

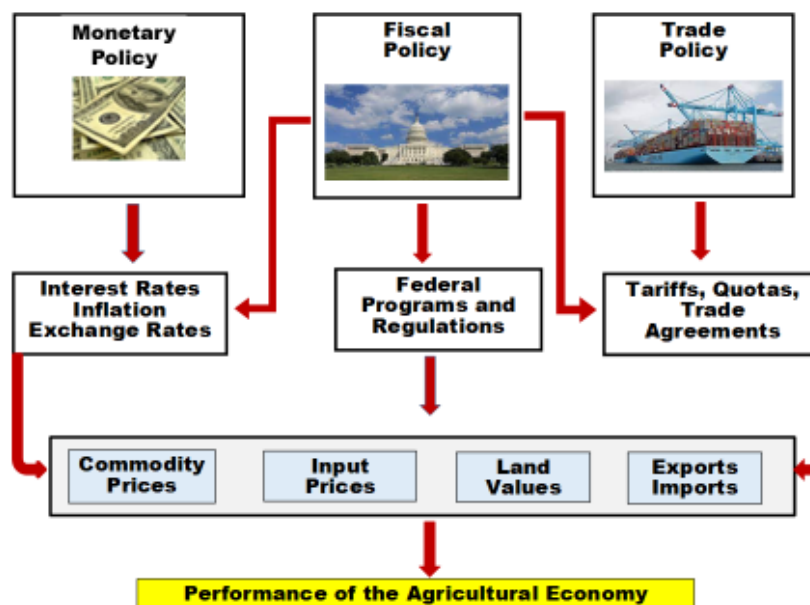
Examining How Macroeconomic Policy Changes Impact the Farm Economy¹

Author: William M. Snell. Publication Date: May 12, 2021. Publication Number: AEC 2021-02.

Farmers and agribusinesses closely monitor changes in commodity and input prices, crop yields, rates of gains on livestock, the latest technology, and of course, the weather. However, changes in macroeconomic variables such as interest rates, inflation, income growth, and exchange rates, often have a much greater impact on their bottom line. To assist ag producers and farm businesses to become better managers and perhaps to aid them in influencing policymakers, this fact sheet presents some basic economic principles and graphical analyses to illustrate the potential impacts of macroeconomic policy changes can have on important variables such as farm prices, operating expenses, income, land values, and trade.

What is Macroeconomics?

Macroeconomics refers to the behavior and performance of an economy as a whole instead of isolating on individual businesses or sectors. Governments attempt to influence the performance of an economy through various policy changes such as adopting federal domestic programs, enacting trade agreements, changing tax laws, or by altering the supply of money available in the economy. Varying macroeconomic policies affect incomes, prices, employment, interest rates, and exchange rates -- all of which influence the agricultural economy. There are three dimensions to macroeconomic policy: monetary policy, fiscal policy, and trade policy. Since many of these policies are closely related and interdependent, macroeconomic policy is often described as a "policy mix" of monetary, fiscal, and trade policies. In the United States, the three main actors setting the macroeconomic agenda (i.e., policy mix) are the President (executive branch), the Congress (legislative branch) and the Federal Reserve Bank -- the nation's central bank whose day-to-day actions are generally independent of the executive and legislative branches of government.



¹ This fact sheet draws upon an earlier version titled [Macroeconomic Policy Linkages to Agriculture](#) by William M. Snell, Mary A. Marchant, and Craig L. Infanger AEC 71, Department of Agricultural Economics, University of Kentucky, March 1991.

