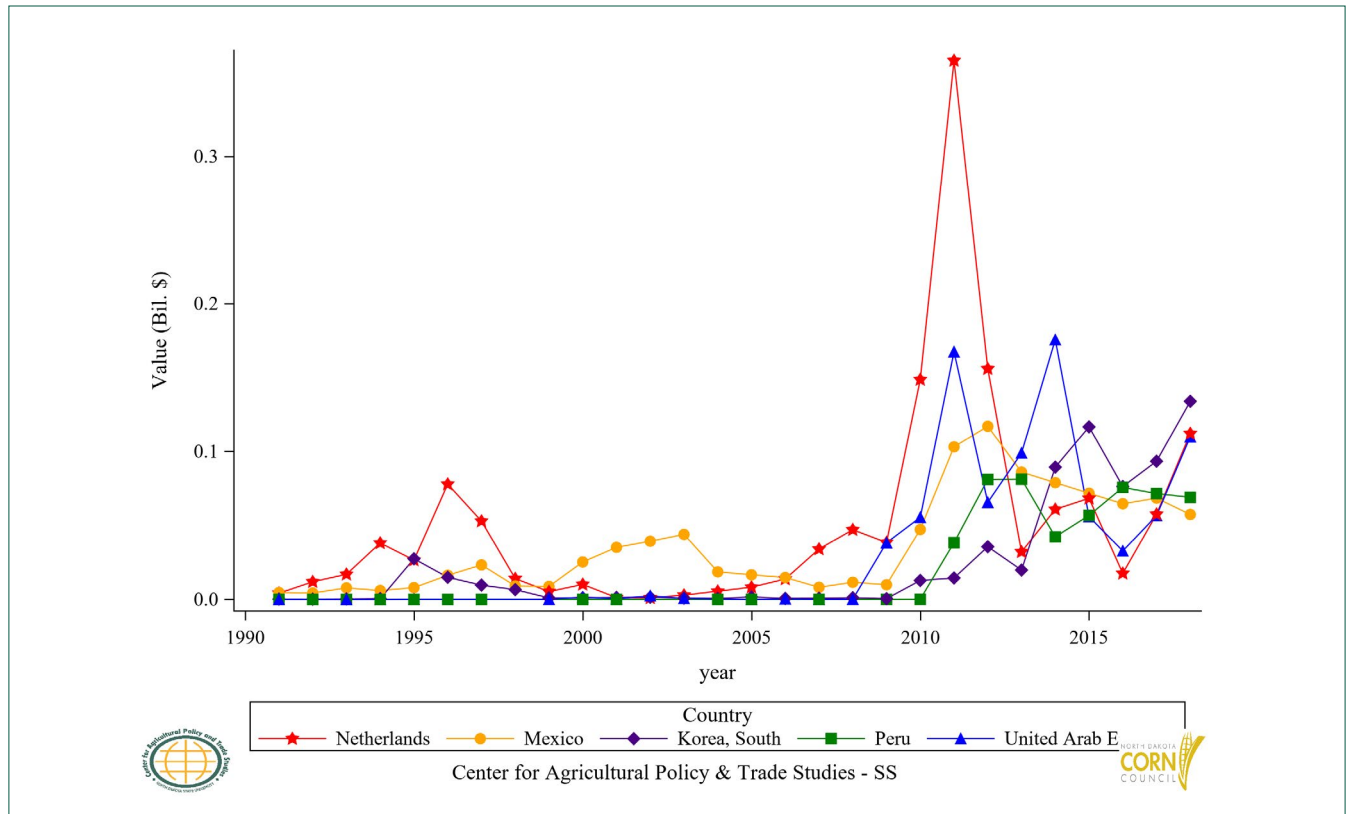


Figure 53: U.S. Ethyl Alcohol Export Value to Top 11 to 15 Countries, Annual Trends

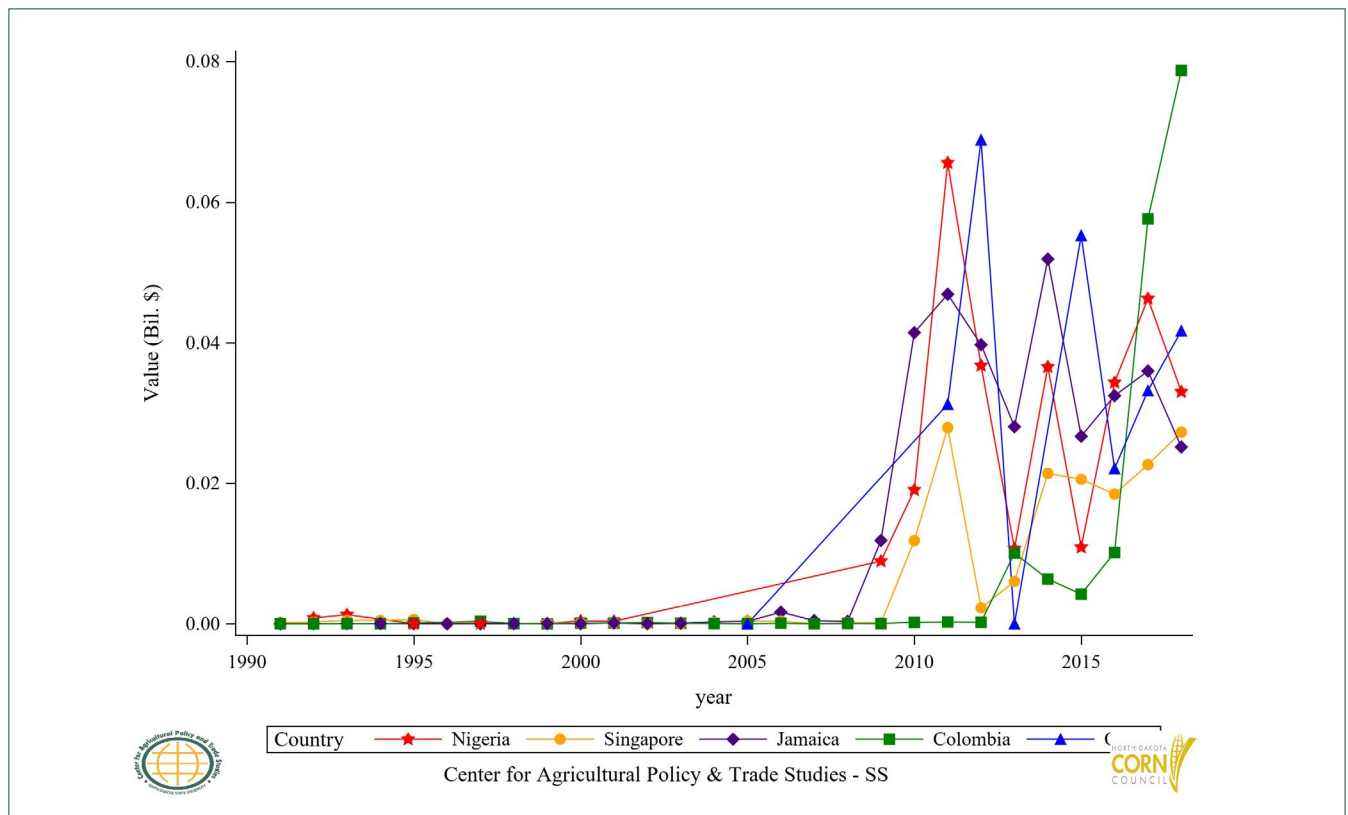


Figure 54: U.S. Corn Residue (BWC) Export Value to Top 5 Countries, Annual Trends

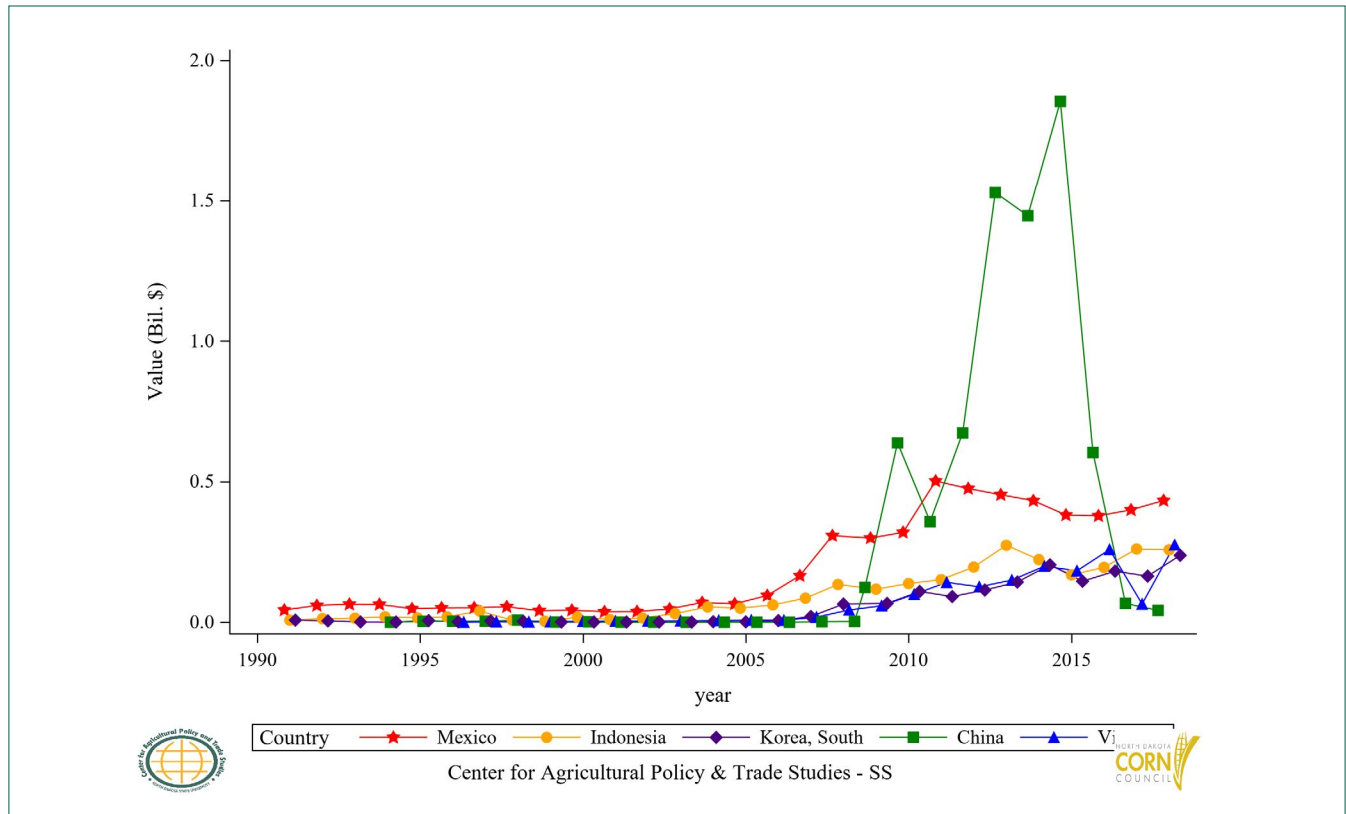


Figure 55: U.S. Corn Residue (BWC) Export Value to Top 6 to 10 Countries, Annual Trends

