Are Farmers Made Whole By Trade Aid?

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Abstract: The USDA provided roughly $23.5 billion in Market Facilitation Program payments to compensate farmers for market losses due to retaliatory tariffs imposed by China and other countries. We examine the distribution of these payments across crops, farms, and regions. Payment rates are larger than estimated price impacts for most commodities—the difference is especially large for cotton and sorghum. Payment rates relative to farmland cash rent or on a per-farm basis are greatest in the South. While payments exceed the tariff-related price impact in the short run, the program may not compensate for long-run losses due to the trade conflict.

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"If you go out and survey farmers…you won't find any that think they are being made whole by this program." – Secretary of Agriculture Sonny Perdue, July 25, 2019[1]

"Well you interviewed the wrong farmer… Our country is taking in billions and billions of dollars from China…and out of that many billions of dollars we are taking a part of it and we are giving it to the farmers because they have been targeted by China. The farmers, they come out totally whole." – President Donald Trump, August 2, 2019[2]

Introduction

Beginning in 2018, China, the European Union, and other countries imposed retaliatory tariffs on US exports as part of a larger international trade conflict. These retaliatory tariffs disproportionately targeted agricultural goods. China targeted agricultural goods in part because these comprise a large share of US trade with China and substitutes exist from other origins. It also targeted agriculture because it imposes costs on an important political constituency for the current US Presidential administration (Li, Zhang, and Hart 2018, Regmi 2019, Zhang 2019). The expected consequence of these tariffs was to reduce the quantity and value of exports from the US to the tariff-imposing countries and lower the price received by US producers. Both outcomes would be negative for US farmers.

In response, the US government made provision for a set of "trade aid" programs to compensate farmers for expected losses due to the retaliatory tariffs. In July 2018, the USDA announced the first Market Facilitation Program (MFP1) to provide up to $10 billion in direct payments to farmers applicable to 2018 crop production. In May 2019, in response to continued expectations of diminished exports and lower prices for 2019 production, the USDA announced a

[1] Transcribed from USDA press release available at https://www.usda.gov/media/press-releases/2019/07/25/usda-announces-details-support-package-farmers.
[2] Transcribed from video available at https://twitter.com/atrupar/status/1157393274413420546.

second Market Facilitation Program (MFP2) to provide up to $14.5 billion in direct payments to farmers applicable to 2019 crop production.

Does trade aid provided through the Market Facilitation Program accurately compensate US farmers for trade-related losses from recent retaliatory tariffs? To answer this question, we describe how USDA quantified the impact of retaliatory tariffs to determine MFP payments and compare this to competing measures of these losses. The procedure used by USDA to generate the MFP payment rate for a commodity was defined as the expected decline in export value to countries imposing tariffs divided by total US production of the commodity. Glauber (2019) compared MFP payment rates to estimated soybean price impacts. We expand this comparison because results for soybeans may not generalize to other crops. Critics suggest that the way in which this procedure was implemented may have "overcompensated" some crops, such as cotton. As a consequence, it also overcompensated regions where those crops are grown (Stabenow 2019).

USDA's estimated decline in trade value may not equal actual damages to US farmers for four reasons. First, the USDA estimated the decline in trade value before actual export levels were known. We compare estimated export changes with realized export values for the recently completed 2018-19 marketing year. Second, their method does not account for potential trade diversion—exports shifting to countries without tariffs—that reduces the size of damages. We show that US agricultural exports to China were replaced to varying degrees by export sales to other countries. Third, their method is sensitive to the definition of the baseline level of exports. We show that redefining this baseline as USDA did for MFP2 dramatically changed the magnitude of payments. Finally, the USDA methodology is based on a change in quantity (i.e., loss in exports) rather than a change in price. The damages to farmers would be more accurately assessed as a decrease in price due to the tariffs times production—or even better a decrease in producer surplus.

Our review finds that the MFP payment rates to specific commodities were generally larger than estimated short-run price effects of the trade war. Corn was a notable exception where the price impact of retaliatory tariffs was greater than the MFP1 payment rate due to cross-commodity impacts from changing soybean prices. For MFP2, USDA used the maximum annual export value in past decade as the baseline export value rather than 2017 exports. This change in the definition of baseline exports led to larger payment rates for MFP2 that favored commodities other than soybeans, but especially cotton and corn. The cotton payment rate under MFP2 was about 40% of the pre-trade-war price, but available estimates suggest that US cotton prices only decreased by 1.2-1.3% due to the 25% tariff imposed by China on US cotton. An important implication of these comparisons is that US farm income could actually decline if the US and China reach a trade deal and the US does not continue MFP payments.