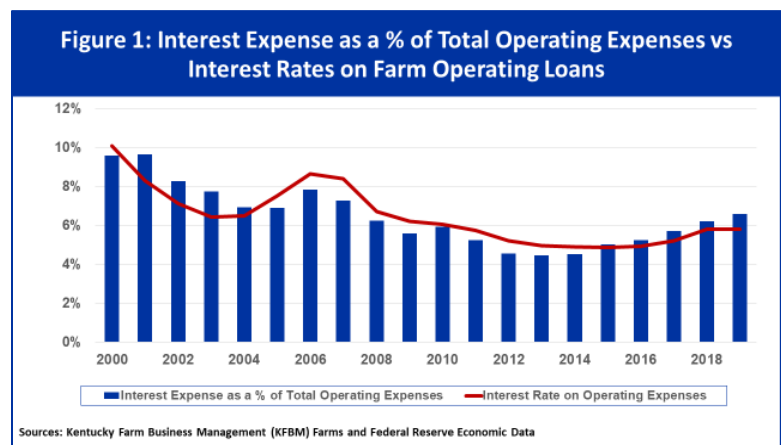
Monetary Policy

The Federal Reserve Bank, often called "The Fed", establishes the nation's monetary policy, which influences the supply of money available in the economy and ultimately affects inflation and interest rates. Inflation refers to a general rise in prices of goods and services in an economy. Economists distinguish between two types of inflation: demand-pull inflation (occurs when the demand for goods and services exceeds supply) and cost-push inflation (occurs when prices of inputs used to produce goods and services increase).² Inflation can initially appear beneficial to agriculture by boosting commodity prices and land values. However, inflation may cause farm input prices to rise more than commodity prices, especially given the level of competition in today's input and commodity markets. The Fed often intervenes further in financial markets to counter inflationary pressures in the general economy which can have long-term adverse implications on the farm economy, such as higher interest expenses and lower land values. Deflation, a general fall in prices, can appear beneficial to consumers, but is a sign of a weak economy, leading to losses in jobs and asset values. In the ag world, consumers do not respond much to falling food prices by buying more food to help offset declining ag commodity prices. Ultimately, decision-makers at the Federal Reserve attempt to develop a balance of policies that result in a growing economy with an "acceptable" level of inflation.

The Fed impacts the money supply by buying and selling government securities, changing the discount rate which refers to the interest rate the Fed charges commercial banks and other financial institutions for loans, and changing the reserve requirement, which is the amount of funds the Fed requires banks to hold to meet liabilities (i.e., withdrawals). Actions by the Fed to purchase government securities and/or lower the discount rate or reserve requirement will effectively increase the money supply and will have a tendency to lower interest rates, holding all other factors constant. Alternative actions will put upward pressure on interest rates. Recently amidst the Covid-19 pandemic, the Fed utilized a mix of these tools to keep interest rates at historical lows to provide financial and economic support for a fragile U.S. economy.³

Interest Rates – Impacts on Operating Expenses and Land/Asset Values

Interest rates are an important economic variable for many farming operations as producers need access to capital for operating loans or purchasing land and equipment. Lower interest rates could increase producer's overall interest expenses and total debt by enticing them to purchase new or replaceable assets or could simply reduce interest expenses if debt is financed by variable interest rates or encourage refinancing at a lower rate. For example, the interest expense on a \$100,000 tractor financed at 4% is approximately \$10,500 versus nearly \$16,000 with a 6% loan. A review of data from Kentucky Farm Business Management (KFBM) farms in Figure 1 illustrates that lower interest rates have generally led to interest accounting for a reduced share of total operating expenses since 2000.



Changes in interest rates also affect land values. Rising interest rates put downward pressure on land prices for two major reasons. First, higher interest rates boost the financing costs of real estate purchases, making it more expensive to finance

² Inflation is generally measured by two indices; the *Consumer Price Index (CPI)* which is calculated based on price changes from a very broad collection of goods and services **bought** by urban consumer in the economy and the *Gross Domestic Product (GDP) Deflator*, which measures price changes of good and services **produced** in the economy. Changes in food prices contribute to the level of inflation/deflation, receiving approximately 14% weight (relative share) of the CPI. Consequently, changes in commodity prices impact the inflation rate, but given the farm value only comprising 14% of the retail U.S. food dollar, changes in the costs of other marketing inputs such as labor, transportation, packaging, processing storing, etc., collectively having a much greater impact on food prices and overall inflation than changes in farm commodity prices.