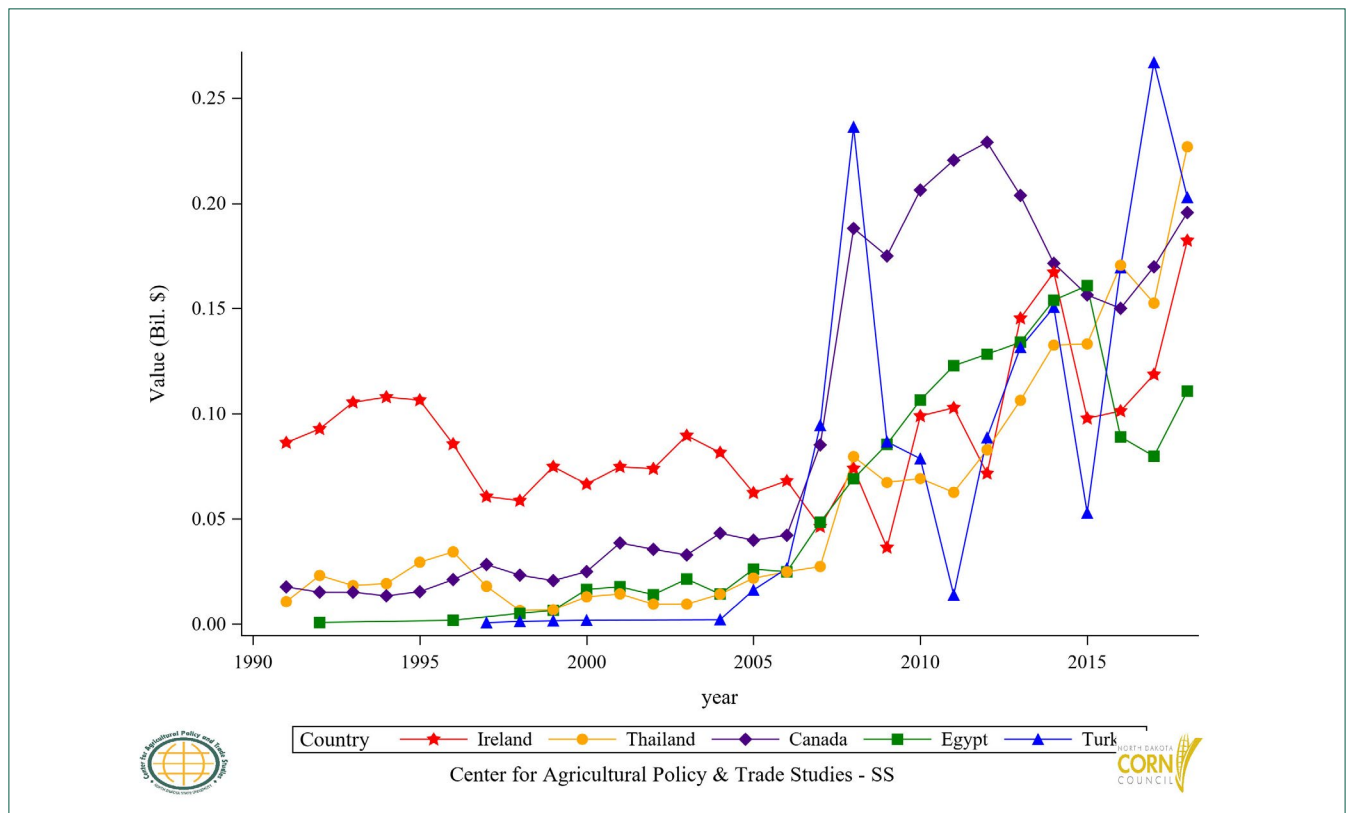


Figure 56: U.S. Corn Residue (BWC) Export Value to Top 11 to 15 Countries, Annual Trends

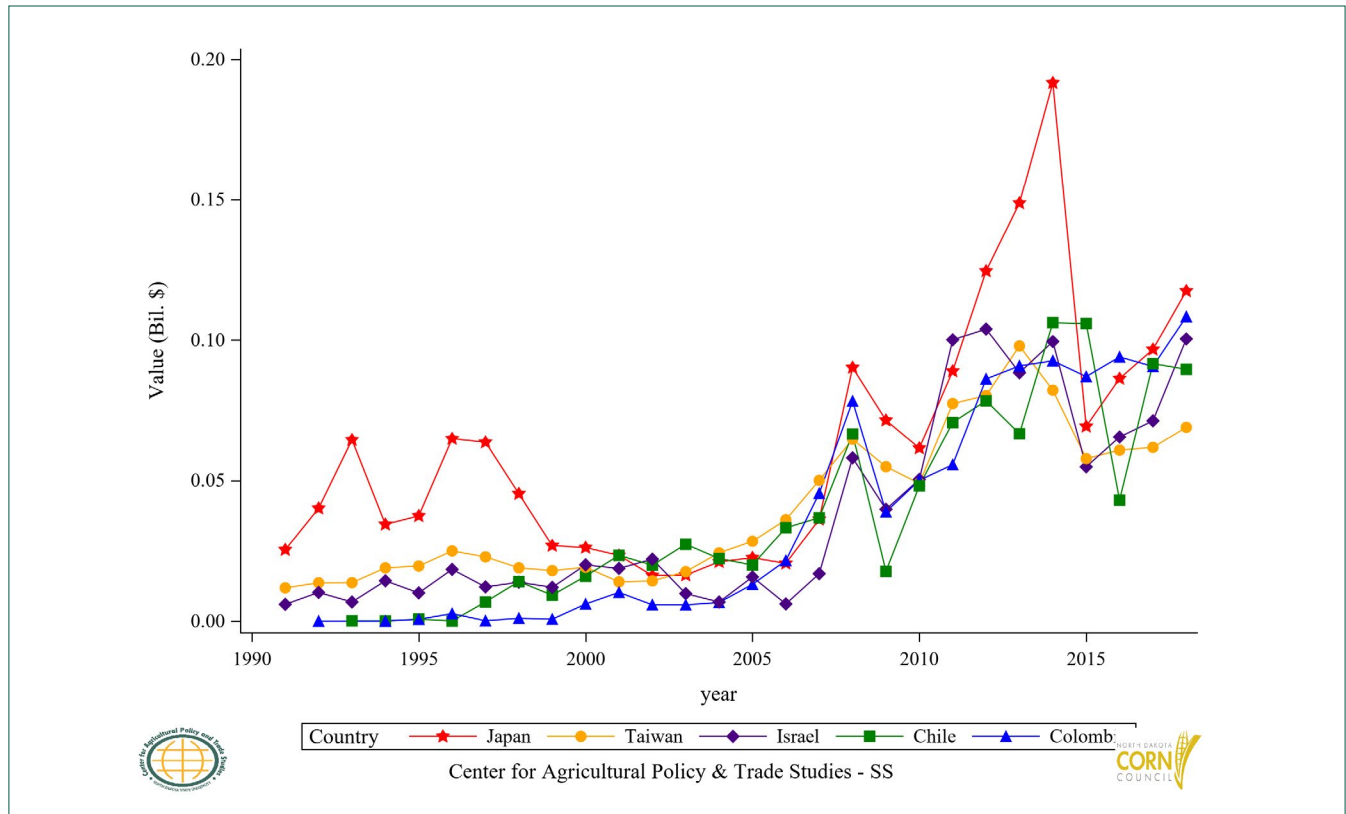


Figure 57: U.S. Corn Flour (GHS) Export Value to Top 5 Countries, Annual Trends

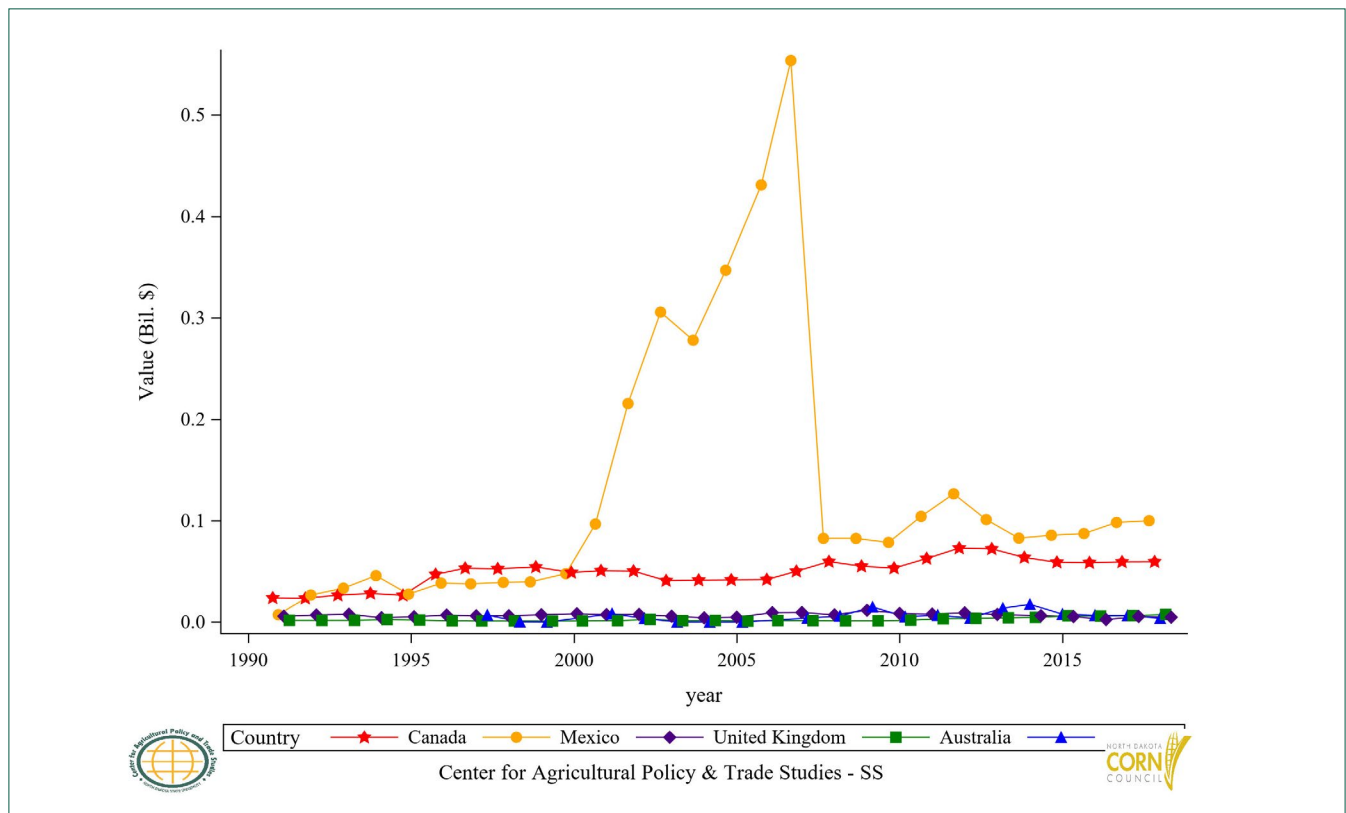


Figure 58: U.S. Corn Flour (GHS) Export Value to Top 6 to 10 Countries, Annual Trends