While our review indicates that the trade aid was larger than economic damages from retaliatory tariffs in the short run, trade aid may not compensate for losses to the farm sector in the long run. Even if retaliatory tariffs on US exports are removed, there could be long lasting future impacts on US agriculture's access to foreign markets. Similarly, the costs of the trade war and benefits of trade aid are not directly comparable to past profit levels. Declines in farm profits since the period of relatively high commodity prices in 2010-2014 are not solely due to the trade war. Trade aid will not restore farm profitability to levels observed during that period.

How large were the trade aid payments and how were they distributed across farmers in the U.S.? Trade aid may not accurately compensate farmers if payments are not targeted to farmers incurring trade related losses, even if the aid amount is equal to damages in aggregate. Critics suggest trade aid, particularly MFP2, was not equitably distributed among US regions (Stabenow 2019). We show the geographic distribution of MFP1 and MFP2 for non-specialty crops in terms of average payment per acre, payment per average size farm, and payment relative to cash rental rates. Payments increased substantially from MFP1 to MFP2 in the South and the Plains, driven primarily by an increase in cotton and corn payment rates. Payments per farm are largest in southern states like Texas, Arkansas, Mississippi, Alabama, and Georgia. MFP2 payments are $191,000 for an average sized farm in the Mississippi Delta region of Arkansas and Mississippi, but $55,000 per farm in Illinois. MFP2 payments in the South are larger than rental rates, but in the Corn Belt are about 30% as large as rental rates.

We also discuss how changes in the payment methodology impacted the distribution of payments within farms in a county. In some states—such as Kansas—farmers within the same county have different cropping patterns; MFP1 and MFP2 payment calculations result in very different distributions of program benefits. MFP1 was more closely linked to farm-level production. Under MFP1, farmers growing commodities that were indirectly affected by the trade war—such as corn—received payments that arguably undercompensated them. Under MFP2, these farmers received the same payment rate as farmers that primarily grow commodities directly affected by the trade war. For example, farmers that specialize in alfalfa receive the same payment rate as farmers in the county that specialize in soybeans even though the two farmers are clearly affected differently by the trade war. Another feature of MFP2 is that the payment rate was not differentiated for irrigated and nonirrigated production; irrigated farmers received a smaller payment rate relative to the productivity of their land that was used to calculate the county average payment rate.

The focus of our analysis are major non-specialty crops: corn, cotton, sorghum, soybeans, and wheat. We focus on non-specialty crops because there is a larger set of estimates of tariff-related price impacts and because these crops were responsible for roughly 95% of MFP1 payments.[3] Our analysis seeks to place the magnitude of the payments into perspective. Paulson, Featherstone, and Hadrich (2020) use farm-level data to better understand how much worse farm financial conditions would be without the payments.

Observed Changes in Prices and Exports

To begin, we analyze commodity prices for these five major crops. Figure 1 shows the high, low and mid-point of USDA forecasted season average prices received by US farmers for these crops for the 2018-19 marketing year.[4] The initial February 2018 forecasts were released at the USDA Agricultural Outlook Forum. Subsequent forecasts beginning in May 2018 were part of the World Agricultural Supply and Demand Estimates (WASDE) reports. As an alternative measure of price expectations, figure 1 also shows the futures price for harvest-time delivery for corn, cotton, soybeans, and hard red winter wheat. Generally USDA forecasts of prices received by farmers closely follow futures market prices.

Observed price changes are confounded by many supply and demand factors coincidental to the trade conflict, so price changes observed in figure 1 cannot be completely attributed to the trade conflict. However, anticipation of the trade conflict likely began to affect price expectations beginning in early April 2018 when the US announced it would impose tariffs on $50 billion in Chinese goods and on steel and aluminum imports from all countries (Burns, Ekblom, and Shalal 2019). Agricultural commodity futures prices, particularly for corn and soybeans, fell dramatically beginning May 29, 2018 when the US announced the end of a brief tariff "truce" between the US and China (Landler and Swanson 2019). For this reason, we use the May 2018 WASDE season

[3] This calculation is from data on actual MFP1 payments obtained by a Freedom of Information Act (FOIA) request to the Farm Service Agency.

[4] Marketing years differ by commodity. The corn, sorghum, and soybean marketing years run from September to August. The cotton marketing year runs from August to July. The wheat marketing year runs from June to May.

average price forecast as a benchmark in our analysis. Escalating trade tensions through the summer of 2018 likely affected all subsequent price forecasts.