³ See [The Federal Reserve's Response to COVID-19](#) for specific monetary policy actions.

farmland. Second, higher interest rates signal higher returns on alternative investments, thereby making these alternative assets more attractive than investing in farmland. A simple expression to estimate the current value of an asset such as land is:

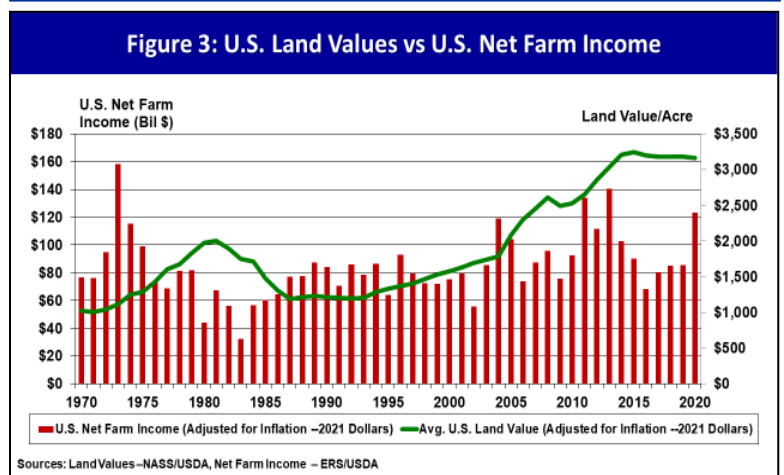
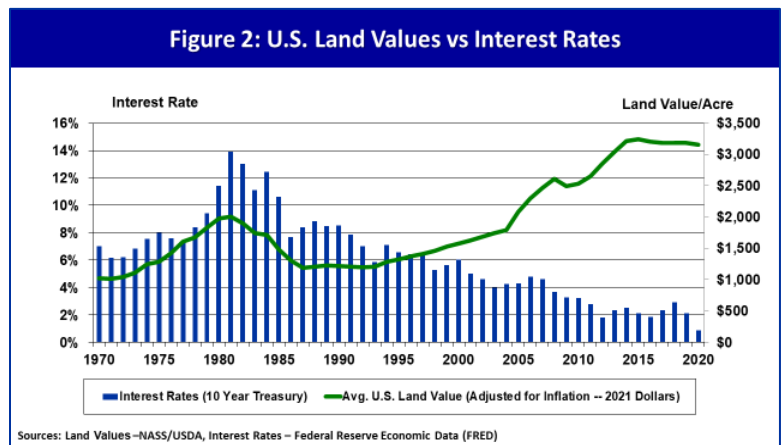
$V = R/I$, where:

V is the current (or present) value of a unit of land,
R is the expected return per unit of land in each future time period,
I represents the discount (or interest) rate.

This expression estimates current land values by "discounting" expected future returns per unit of land (**R**) into today's dollars. Anticipated cash rent for a specific parcel of land is often used as a proxy for the expected return. The discount rate reflects the "opportunity cost" of money, or what an individual could earn by investing this money in other assets such as stocks or bonds instead of land. The current interest rate on ten-year government securities or bonds is often used as the discount rate.

For example, assume that a farmer expects an acre of farmland to generate (either through renting or growing crops or livestock) \$250 annually and the current rate of interest is 5%. According to the above equation, the value of this acre would be $(\$250/.05)$ or \$5,000. If the interest rate falls to 4%, then the value would increase to \$6,250/acre. Conversely, an increase in the interest rate to 6% would cause the value of land to fall to \$4,167/acre. Therefore, land prices typically vary inversely with interest rates.⁴

Figures 2 and 3 compare U.S. land values (green line in both charts, measured on the right vertical axis) versus interest rates (10 year Treasury note measured on the left vertical axis in Figure 2) and net farm income (a proxy for net earnings measured on the left vertical axis in Figure 3) over the past 50 years. Land values increased during the 1970s in response to a strong ag economy and overall inflation in the general economy. Inflationary pressures eventually led the Fed to boost interest rates to double digit levels in the early 1980s to slow down soaring prices in the economy, which took its toll on land values and eventually led to a major farm financial crisis. Once the economy stabilized in the mid-80s, land values increased fairly steadily during the 1990s through the mid-2010s (with a brief adjustment during the Great Recession in 2008-2009) as interest rates fell and the farm economy rebounded due primarily to trade gains and an ethanol boom. Since 2015, farmland values have been remarkably stable as record low interest rates offset a struggling farm economy. Entering 2021, land values started trending upward as government payments and trade gains induced significant gains in 2020 net farm income, commodity price forecasts improved, and interest rates remained at historically low levels.