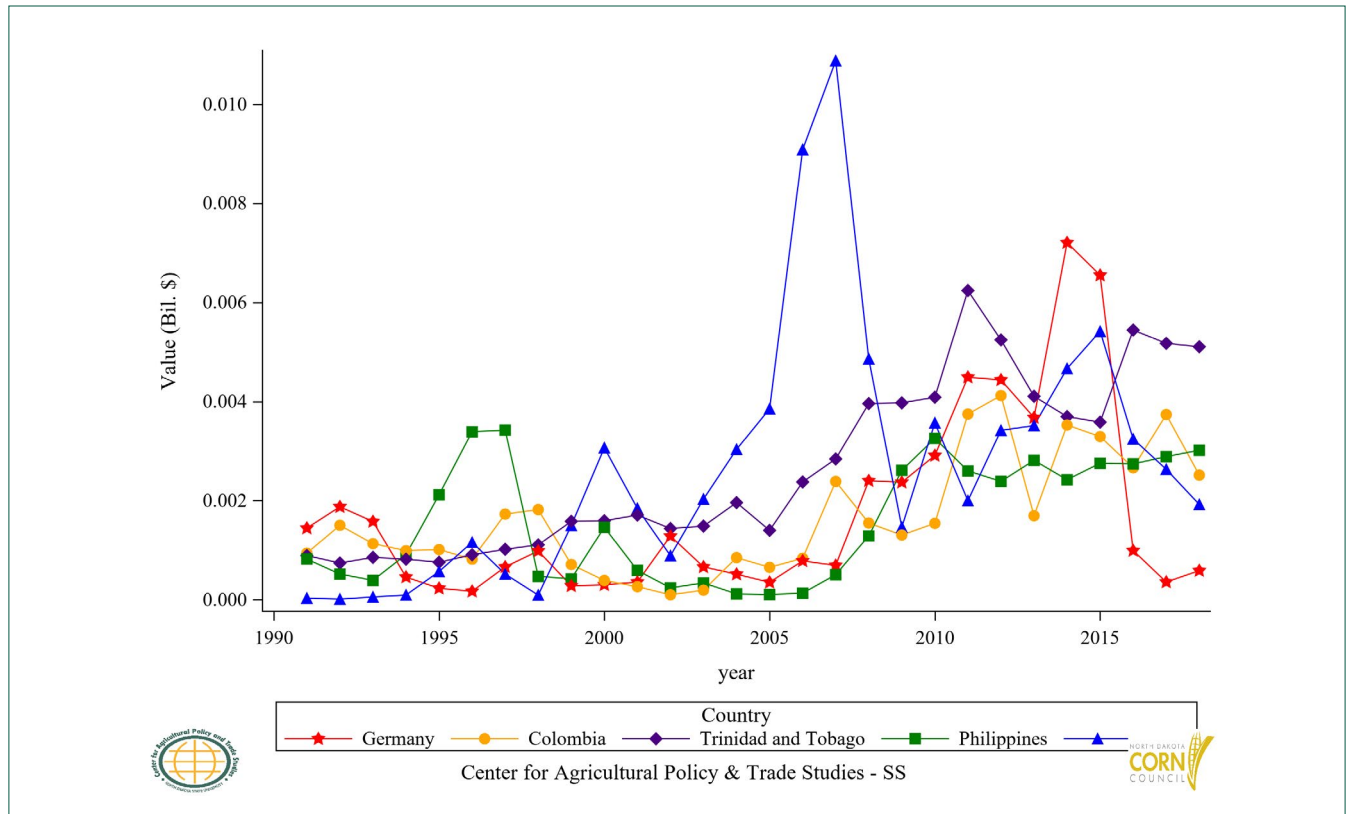


Figure 59: U.S. Corn Flour (GHS) Export Value to Top 11 to 15 Countries, Annual Trends

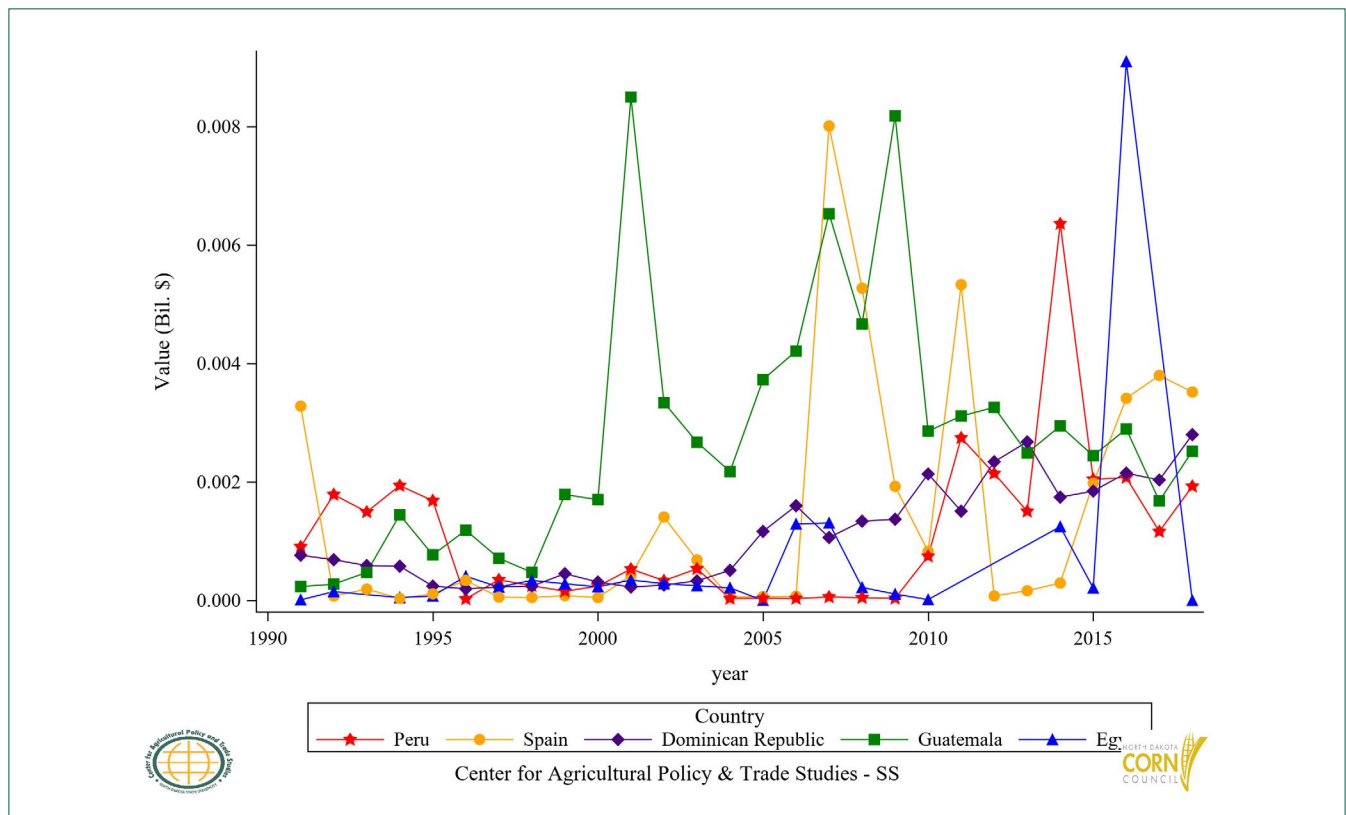


Figure 60: U.S. Glucose and Fructose Export Value to Top 5 Countries, Annual Trends

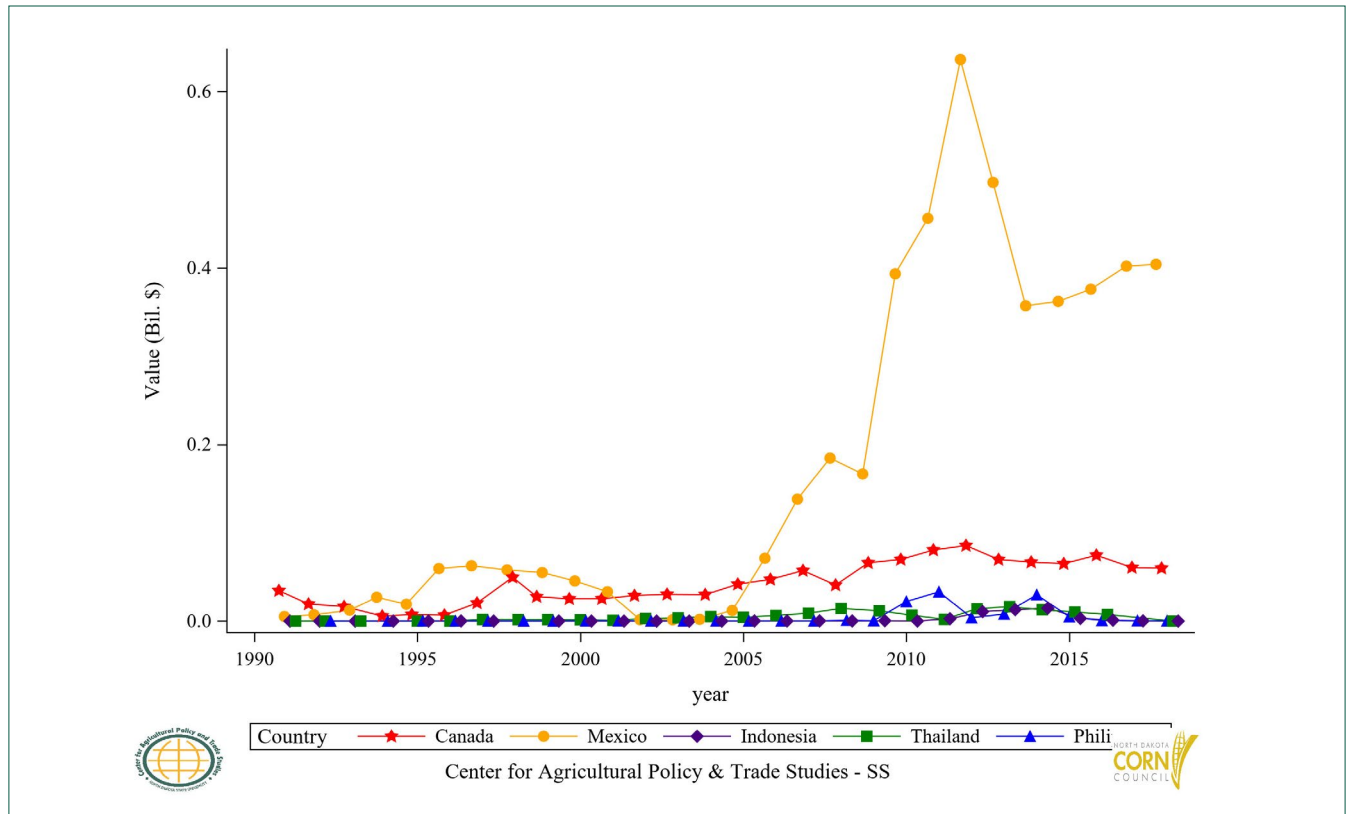


Figure 61: U.S. Glucose and Fructose Export Value to Top 6 to 10 Countries, Annual Trends

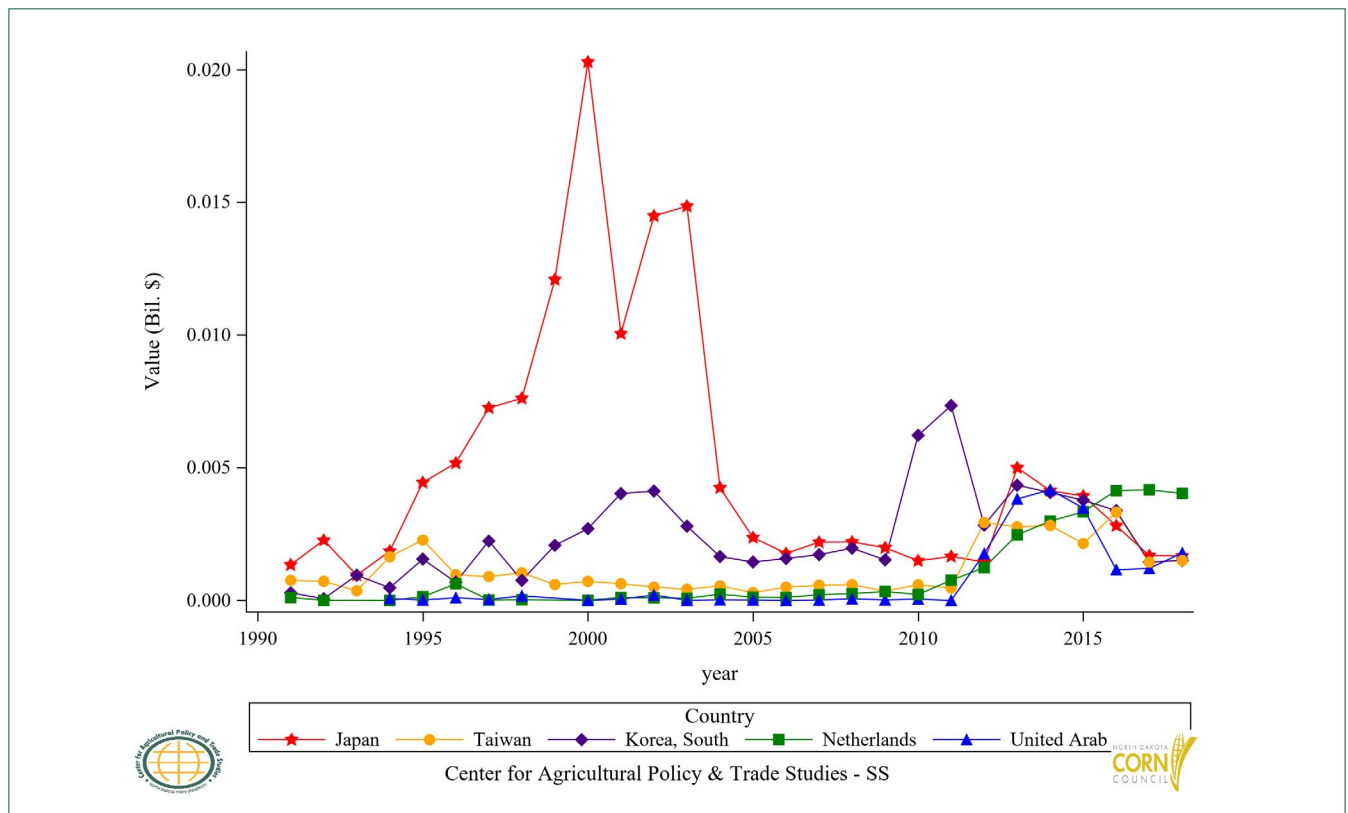


Figure 62: U.S. Glucose and Fructose Export Value to Top 11 to 15 Countries, Annual Trends