For corn, sorghum, and soybeans, expected prices for 2018-19 declined over time. Soybeans experienced the largest decrease; the season average price fell by $1.50 per bushel from the May midpoint forecast. Forecast prices for corn and sorghum fell by $0.20 and $0.40 per bushel. While we cannot attribute all of this decrease to the trade conflict, it suggests the trade conflict may have hurt some commodities more than others. Cotton and wheat expected prices actually increased, though this does not imply that these commodities did not experience harm due to retaliatory tariffs.

To assess the trade war effect on the United States more directly, we consider changes in the value of US exports. Figure 2 displays the nominal dollar value of selected US crop exports by marketing year from 2009-10 to 2018-19. For each commodity, exports to China and all other countries are reported separately. Past years represent an important comparison for 2018-19 export value because they may be representative of the export value in the absence of retaliatory tariffs. We initially consider 2017-18 export value as a benchmark because the trade conflict likely had limited impact on exports in the 2017-18 market year.

Compared to 2017-18, US agricultural exports generally declined in value in 2018-19 following the imposition of retaliatory tariffs by China and other US trading partners. However, these year-over-year declines are concentrated in commodities dependent on trade with China. Sorghum and soybeans had the largest year-over-year decreases in export value. Sorghum export value fell by 54% or approximately $544 million. Soybean export value declined by 25% or $5.5 billion. Corn and cotton exports were down $1.4 billion and $600 million, respectively. Exports of wheat actually increased.

The value of exports to China fell proportionally more than the overall decline in exports for all commodities, suggesting a reallocation of US exports from China toward other countries. For example, US sorghum and soybean exports to China fell by 90% and 65% ($613 million and $7.0 billion) respectively from 2017-18 to 2018-19. For corn and wheat, exports to China fell but were not a significant share of overall exports in recent years prior to the trade conflict. Cotton represents an in-between case. Exports to China fell by about $500 million or just slightly less than overall exports.

To compare changes in export value to changes in price, we calculate changes in US export value to China and to all countries between 2017-18 and 2018-19 divided by 2017 production quantities. These per-unit values are comparable to changes in price observed in figure 1. We also calculate the change in expected season average price using the midpoint of the USDA forecast season average price from May 2018 (prior to the apparent market reaction to the trade conflict) less the final estimated season average price release in September 2019.

We find that commodities with the largest decreases in per-unit export values also experienced the largest decreases in forecasted price. For sorghum and soybeans, the value of exports to China decreased by $1.87 and $1.38 per bushel, respectively. Cotton export values to China were a more modest $0.04 per pound. For corn, per-unit-of-production changes in China trade alone were negligible. Total US corn exports saw a more significant decrease of about 10 cents per bushel, or less than five percent of the value of the commodity. The loss in export values are not always similar in magnitude to the change in expected prices. While the decline in export value was roughly equal to the change in price for soybeans, it was smaller for corn and larger for sorghum. For cotton and wheat, the expected season average price actually rose through the 2018-19 marketing year.

Both observed changes in prices and export value are flawed measures of the impact of retaliatory tariffs because they may be confounded by other simultaneously observed production, consumption, or trade shocks. They also suffer a form of hindsight bias. They cannot be used to determine the parameters of a trade aid program that is required to provide timely compensation because they are not known until well after economic damages occur.

Model-based estimates of trade damage

To assess the magnitude of the economic harm to US farmers caused by the trade war, economists have developed models to isolate the effect of the retaliatory tariffs on prices and trade. Most trade damage estimates specify an economic model of supply, demand, and trade. The model is used to simulate outcomes with and without tariffs imposed. The difference between estimated outcomes with and without the tariff is the causal impact of the tariff. By design, such model-derived estimates are internally consistent as they are unconfounded by changes in other supply and demand factors. However, they are only externally valid to the degree that the model accurately captures the true nature of economic response of producers and consumers to the changing set of incentives posed by the tariffs.

Model-based approaches to trade damage may be partial equilibrium or general equilibrium. Partial equilibrium models consider separately the market for each commodity. They do not consider substitution in production or consumption across commodities. For example, tariffs on soybeans do not generate any change in corn prices or production in a partial equilibrium framework. General equilibrium models are capable of simultaneously determining the price and quantity responses to tariffs both for commodities where tariffs were imposed as part of the trade war and for related commodities not specifically subject to tariffs.

Both types of models of global agricultural trade vary in the degree to which they assume countries can adjust production, consumption, and trade in response to changing market conditions. Partial equilibrium models specify a set of demand and supply elasticities, along with elasticities of substitution across origins that define the degree to which countries view the same commodity produced in two different countries as substitutes. Armington-type trade models assume commodities are imperfect substitutes across origins and allow the modeler to specify the degree to which this is the case. Spatial equilibrium models make the assumption of perfect substitutability across origins. General equilibrium models also allow for substitution across commodities that would be essentially subsumed in the supply and demand elasticities in a partial equilibrium model.