⁴ Alternatively, economists evaluating the farmland market might examine changes in the capitalization rate which is calculated as the ratio of cash rents to farmland values. For example, if cropland is renting for \$200/acre and selling for \$6000/acre, the capitalization rate is 3.3%. The capitalization rate provides an estimate of the annual rate of return a buyer expects to receive on farm real estate.

Real vs nominal prices

Economists prefer to express prices and incomes in real or inflation-adjusted values. Inflation erodes the purchasing power of producers and consumers. If grain prices increase 5%, but prices of all other foods and services in the economy increase by 6%, grain producers have experienced a loss of purchasing power, or what economists refer to as a reduction in real (inflation-adjusted) prices.

Nominal prices refer to what is observed in the marketplace, such as the price offered by the local grain elevator or the winning bid at a local stockyard for a group of cattle. Real prices are nominal prices adjusted for inflation. Economists calculate real prices by simply dividing the nominal prices by a general price index, such as the Consumer Price Index (CPI) or the Gross Domestic Product (GDP) price deflator and multiplying by 100.

Table 1 presents the data to calculate the real price for corn expressed in 2020 dollars. For example, corn farmers received an average price of \$1.33/bushel for their corn in 1970. However the real price of corn in 1970, if expressed in today's inflated dollars was much higher -- \$6.96/bushel which is calculated by dividing the nominal price of corn in 1970 (\$1.33) by the selected price index value in 1970 (19.1) and multiplying by 100.

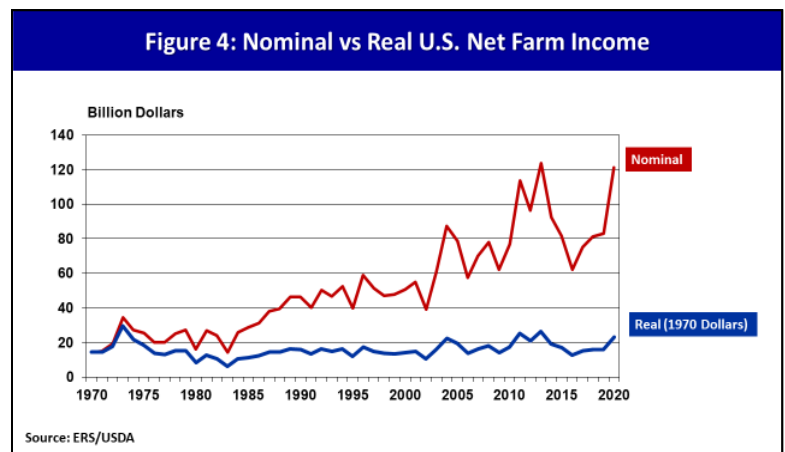
Table 1: Nominal vs Real Corn Prices

Marketing Year	Average (Nominal) Corn Price (\$/bu)	GDP Price Deflator (2020 = 100)	Real Corn Price (Expressed in 2000 \$/bu)
1970	\$1.33	19.1	\$6.96
1980	\$3.11	37.2	\$8.36
1990	\$2.28	56.0	\$4.07
2000	\$1.85	68.7	\$2.69
2010	\$5.18	84.6	\$6.12
2020	\$4.20	100	\$4.20

While the data reveal the (nominal) prices farmers have received for corn has more than tripled over the past fifty years, the real price from 1970 to 2020 declined. This tells us that the rate of inflation has exceeded the gain in the market price of corn, which would indicate that the purchasing power of corn farmers has deteriorated, holding all other factors constant. However, "all other factors" have not remained constant over this time frame. What is missing from that conclusion alone is that it does not take into account the gains in corn yields, which have increased by more than 140% during this time frame compared to a 40% reduction in real prices. This is in comparison to burley tobacco where both real prices and yields have declined over the past couple of decades, thus reducing the profitability of raising this crop even without taking into account the significant increase in labor and other production costs.