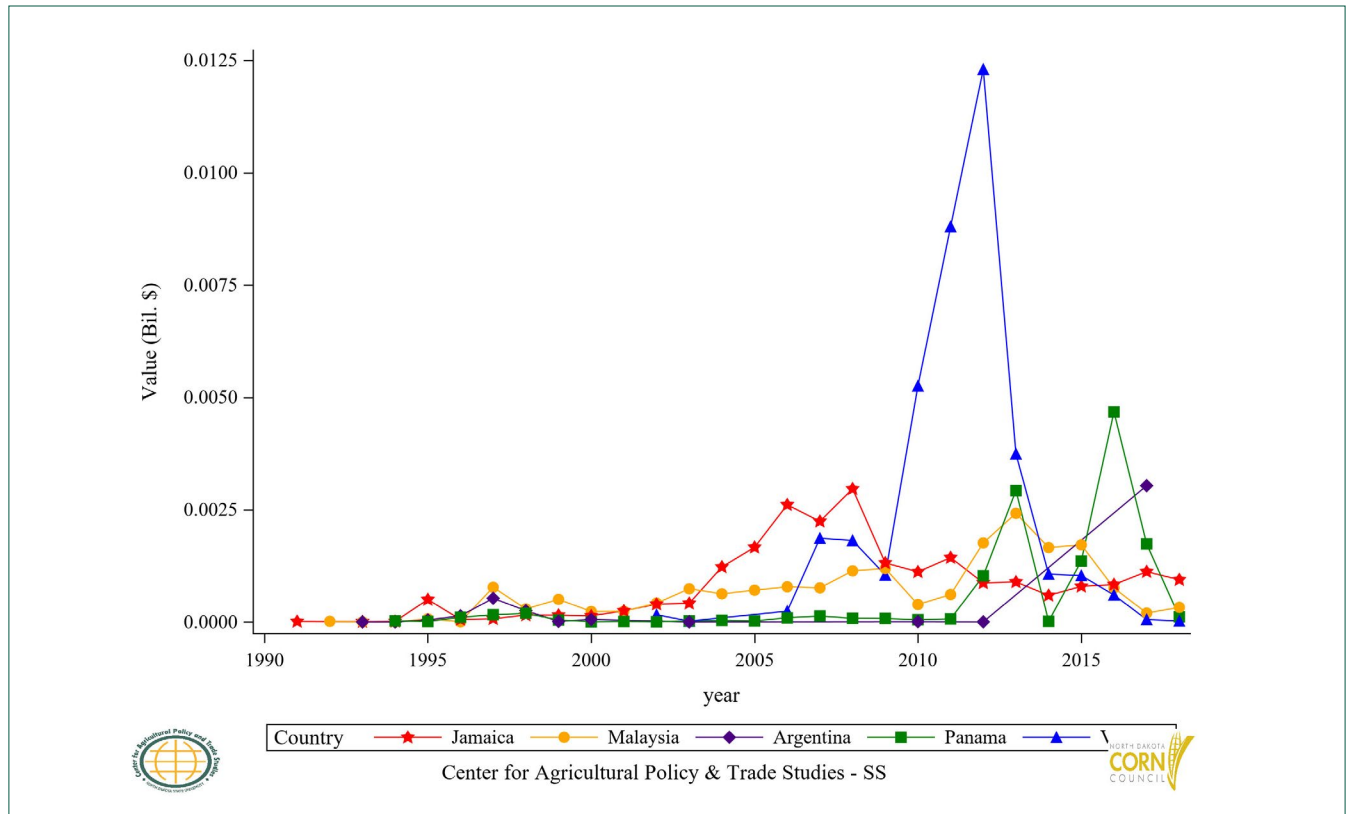


Figure 63: U.S. Corn Oil (CR) Export Value to Top 5 Countries, Annual Trends

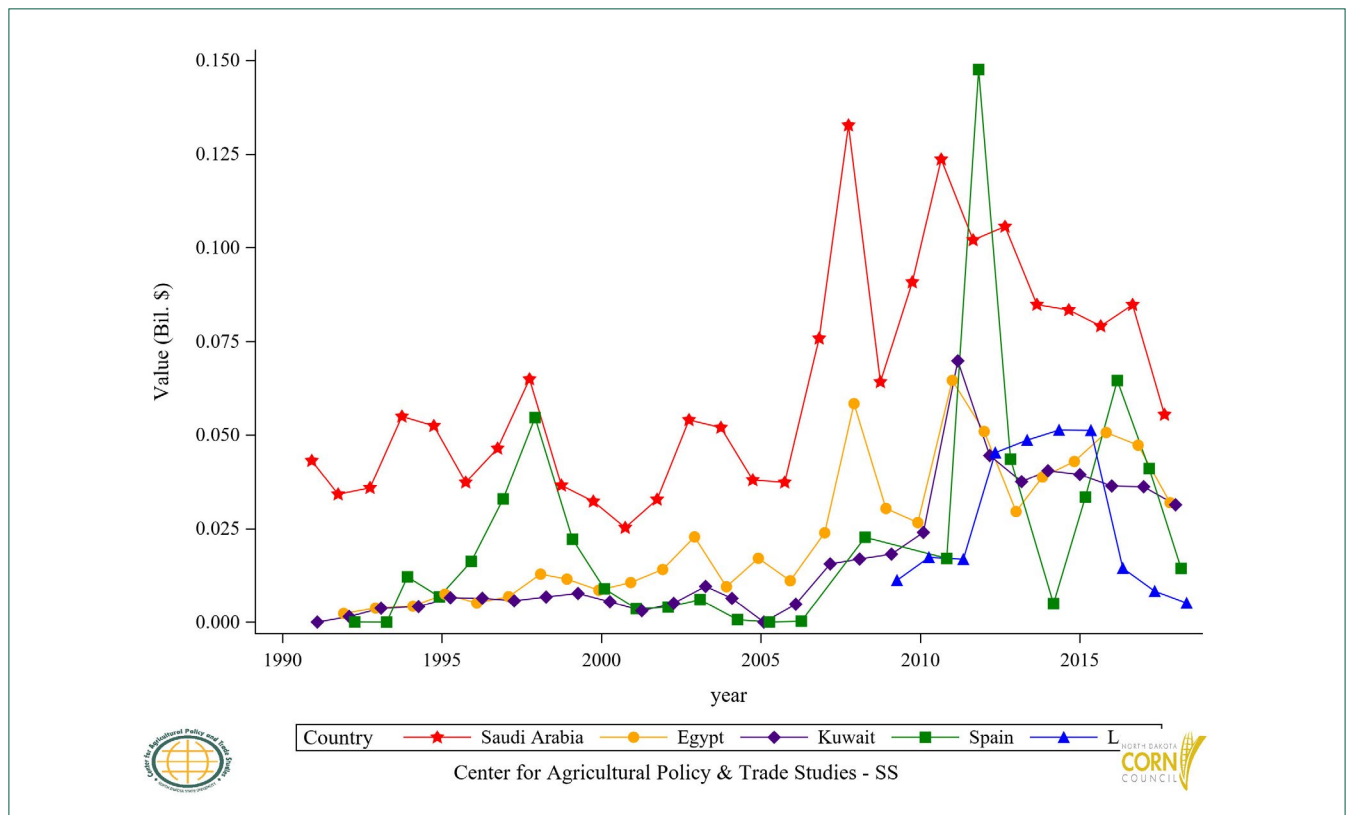


Figure 64: U.S. Corn Oil (CR) Export Value to Top 6 to 10 Countries, Annual Trends