Generally, estimated economic impacts of a tariff are greater when the modeler assumes economic agents adjust less to the consequences of the tariffs. For example, when consumers outside the US are entirely willing to substitute away from importing from the US and US producers are completely unable to substitute away from producing the commodity, then the incidence of the tariff will fall entirely on US producers and the welfare effects will be large. On the other hand, if foreign consumers can easily switch among origins and/or US producers can easily switch to other crops, the price and welfare effects of a similar tariff will be smaller.

We focus on soybeans, for which there have been numerous efforts to quantify the impact of the trade conflict. Table 2 presents estimates of the change in US soybean exports and prices for four analyses of the trade conflict. These models differ in the assumed parameters representing the flexibility of demand to choose different sources. They also vary in their assumed baseline levels of trade and in how they specify the nature of the retaliatory tariffs, though each considers a 25% tariff by China on soybeans. However, all models have the advantage that the estimates are not confounded by changes in other factors affecting prices and trade.

Existing trade model-derived estimates suggest retaliatory tariffs lowered US farm prices for soybeans by 4-12 percent. The smallest impact is given by Zheng et al. (2018). The models vary dramatically in their predicted change in US-China soybean exports. In the extreme, the spatial equilibrium model of Sabala and Devadoss predicts a total reallocation of US soybean exports away from China toward other destinations.

Some of these studies also estimate price changes for other commodities. A number of studies suggest retaliatory tariffs affected corn prices, though impacts were smaller than for soybeans. Estimated corn price declines range from 1.5-4%. Zheng et al. (2018) and Liu and Hudson (2019) directly estimate price impacts of Chinese tariffs on US cotton. They estimate these tariffs lower US cotton prices by 1.2 and 1.3%, respectively.

Counterfactual price forecasting using time-series econometric methods is an alternative method to estimate the effect of retaliatory tariffs on prices. Adjemian et al. (2019) and Swanson et al (2019) are two such studies that estimate price impacts of Chinese retaliatory tariffs on soybeans. Adjemian et al. (2019) consider soybeans and use Brazilian soybean prices as a counterfactual. They find a sharp divergence in these prices between June 2018 and November 2018 of about 17% (or slightly less than the size of the tariff). They attribute a 7.1% decline in US prices—or slightly less than half of the divergence—to the Chinese tariff. Swanson et al. (2019) consider historic seasonal price patterns for corn and soybeans. They use the typical harvest time price decline (relative to pre-harvest cash prices) in years when yields are high, but retaliatory tariffs were not imposed to estimate a counterfactual price absent retaliatory tariffs. Their analysis finds soybean prices were 11.9% lower and corn prices 2.2% lower due to the tariffs.

Comparing estimated price impacts from these existing studies is difficult. Beyond differences in modeling techniques, estimates may be specific to a given time period or a given length of run. The estimated price change may apply specifically to farmers or the commodity at export position. The estimates are often represented as a percentage change, so that the effect expressed in variable levels depends on assumptions about the base level in the absence of tariffs. Nonetheless, existing observed changes in price and estimated components of these changes specifically attributable to tariffs suggest the trade conflict price effects were concentrated on soybeans and sorghum. Cotton and wheat experienced smaller impacts. Corn experienced small changes in exports, but some cross-commodity impact on prices because of changes in the soybean markets.

Soybean price impacts across all study types found in table 2 range from approximately 4-12%, with the simple average of available estimates equal to 8.1%. Considering predicted changes in export value found in table 2 can help to validate these estimates. Recall that US soybean exports value to China fell by 65% between 2017-18 and 2018-19. This is roughly similar to decreases predicted by Taheripour and Tyner (2018) and Westhoff et al (2019) who estimate price changes in the middle of the estimated range. None of the tariff-induced soybean price decline estimates are as large as the observed decline in expected prices for the 2018/19 MY of $1.50/bu; other factors were responsible for some portion of observed commodity price changes. Available price impact estimates for other commodities are generally lower than for soybeans (with the exception of sorghum); the magnitude of the price response varies with the degree to which production and trade can be adjusted and reallocated.