Referring back to Figures 2 and 3, land values (green line) are expressed in inflation-adjusted values. The positive slope for real land values over the past 50 years implies the nominal (observed) land values have increased at a greater rate than prices of all other goods and services in the economy, indicating that land investments have been an effective hedge (i.e., protection) against inflation.

Figure 4 illustrates changes in nominal versus real U.S. net farm income over the past 50 years. While nominal farm income in 2020 challenged the record level established in 2013, it was below the record inflation-adjusted level in 1973 when the farm economy experienced a boom in U.S. ag exports and worldwide ag commodity shortages. Clearly, Figure 4 shows that despite nominal net farm income increasing dramatically over the past 50 years, inflation has eroded the purchasing power of U.S. farmers by keeping real net farm income relatively flat.



Fiscal Policy

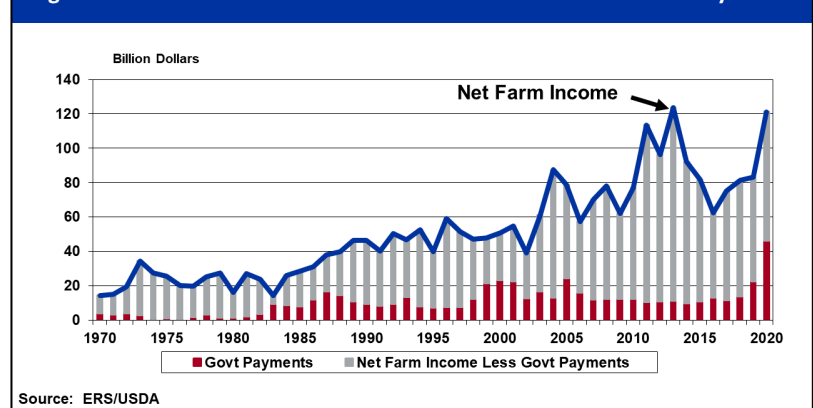
The legislative and executive branches of government develop policies and regulations as part of the nation's fiscal policies. Since their development in the 1930s under President Roosevelt's New Deal, farm programs have been an important source of revenue and support for U.S. agriculture. These programs have varied considerably over time, including direct government payments evolving from Farm Bill price and income support programs, acreage set-asides/quotas to reduce supplies and improve prices, and rental payments on land retirement programs. More recent programs outside the Farm Bill have included trade assistance within the Market Facilitation Program (MFP), Coronavirus Food Assistance Program (CFAP) payments and emerging federal programs to provide financial incentives to ag producers for adopting practices to improve the environment.

Over the past 50 years, direct government payments have averaged 21% of U.S. net farm income. Payments ranged from less than 2% in 1974 when farm markets were exceptionally strong, to 65% in 1983 when a severe drought significantly reduced crop yields and parched pastures. After trending downward for many years following the 1983 drought, government payments increased to nearly 50% of net farm income in the late 1990s as an attempt reduce government involvement in agricultural markets under Freedom to Farm (1996 Farm Bill) led to global oversupplies and depressed commodity prices. Government payments in response to trade losses and the Coronavirus led to record high government payments in 2020, representing around 40% of net farm income. (Figures 5-6)⁵

Besides providing direct payments to farmers, government programs can also have significant impacts on farm commodity prices. Historical examples include supply control measures such as quotas or land-retirement programs, development of risk management tools like crop insurance, programs to boost production of renewable fuels (ethanol and biodiesel), direct purchasing of surplus food commodities, and trade agreements – all of which affect the supply and demand for ag commodities and thus farm prices. In addition, the U.S. Congress have enacted fiscal policies over the years to provide agriculture with beneficial tax laws (e.g., depreciation expensing, capital gain tax rates, allowable deductions, estate tax exemptions) and programs to support rural economies such as funding for rural broadband and transportation infrastructure.