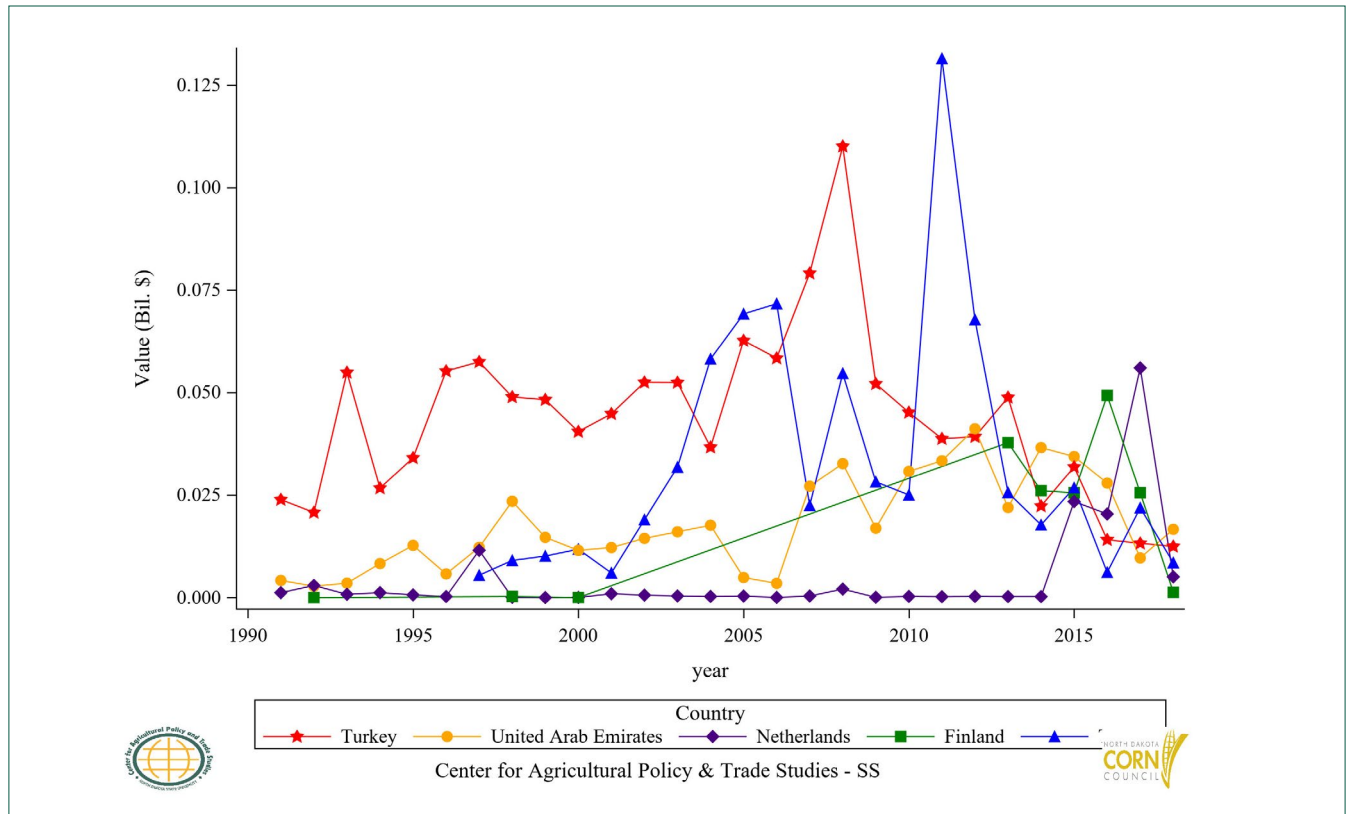
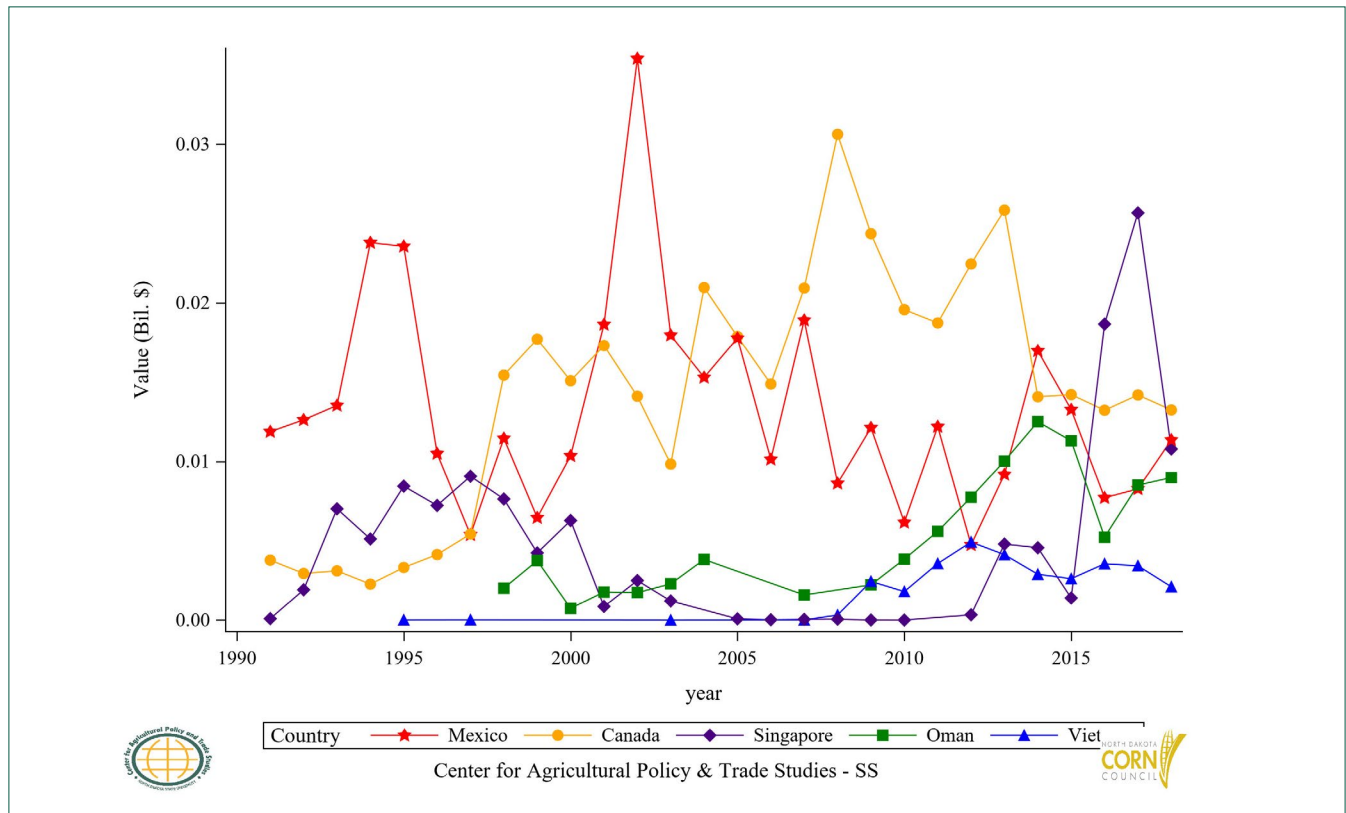


Figure 65: U.S. Corn Oil (CR) Export Value to Top 11 to 15 Countries, Annual Trends



■ Section VI

U.S. State Level Corn Export

Figure 66: U.S. Corn Excluding Seed Export Value of Top 5 States, Annual Trends

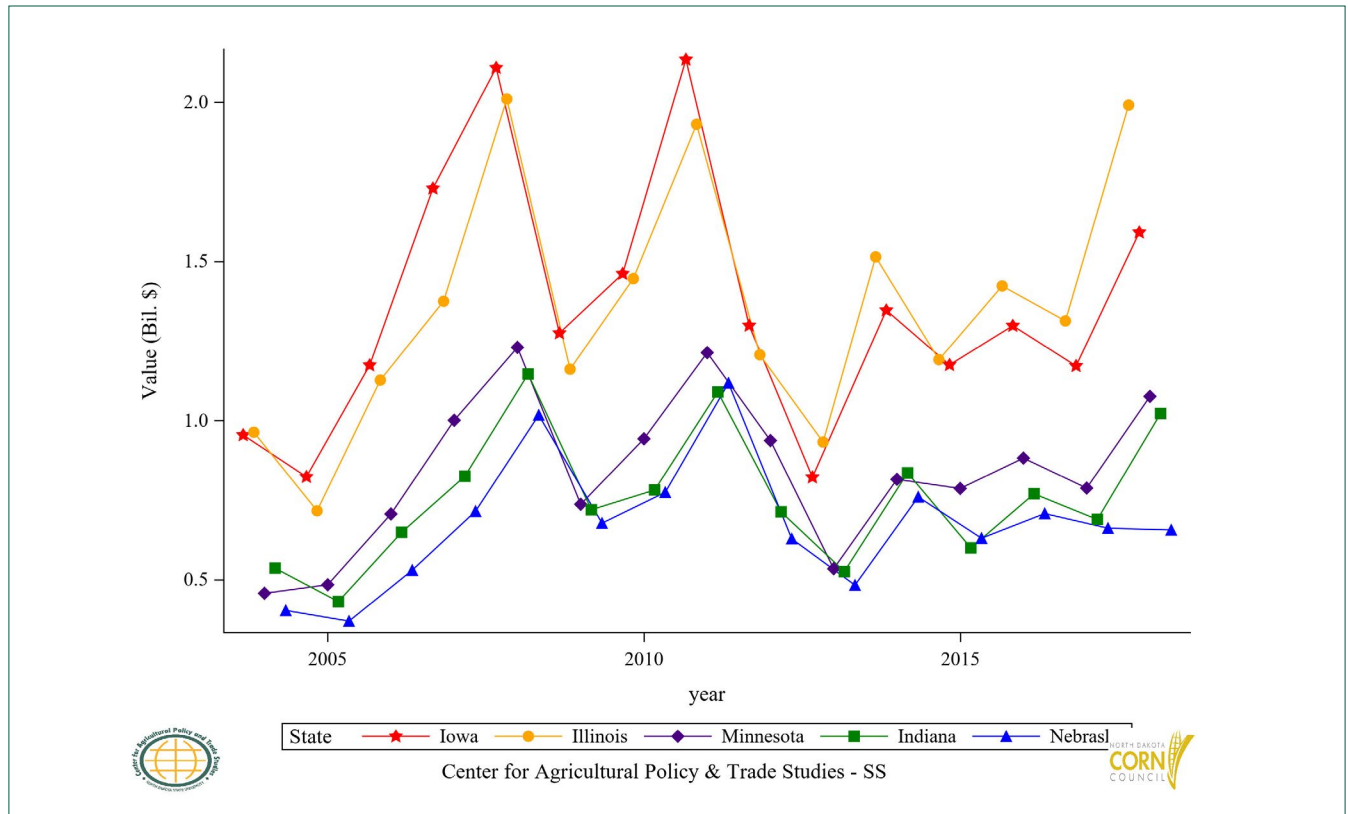


Figure 67: U.S. Corn Excluding Seed Export Value of Top 6 to 10 States, Annual Trends

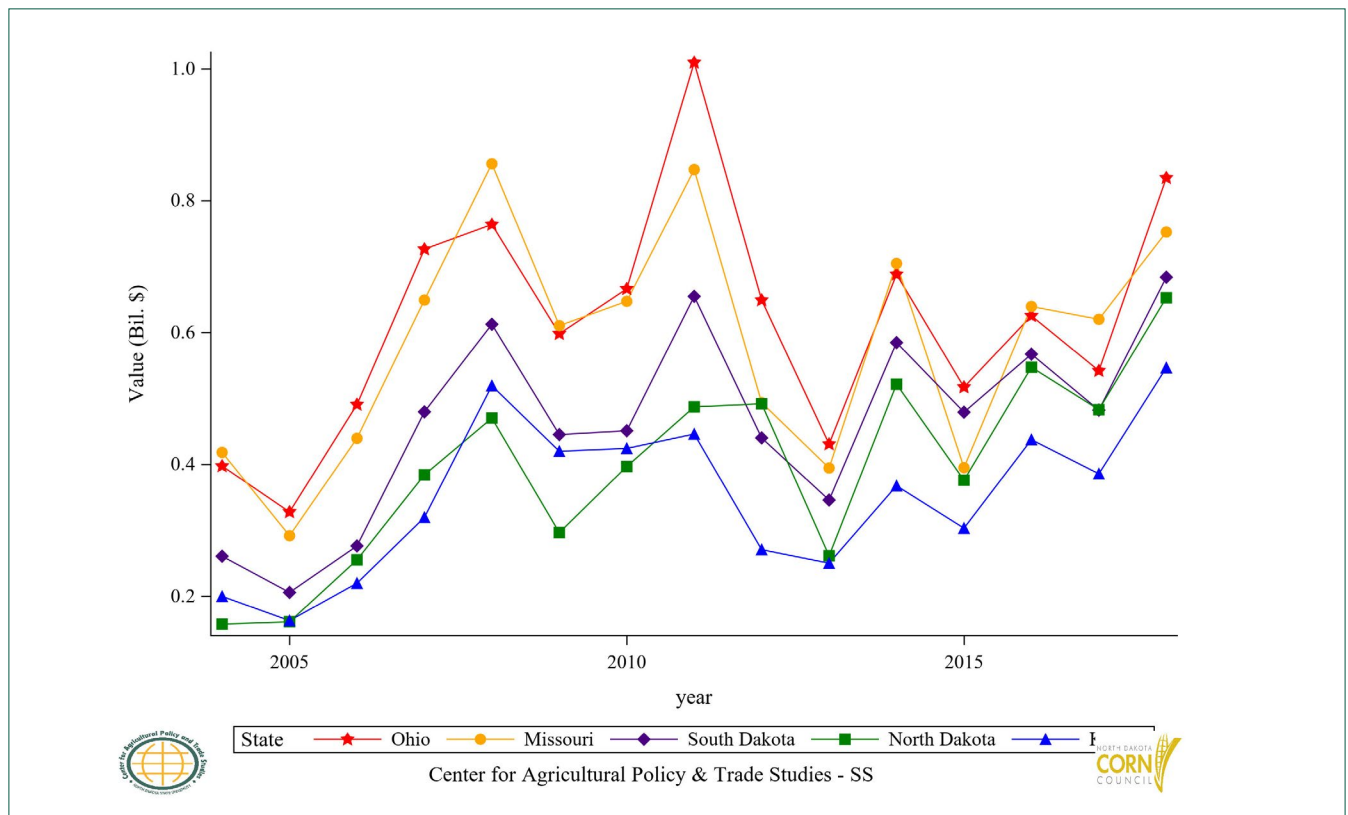


Figure 68: U.S. Corn Excluding Seed Export Value of Top 11 to 15 States, Annual Trends