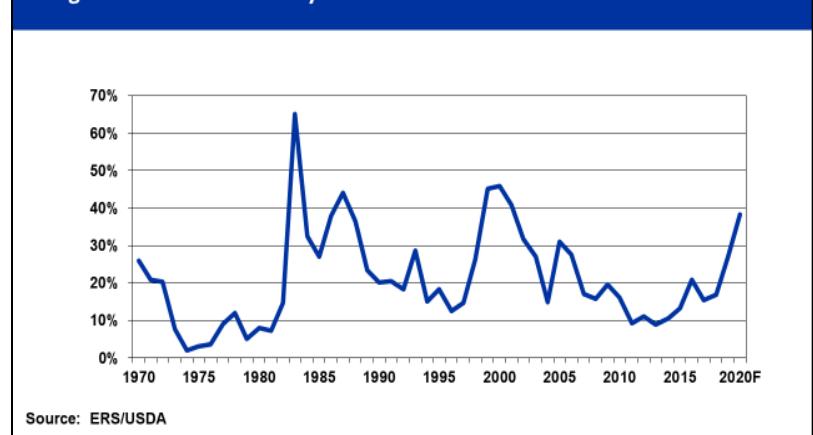
Fiscal policy changes can also have a big influence on costs of production and thus farm profitability. The executive and legislative branches can enact various regulatory/legislative policies to protect the environment, actions to affect the cost of labor, or additional costs associated with the adoption of certain production practices to meet preset government standards. Alternatively, Congress can develop market promotion programs to boost trade or to subsidize the cost of borrowing for beginning farmers. While government programs can be beneficial in the short-run supporting farmers and rural communities, they are vulnerable to future changes, including elimination, which could impact longer term farm income outcomes.

Figure 5: U.S. Net Farm Income vs U.S. Government Direct Farm Payments



Source: ERS/USDA

Figure 6: Government Payments As a Percent of U.S. Net Farm Income



Source: ERS/USDA

⁵ While providing a significant source of support for many farmers, these taxpayer funds typically represent a very small portion of federal spending (generally less than 1%), with the majority of ag-related funds allocated to food assistance programs.

Trade Policy

Trade policy is critical to the farm economy, but very complicated. In recent years, 20-25% of U.S. agricultural production has been consumed overseas which makes it an important component of the farm economy. Trade markets though are very vulnerable to not only the monetary and fiscal policy changes in the United States, but also policy changes by our customers and competitors.

Trade policy comes in many different forms – some to enhance trade (e.g. trade promotion programs or free trade agreements⁶) and some to restrict trade (e.g., embargoes, tariffs). Consequently, trade policies impact both producers and consumers, with both winners and losers. A trade policy action to reduce trade barriers can benefit exporters in low-cost of producing nations and benefit consumers in importing nations as food supplies increase at a lower price. Alternatively, a less restrictive trade environment can be detrimental to both local producers in importing nations by lowering commodity prices in response to increased competition and hurt consumers in exporting nations who might experience higher domestic food prices.

Trade restrictions can take on many different forms. A tariff or duty is a tax imposed by one country on the goods and services from another country. The “tax” can be fully or partially passed onto the consumer in the importing nation or can be borne by the seller. Nations can also impose quotas, which limit the volume of goods that can enter a country as supplies are diverted to other markets, or put in place a tariff rate quota which allows goods at a certain level to come into a country with a lower or no tariff, while assessing a higher tariff on goods above a certain level. Countries can also put in place sanitary and phytosanitary measures in the form of rules, food-safety standards, and laws to protect humans, animals, and plants from diseases, pests, or other contaminants. Historically, some nations have also resorted to various forms of export subsidies (e.g., direct payments, export loans, tax benefits) to lower the cost of their products to buyers in international markets.

One memorable event in U.S. agriculture trade policy history was the 1980 grain embargo. Then U.S. President Jimmy Carter enacted a grain embargo on the Soviet Union following the USSR’s military invasion into Afghanistan in 1979. This trade policy action, implemented to use food as a military weapon, effectively led to other grain producing nations such as Argentina, Brazil, and Canada capturing a greater share of global grain exports at the expense of the U.S. and effectively depressed U.S. grain prices.

More recently, trade policy agreements enacted by the U.S. and several of our top trading partners – Canada, Mexico, Japan, and China have impacted current and future trade flows. Japan has historically been the largest export customer for U.S. beef, but the U.S. faced a competitive disadvantage due to much higher tariffs on U.S. beef compared to competing beef trading nations such as Australia, Canada, and New Zealand. In 2019, the U.S. was able to negotiate reducing the 38.5% tariff on U.S. beef entering Japan down to 9% by 2033, putting the U.S. on level playing field with their global beef competitors.

The North American Free Trade Agreement (NAFTA), signed by the United States, Canada, and Mexico in 1992, resulted in significant gains in U.S. agricultural exports to both of our neighboring nations during its nearly 30 year history. However NAFTA came under attack within the Trump administration, primarily due to domestic job losses. A revised NAFTA, called the U.S. Mexico Canada Agreement (USMCA) was enacted in 2020 maintaining most of the tariff-free policies under NAFTA, with modest trade benefits to U.S. dairy, wheat and poultry producers.

The most significant trade policy event of late has been the trade battle between the United States and China. The Trump administration levied a series of tariffs on U.S. products entering China in response to alleged unfair trade practices by the Chinese government. China responded by placing tariffs on many U.S. goods (including farm products), which led to U.S. ag exports entering China falling from more than \$25 billion in 2016 to less than \$10 billion in 2019. Both governments negotiated a Phase One trade agreement in January 2020, where China agreed to purchase \$80 billion of U.S. farm products in 2020 and 2021. While certainly presenting opportunities in the short-term, the longer term outlook for this large market remains unclear as China attempts to reduce its dependency on the United States and other global ag/food traders amidst a lot of internal resource challenges.

⁶ Currently, the United States has free trade agreements with 20 countries which includes Australia, Bahrain, Chile, Colombia, Israel, Jordan, Korea, Morocco, Oman, Panama, Peru, Singapore; DR-CAFTA (Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, & Nicaragua); and USMCA (Mexico, Canada, formerly the North American Free Trade Agreement, NAFTA).

What about exchange rates?

Another important macro variable impacting trade flows are exchange rates. Exchange rates are simply the value of one currency relative to another. Thus, the U.S. dollar's exchange rate reflects how much the U.S. dollar is worth in terms of a foreign currency. A decline in the value (or depreciation) of the U.S. dollar relative to other currencies effectively makes U.S. goods less expensive to foreign customers, which generally will have a positive impact on export volume, holding all other factors constant. Alternatively an increase in the value (or appreciation) of the U.S. dollar will increase the cost of U.S. goods in international markets, and thus have a tendency to reduce exports. On the import side, a lower valued U.S. dollar will increase the cost of foreign items shipped to the United States, while a higher valued U.S. dollar will boost the demand for imported items by lowering prices for U.S. consumers, holding all other factors constant.

Theoretically, the value of the U.S. dollar is determined by the supply and demand for the U.S. dollar. A major factor affecting the demand for U.S. dollars is the financial return (i.e., the interest rate) an investor expects from investing in U.S. dollar denominated assets (e.g., U.S. government securities). If interest rates are relatively low in the United States, investors will purchase alternative assets (e.g., foreign securities), thus decreasing the demand and value of the U.S. dollar if no other variables change. A nation's economic and political stability and their rate of inflation will also affect a country's exchange rate relative to other currencies.

Figure 7 shows changes in the value of the U.S. dollar (weighted by our major ag export partners) relative to annual U.S. ag exports. While certainly a lot of factors impact trade flows, one can easily notice the sustained increase in U.S. ag exports during 2000-2014, while the value of the U.S. dollar during this period generally trended down. Since 2014, the value of the dollar has trended higher, which has (along with many other factors like the trade war and slumping global economies) constrained the growth in U.S. ag exports.