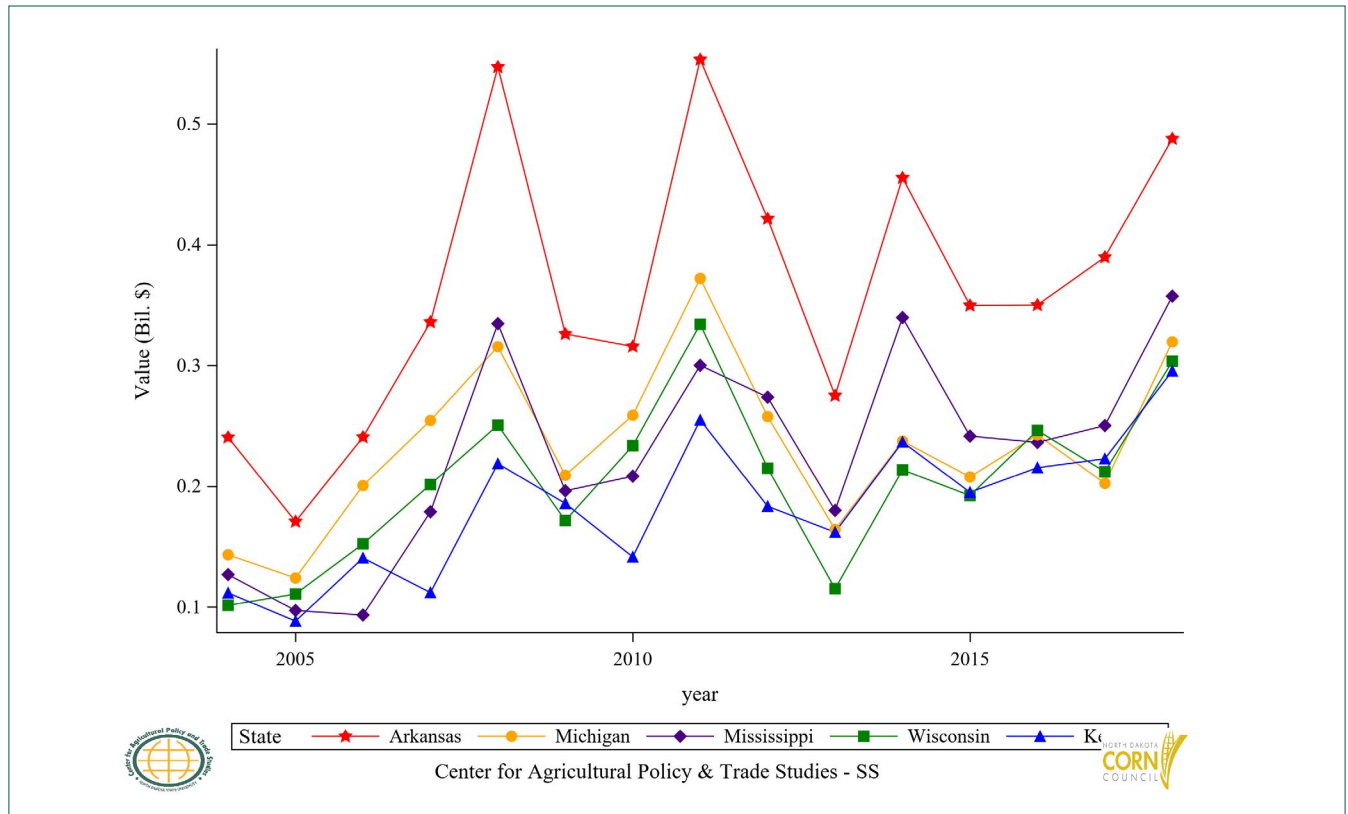


Figure 69: U.S. Corn Excluding Seed Export Value of Top 16 to 20 States, Annual Trends

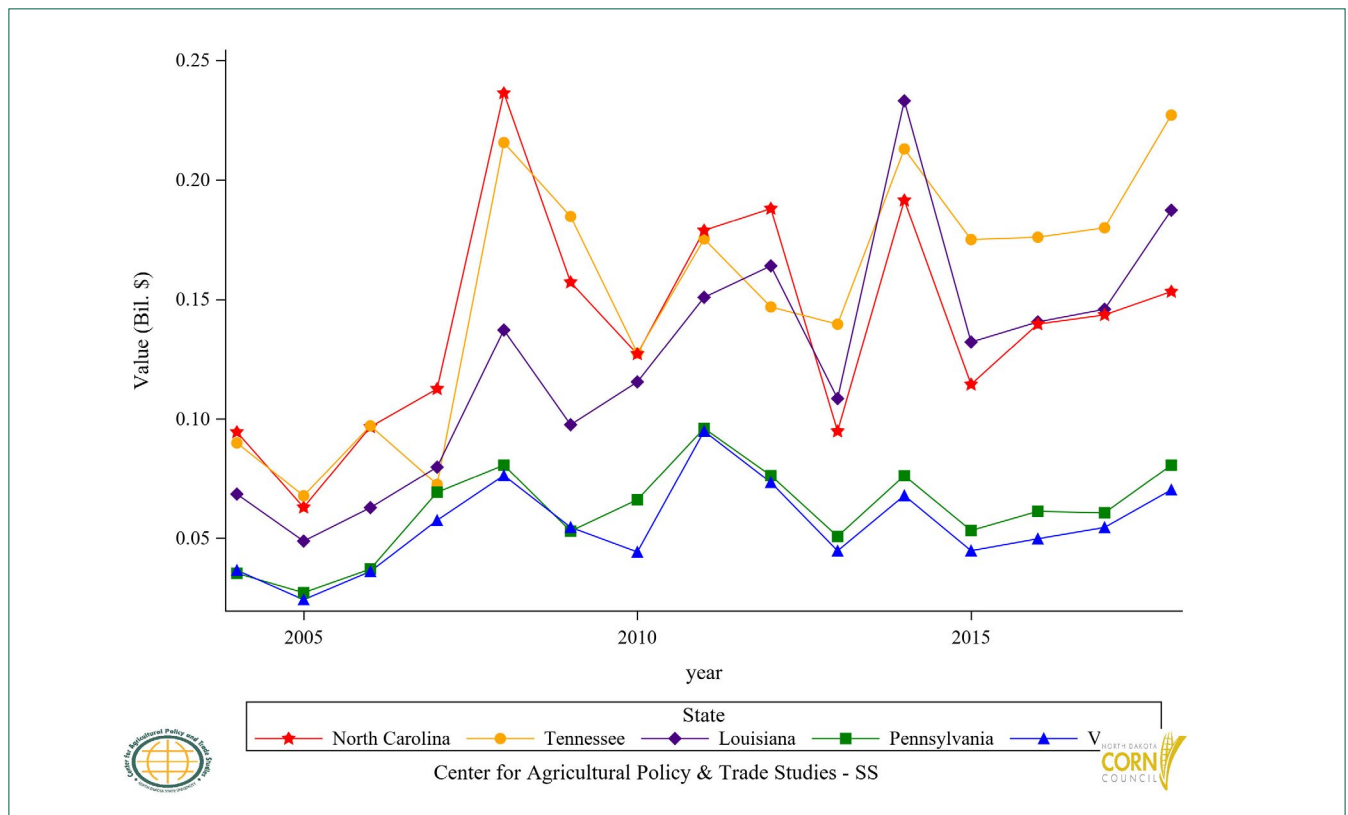


Figure 70: U.S. Corn Excluding Seed Export Value of Top 21 to 25 States, Annual Trends

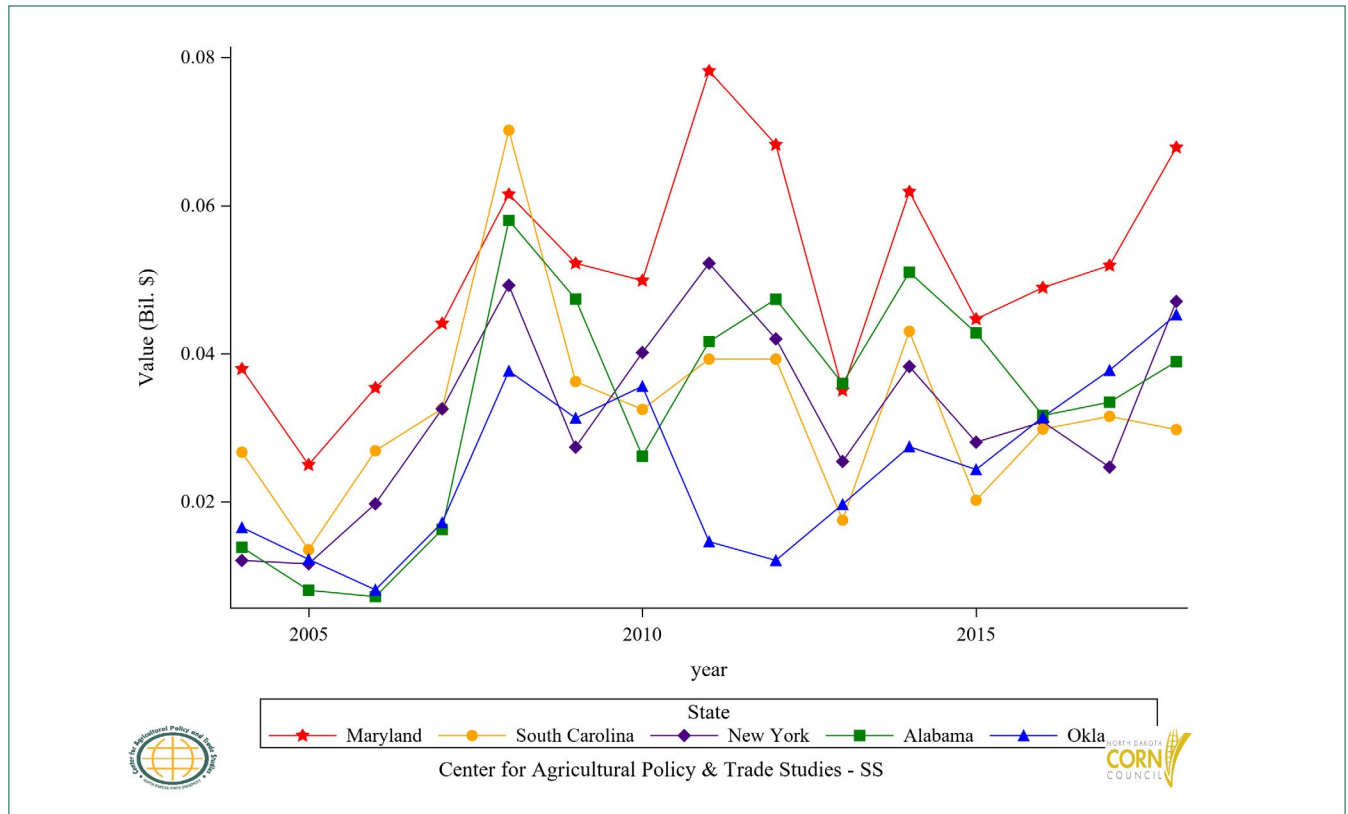


Figure 71: U.S. Corn Excluding Seed Export Value of Top 26 to 30 States, Annual Trends

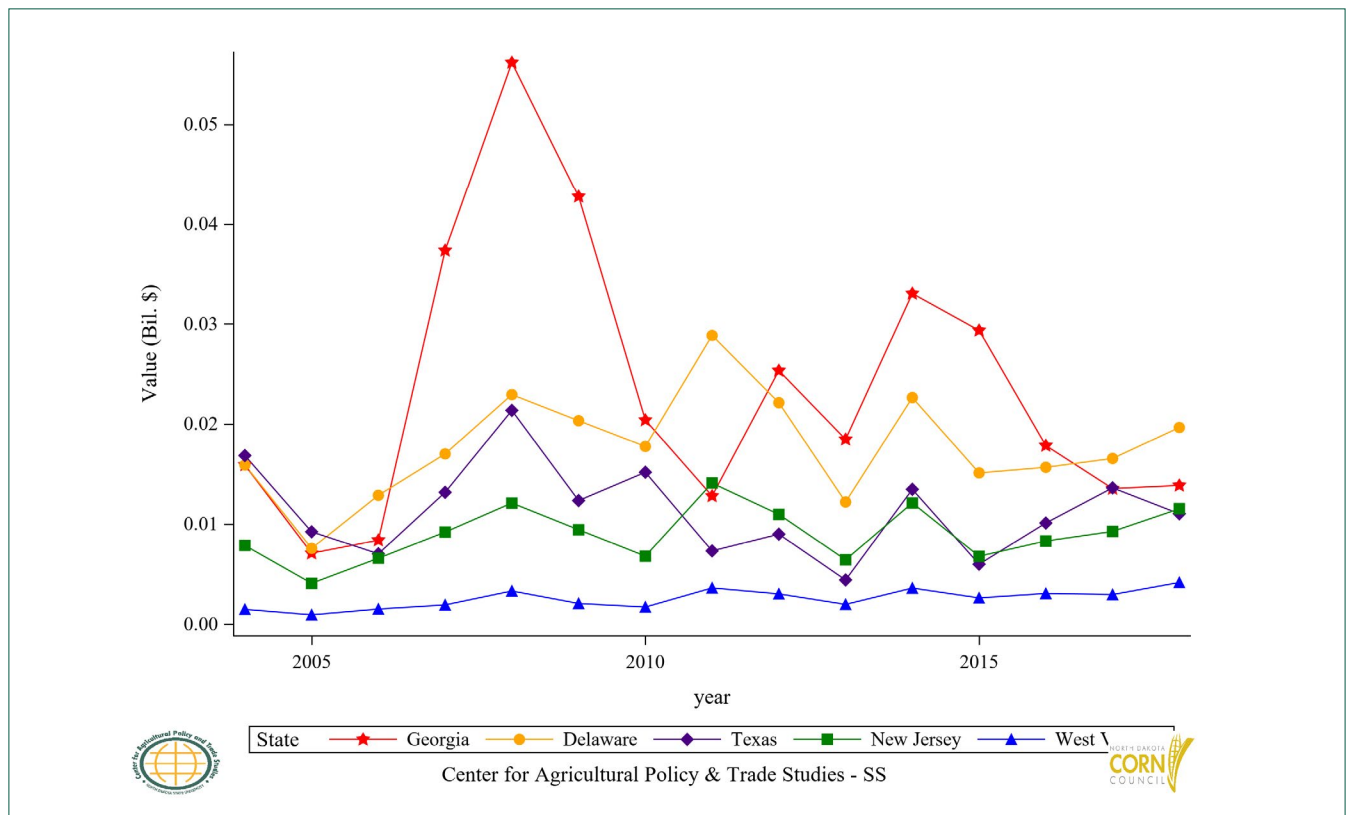


Figure 72: U.S. Corn Excluding Seed Export Value of Top 31 to 35 States, Annual Trends

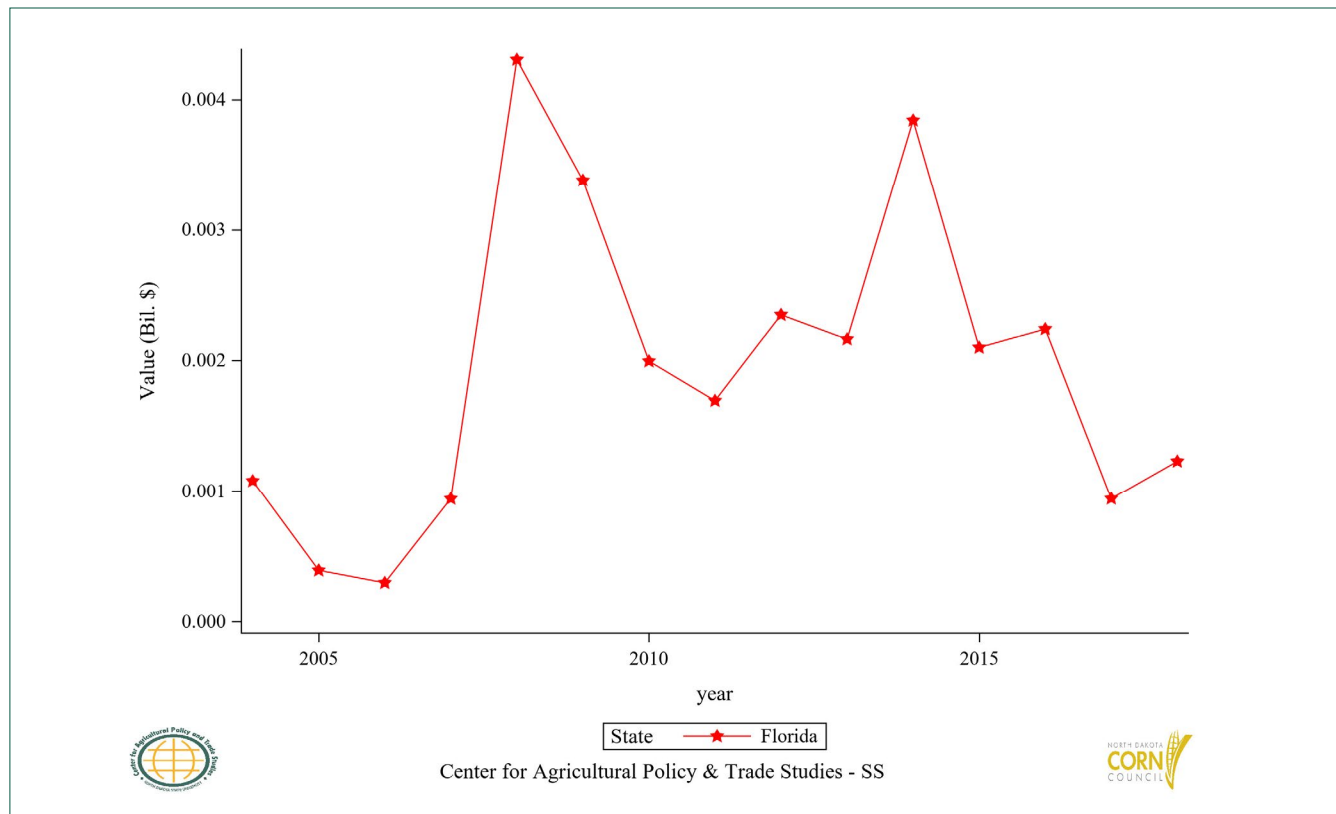


Table 1: NDSU Estimate of U.S. State Corn Grain Export Value, Annual Trends.

Reporter	2010	2011	2012	2013	2014	2015	2016	2017	2018
Alabama	26,173,819	41,624,953	47,364,118	35,959,929	50,999,370	42,810,036	31,639,862	33,447,903	38,908,101
Arkansas	315,905,196	553,447,252	421,672,458	275,154,152	455,478,630	349,854,895	350,231,958	389,774,431	487,852,592
Delaware	17,754,412	28,847,069	22,125,851	12,200,251	22,638,566	15,108,248	15,667,092	16,550,961	19,648,420
Florida	1,995,232	1,693,218	2,349,968	2,163,006	3,841,229	2,099,003	2,241,065	941,612	1,228,389
Georgia	20,391,589	12,804,964	25,333,170	18,463,191	33,041,081	29,357,229	17,840,202	13,545,536	13,857,638
Illinois	1,445,737,642	1,930,268,992	1,206,457,554	932,444,046	1,513,873,985	1,190,998,563	1,422,665,547	1,312,901,813	1,990,631,034
Indiana	781,481,199	1,089,199,446	712,654,856	525,798,116	835,408,747	599,749,072	769,565,993	688,944,458	1,021,985,329
Iowa	1,461,008,397	2,134,106,193	1,298,266,837	821,665,347	1,346,266,454	1,174,609,867	1,297,824,615	1,171,341,511	1,590,846,365
Kansas	423,986,846	445,802,459	270,374,988	249,853,515	367,245,651	302,874,948	437,262,800	385,456,381	546,299,461
Kentucky	141,628,365	255,026,058	183,478,257	162,039,127	236,770,815	195,113,920	215,502,864	222,910,176	295,551,266
Louisiana	115,431,676	150,850,368	164,016,994	108,476,351	233,055,186	132,159,791	140,599,531	145,885,057	187,367,273
Maryland	49,872,919	78,188,066	68,221,158	35,037,291	61,882,582	44,681,425	48,920,718	51,909,132	67,855,182
Michigan	258,936,979	372,206,251	257,803,521	164,256,081	237,545,843	207,853,648	242,708,435	202,470,065	319,720,746
Minnesota	942,557,952	1,213,096,926	937,049,668	534,524,354	815,171,220	786,441,506	881,927,125	787,575,250	1,075,605,748
Mississippi	208,406,343	300,161,446	273,813,215	180,075,797	339,818,569	241,652,448	236,442,040	250,365,779	357,517,627
Missouri	647,133,197	846,987,972	493,331,843	394,282,194	704,429,072	394,820,361	639,326,879	619,842,915	752,104,187
Nebraska	774,236,850	1,117,524,153	628,357,938	482,999,250	759,697,740	630,228,420	707,498,676	661,633,237	656,075,987
New Jersey	6,791,150	14,089,843	10,965,871	6,423,444	12,109,638	6,780,093	8,300,404	9,260,117	11,522,469
New York	40,133,084	52,202,223	42,003,953	25,454,584	38,251,969	28,042,495	30,802,806	24,680,383	47,058,648
North Carolina	127,127,049	178,838,356	188,027,553	94,832,009	191,475,508	114,408,266	139,684,460	143,532,703	153,266,833
North Dakota	396,507,583	486,941,396	491,640,383	260,959,447	521,351,099	375,775,531	547,032,540	482,727,166	652,594,412
Ohio	666,044,791	1,009,431,826	648,959,108	430,591,447	687,980,961	516,874,655	625,122,183	541,724,649	834,502,937
Oklahoma	35,586,899	14,607,572	12,085,549	19,643,798	27,446,884	24,356,622	31,431,825	37,748,520	45,279,602
Pennsylvania	66,128,936	96,027,433	76,273,241	50,788,305	76,205,266	53,256,241	61,272,211	60,621,223	80,636,100
South Carolina	32,461,824	39,251,881	39,254,362	17,511,790	43,029,362	20,193,139	29,815,118	31,532,941	29,748,813
South Dakota	450,777,374	654,624,891	439,915,697	345,542,142	584,494,016	478,880,468	566,929,811	482,002,574	683,630,369
Tennessee	127,542,657	175,273,761	146,852,330	139,636,357	212,959,264	175,002,208	175,988,731	179,941,107	227,118,441
Texas	15,173,228	7,311,625	8,985,829	4,405,294	13,466,275	5,979,872	10,101,106	13,615,939	11,026,809
Virginia	44,289,423	94,851,587	73,391,303	44,753,380	67,892,098	44,816,184	49,811,256	54,539,745	70,257,988
West Virginia	1,703,439	3,609,848	3,015,792	1,966,734	3,597,083	2,614,706	3,057,760	2,949,774	4,155,208
Wisconsin	233,697,685	334,335,098	215,112,439	115,312,605	213,654,808	192,398,740	246,274,267	212,194,841	303,474,308

Table 2: FAS Estimate of U.S. State Corn Grain Export Value, Annual Trends.