Focusing on a single market, the U.S. dollar has depreciated by more than 10% against the Japanese yen since 2015, which coupled with tariff rate changes has improved the competitiveness of U.S. beef entering Japan. Figure 8 illustrates the effects of a depreciating U.S. dollar against the yen, with the Japanese buyer paying over 600 yen for a \$5.00/lb U.S. beef product entering the Japanese market in 2015, compared to around 530 yen in 2020 for the same U.S. beef product entering Japan late in 2020.

Figure 7: U.S. Ag Exports vs Exchange Rate

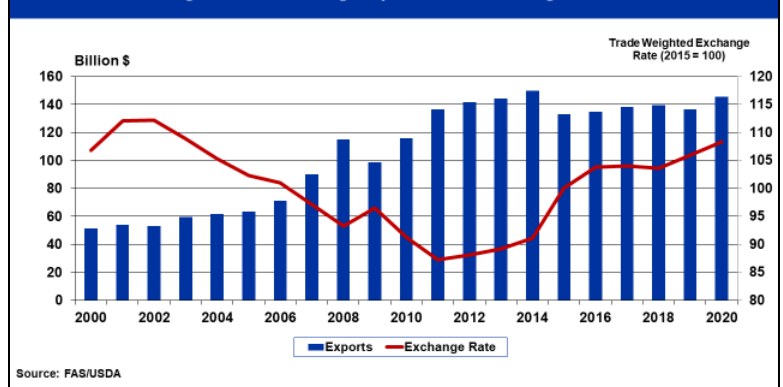
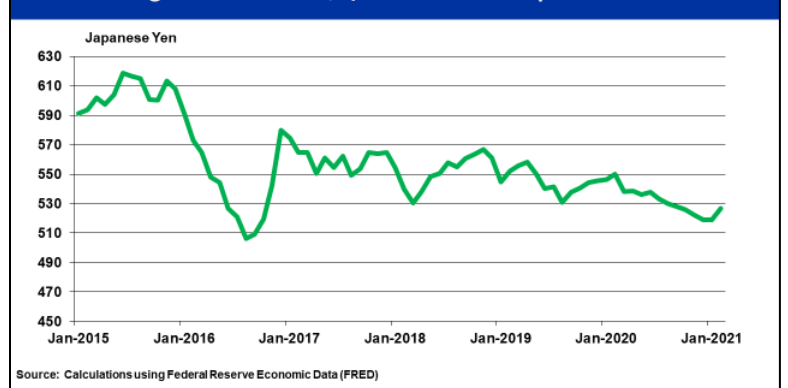


Figure 8: Cost of \$5/lb U.S. Beef In Japanese Yen



Macro Factors Impacting Income Growth Impact Consumer Demand/Trade Flows As Well

Income growth in industrialized nations like the United States and Western Europe will have a tendency to cause consumers to switch to higher valued food items (e.g. hamburger to steak) but will not have a significant impact on overall food demand. Conversely, income growth in lower-income countries will likely have a much larger impact on both the composition of food items as well as total food demand. As per capita incomes grow in developing nations, consumers will tend to substitute higher priced meat products for lower valued food items such as rice and wheat products, thus increasing the demand for both U.S. meat and grain exports to feed the livestock in the importing market. Anticipated income growth in developing Asian and African markets (along with population gains) present considerable future opportunities for American agriculture, as well as our competitors.⁷

⁷ A recent Brookings Institution study, [The Unprecedented Expansion of the Global Middle Class](#), declared that the global middle income class would increase from around 3 billion in 2015 to more than 5.4 billion by 2030. Asia will account for 88% of the new entrants in the middle class, with more than 350 million being added both in China and India – exceeding the entire size of the current U.S. population.

Concluding Comments

Farmers face many risks in today's farm economy. Many of these risks are uncontrollable, having a significant effect on their financial position. One of the major disruptors are macroeconomic policy variables in the form of monetary, fiscal, and trade policy changes. While farmers may have limited control over these actions individually, a better understanding of the impacts of changes in macroeconomic variables on their operations can lead to improved management and marketing decisions and more effective communication with policymakers.