Reporter	2010	2011	2012	2013	2014	2015	2016	2017	2018
Alabama	34,716,607	.	9,754,265	6,419,243	23,848,117	46,955	21,780	11,000	24,945
Alaska	.	.	.	.	.	.	978,670	.	.
Arizona	.	26,034	25,501	9,912	23,961	.	34,164	25,907	33,574
Arkansas	.	4,596,593	4,706,259	5,963,638	10,594,436	184,999	.	.	3,707,450
California	38,608,040	31,562,613	22,223,909	37,129,983	19,354,187	13,409,608	15,081,212	12,092,151	11,733,298
Colorado	3,979,586	12,416,909	1,438,190	2,864,276	5,260,694	3,384,282	9,583,554	1,269,494	19,473,166
Connecticut	169,032,653	127,085,742	39,305	.	4,958	12,902	2,206,640	65,018	2,495,242
Delaware	.	.	.	.	30,720	4,536	.	6,737,278	1,550,223
Florida	3,377,652	7,266,910	2,121,445	15,910,852	1,873,905	2,949,063	3,752,378	1,733,719	5,010,728
Georgia	7,627,334	1,768,181	2,886,409	1,240,654	532,492	54,470	92,167	917,449	2,346,296
Hawaii	9,865	.	.	84,087	274,766	.	.	28,092	.
Idaho	2,658,367	401,556	101,489	603,057	2,141,683	91,812	68,299	26,237	3,260,095
Illinois	447,832,696	733,550,745	511,974,466	657,771,692	1,008,456,636	708,896,992	504,743,230	433,249,827	829,134,925
Indiana	41,767,638	35,116,977	38,787,756	46,659,489	61,681,087	79,216,473	55,823,850	67,394,533	44,161,064
Iowa	401,253,223	733,890,595	887,916,560	539,960,724	1,145,681,143	966,229,035	1,176,124,824	1,184,048,710	1,441,396,092
Kansas	215,900,047	249,707,330	106,868,939	255,179,408	281,136,247	212,769,600	304,939,213	217,675,627	194,918,897
Kentucky	7,519,770	8,764,309	7,422,900	1,331,335	2,321,019	14,061,614	2,903,478	3,405,043	3,129,965
Louisiana	4,989,696,005	7,190,836,624	4,710,476,567	3,283,377,169	5,404,078,218	4,020,538,238	4,493,936,202	4,185,334,437	4,894,774,277
Maine	.	.	4,726	6,484,895	635,223	183,740	45,925	.	45,421
Maryland	926,645	52,632	4,682,812	1,090,127	208,922	548,214	466,758	1,029,238	247,719
Massachusetts	20,703	.	23,895	23,947	9,186	.	.	32,181	.
Michigan	35,890,132	43,210,268	4,006,943	2,467,592	39,773,447	25,422,504	16,773,037	18,586,688	33,350,754
Minnesota	189,294,729	392,579,176	185,872,238	112,108,491	195,564,309	126,468,052	169,817,962	195,471,804	135,332,694
Mississippi	.	3,346,921	10,512,100	8,700,824	.	.	562,982	194,064	.
Missouri	134,462,425	177,689,176	262,892,377	109,883,441	167,811,191	231,982,780	231,742,083	247,670,341	263,937,162
Montana	982,941	519,192	788,697	714,944	628,472	1,528,062	2,600,857	2,569,082	19,973,642
Nebraska	438,284,353	646,853,697	574,637,247	144,176,236	194,659,736	229,580,529	343,966,130	429,565,846	447,420,498
Nevada	57,400	40,654	.	.	69,750	.	.	.	.
New Jersey	411,124	1,039,736	2,092,023	1,108,810	926,434	918,590	225,282	349,435	226,330
New Mexico	3,365,531	3,342,966	5,754,203	5,784,317	3,278,652	3,495,337	3,943,659	4,222,355	7,073,855
New York	130,492,731	46,305,410	54,802,562	4,827,621	4,862,019	4,174,000	7,285,873	1,523,473	3,471,391
North Carolina	630,530	552,510	17,117	6,261,191	3,187,624	1,294,031	842,911	19,224	939,198
North Dakota	82,289,805	59,113,932	84,033,573	75,667,677	27,735,598	82,134,314	89,292,071	69,436,021	134,183,209
Ohio	34,274,110	33,769,085	32,877,932	96,459,078	87,965,749	65,688,228	97,358,974	54,807,083	47,377,789
Oklahoma	.	861,596	.	283,284	.	.	.	5,421,991	2,691,606
Oregon	77,072,958	96,191,789	75,234,342	57,863,558	22,377,766	12,094,924	56,731,521	72,723,213	149,612,067
Pennsylvania	991,163	1,145,742	1,248,835	2,532,065	2,339,283	606,763	346,061	749,611	1,124,755
Puerto Rico	26,815	15,820	19,579	56,937	5,339	31,074	15,091	10,551	66,150
South Carolina	385,804	16,962	.	667,534	590,036	1,562,763	14,647,217	60,225	168,295
South Dakota	4,230,703	23,807	357,281	18,420,405	172,819	6,719,014	7,429,689	14,121,965	8,915,985
Tennessee	20,334	189,952	16,343	552,998	.	4,874,654	.	133,063	16,813
Texas	326,451,305	343,512,660	88,331,351	84,988,821	73,342,649	62,671,607	172,194,405	112,711,758	95,493,871
Utah	230,557	20,999	28,008	123,968	52,784	107,629	110,677	25,748	.
Vermont	69,468	58,525	202,243	79,116	162,562	479,712	80,367	50,746	.
Virgin Islands	490,474	.	.	.	.	.	.	.	.
Virginia	108,866,765	103,838,847	46,113,415	57,835,210	145,630,111	58,718,198	51,190,704	10,763,586	24,687,480
Washington	1,944,958,439	2,599,445,013	1,649,271,071	834,818,481	1,751,248,565	1,418,342,789	2,103,228,076	1,880,065,016	3,713,992,731
West Virginia	.	.	.	.	.	.	12,029,211	.	.
Wisconsin	39,906,647	54,045,107	18,302,810	8,185,282	12,315,858	25,241,992	42,361,311	13,459,499	24,022,254
Wyoming	.	.	224,474	.	.	.	.	.	.

Table 3: ERS Estimate of U.S. State Corn Grain Export Value, Annual Trends.

Reporter	2010	2011	2012	2013	2014	2015	2016	2017	2018
Alabama	27,024,048	33,465,421	25,542,396	20,488,604	37,042,412	26,234,117	28,648,344	27,960,699	41,445,189
Arizona	3,967,449	6,374,915	5,457,336	4,549,638	8,375,551	5,379,481	8,365,372	7,682,691	6,137,702
Arkansas	49,090,535	68,768,877	81,832,625	82,648,534	125,816,844	64,286,419	84,418,410	82,827,320	112,105,289
California	30,774,195	35,553,039	24,445,317	19,131,040	26,477,543	10,302,699	12,605,373	14,502,037	13,873,032
Colorado	134,275,543	189,940,571	125,561,917	69,902,496	106,002,056	87,452,804	104,535,901	100,295,455	151,867,083
Delaware	18,714,486	24,776,806	19,397,123	14,235,354	23,392,682	19,015,509	22,509,019	20,752,688	27,271,843
Florida	2,696,596	3,298,976	3,399,730	3,859,034	6,667,417	3,535,254	4,558,462	4,117,492	8,106,369
Georgia	42,486,634	49,519,449	46,018,107	41,116,308	64,315,258	34,221,725	41,318,553	36,993,417	51,109,338
Idaho	15,130,558	24,859,493	20,874,637	14,594,609	16,546,546	10,480,701	14,302,983	16,028,094	26,468,806
Illinois	1,670,923,501	2,290,903,223	1,459,146,653	806,865,745	1,820,489,328	1,336,373,673	1,565,070,870	1,413,486,544	2,002,812,469
Indiana	725,770,816	1,110,404,375	630,353,015	399,500,134	895,922,307	640,048,512	642,046,825	664,564,484	875,156,364
Iowa	1,720,966,660	2,489,273,252	1,728,165,656	1,090,663,768	1,587,676,202	1,414,348,888	1,790,825,953	1,587,508,590	2,127,909,904
Kansas	517,672,344	481,251,584	312,863,253	210,789,938	381,054,651	328,070,084	439,366,277	407,907,151	575,274,821
Kentucky	123,590,909	178,530,045	108,422,962	80,093,277	172,870,288	131,940,819	162,033,242	139,563,454	191,247,546
Louisiana	68,331,899	83,088,229	72,164,000	60,747,621	90,845,057	48,019,574	62,796,547	63,606,089	82,553,118
Maryland	45,306,196	50,812,188	38,559,545	31,097,326	53,705,709	40,400,108	46,315,825	44,469,073	60,094,745
Michigan	234,848,164	371,839,222	244,990,716	163,535,729	251,429,326	210,344,330	220,921,598	193,148,860	257,504,272
Minnesota	885,222,212	1,221,042,237	933,955,362	800,128,092	904,054,061	717,176,983	914,941,961	885,069,741	1,166,982,734
Mississippi	78,155,567	101,277,746	96,914,750	83,172,665	113,730,524	62,003,165	81,771,138	75,972,368	88,936,507
Missouri	319,344,193	433,472,686	252,011,429	167,657,414	394,614,633	324,338,887	345,841,750	351,493,070	461,030,916
Montana	3,963,329	5,461,011	4,302,325	3,903,555	6,172,052	4,134,342	4,359,079	3,657,015	4,227,092
Nebraska	1,131,439,252	1,780,512,900	1,093,752,645	769,433,157	1,183,510,547	1,009,979,840	1,142,887,072	1,036,755,432	1,476,573,551
New Jersey	7,399,574	9,832,301	7,917,101	5,675,013	8,784,081	6,828,831	7,673,149	7,130,398	9,280,180
New Mexico	9,262,392	11,040,395	6,732,736	4,249,816	6,995,717	5,833,634	5,725,940	4,213,708	6,194,439
New York	70,358,466	97,987,909	65,464,368	49,088,507	78,157,306	58,498,517	61,099,572	50,499,487	82,986,964
North Carolina	73,179,676	93,806,799	83,858,032	60,327,443	97,399,608	66,335,737	99,124,184	96,182,364	115,582,651
North Dakota	145,901,268	244,165,538	211,819,714	188,068,586	252,243,472	154,252,368	249,378,399	251,331,038	337,701,587
Ohio	395,285,758	532,541,178	389,027,894	291,136,919	438,183,234	349,886,146	371,141,487	336,596,567	507,306,728
Oklahoma	30,720,230	28,087,532	18,851,169	20,071,621	36,467,789	25,106,826	27,550,151	24,434,706	34,779,958
Oregon	6,613,170	10,977,727	9,438,968	5,673,628	6,437,606	4,662,370	5,419,768	6,689,724	8,809,125
Pennsylvania	118,367,643	113,871,124	102,234,370	69,218,388	109,900,480	87,414,811	115,186,436	80,540,135	132,728,790
South Carolina	32,508,280	31,133,661	27,473,147	24,617,851	33,345,436	19,583,992	27,078,923	33,736,870	48,226,270
South Dakota	400,942,802	642,687,491	441,765,029	302,477,359	546,556,048	413,516,664	487,981,462	438,953,969	581,696,212
Tennessee	55,989,389	90,852,278	68,739,959	60,981,728	94,613,521	69,838,802	88,230,406	76,420,443	101,668,979
Texas	255,994,777	177,625,498	191,104,260	124,699,352	254,132,658	187,737,634	248,083,790	202,104,965	249,160,924
Utah	2,987,842	5,279,754	4,660,389	3,544,726	4,737,436	2,707,858	3,082,905	3,154,730	3,770,815
Virginia	26,513,235	30,892,129	30,035,844	22,847,459	42,559,417	29,424,623	37,938,164	34,109,932	46,266,312
Washington	23,478,019	28,604,105	19,790,359	13,959,922	22,506,659	16,940,863	16,482,417	16,845,031	19,591,403
West Virginia	2,629,655	3,281,350	2,973,907	2,606,808	4,178,937	3,102,207	3,788,901	3,422,775	4,800,803
Wisconsin	278,715,846	457,147,150	295,830,851	193,495,433	267,739,262	236,248,123	276,702,259	261,658,973	358,823,588
Wyoming	5,444,892	7,956,839	7,206,404	4,817,402	6,250,339	4,984,076	6,471,134	6,076,421	8,784,582

Table 4: NDSU, FAS and ERS Corn Excluding Seed Export Value for North Dakota.

Year	NDSU	FAS	ERS
2004	157,304,687	12,171,791	71,136,990
2005	160,848,513	4,134,773	49,821,539
2006	254,917,151	14,886,252	94,574,977
2007	383,898,233	73,701,411	145,898,482
2008	469,903,563	182,966,287	275,387,915
2009	296,128,345	80,522,948	168,867,945
2010	396,507,583	82,289,805	145,901,268
2011	486,941,396	59,113,932	244,165,538
2012	491,640,383	84,033,573	211,819,714
2013	260,959,447	75,667,677	188,068,586
2014	521,351,099	27,735,598	252,243,472
2015	375,775,531	82,134,314	154,252,368
2016	547,032,540	89,292,071	249,378,399
2017	482,727,166	69,436,021	251,331,038
2018	652,594,412	134,183,209	337,701,587