MFP Payment Methodology and Rates

The USDA has provided two rounds of trade aid payments to US farmers. The trade aid payments are authorized under section 5 of the Commodity Credit Corporation (CCC) Charter Act (15 U.S.C. 714c), which authorizes the CCC to assist in "developing or aiding in the development of new and additional markets, marketing facilities, and uses for such commodities" (Department of Agriculture, Commodity Credit Corporation, 2019, p. 36457). USDA argues that the trade aid payments are authorized by the CCC Charter Act because the payments "provide producers with financial assistance that gives them the ability to absorb some of the additional costs from having to delay or reorient marketing of the new crop due to the trade actions of foreign governments resulting in the loss of exports" (Department of Agriculture, Commodity Credit Corporation, 2019, p. 36457).

There are three important points to note about the use of the CCC to provide trade aid payments. First, the use of the CCC allows USDA to avoid the need for Congressional legislation to authorize payments to farmers. Second, the authority of the CCC implies that payment must be tied in some way to the production of commodities affected by the trade actions of foreign governments. It is unclear whether CCC could legally provide payments based on some measure of historical production. For crops, MFP1 payments were based on actual production of affected commodities and MFP2 payments were based on planted acres of affected commodities. Third, USDA cannot use the CCC to provide payments due to decreases in prices—the payment must be linked to trade damages.

USDA calculated the size of aid payments as the estimated loss in export value, defending this approach as similar to those used in adjudicating trade disputes at the World Trade Organization. It maintained this rationale when announcing the availability of MFP2. This approach suggests USDA designed the program in such a manner as to be consistent with US obligations under the WTO rules and the authority to make payments under the Commodity Credit Corporation (CCC) Charter Act. USDA chose not to measure the trade damages in terms of a decrease in price due to the tariffs, perhaps due to concerns about violating WTO rules or the CCC authority.

To calculate payment rates for MFP1 and MFP2 on the basis of export losses, USDA required three components: the baseline value of bilateral exports to country *i* imposing retaliatory tariffs on a particular commodity *j*, M_{ij}^{base}, the baseline level of US production of *i*, X_i^{base}, and the estimated percentage reduction in exports. Equation (1) shows the payment rate as a function of these three values:

$$Payment\ Rate = \frac{M_{ij}^{base}\left[\frac{M_{ij} - M_{ij}^{\tau}}{M_{ij}}\right]}{X_i^{base}}. \qquad (1)$$

The bracketed term is the predicted percentage reduction in exports due to retaliatory tariffs.[5] To estimate this term, USDA used the same model used by Zheng et al. (2018) to estimate the effect of tariffs on cotton, sorghum, and soybean prices and trade but extracted only the change in exports.

The base period is meant to represent the expected value of exports without a trade conflict. For MFP1, USDA used 2017, the period immediately prior to the trade conflict, as the base period. This meant that commodities where the US had low levels of exports to tariff-imposing countries in 2017 had low estimated trade damages and payment rates, even if actual trade in 2018 might

[5] The predicted percentage reduction in exports depends on the baseline level of exports, M_{ij}, specified in the trade model used by USDA. M_{ij} may or may not be equal to the value M_{ij}^{base} used in the payment rate calculation. MFP documentation (USDA Office of the Chief Economist 2018, 2019) is not clear on this point.

have been higher in the absence of the trade conflict. For MFP2, it used a more expansive definition of the base period. It defined the base export value as the maximum level that occurred between 2009 and 2018.[6] This adjustment generally increased payment rates, in some cases dramatically, because exports to retaliating countries were much higher some previous year than in 2017. For example, figure 2 shows that corn exports to China were worth about $1.5 billion in 2011-12 compared to just $62 million in 2017-18. This more broad approach to defining baseline export levels is subject to criticism about how representative these earlier periods are of what trade would have been in the absence of the trade war.

USDA used a model of global commodity trade to estimate the decline in export value. We have discussed how such models may be sensitive to parameterization, the assumptions modelers made about the ability of the individual market to adjust to the new reality of a tariff. Models which assume more flexibility and less cross-country product differentiation estimate smaller trade impacts. Models like the one used by USDA that separately consider the market for each commodity do not estimate any cross-commodity impacts of a tariff. For example, a 25% tariff on soybeans does not generate any predictions about declining export values and resulting trade damages for corn.

The choices to adjust the base period and ignore cross-commodity effects explain differences in commodity-specific MFP payment rates. Table 3 shows actual MFP1 payment rates and the underlying MFP2 commodity-specific trade damage estimates. MFP2 payment rates were higher than MFP1 rates for all commodities and differences in payment rates can be directly linked to the choice of the base year export value. For soybeans, where 2017 exports to China were

[6] MFP documentation (USDA Office of the Chief Economist 2019) does not explicitly state that the maximum export level was used as the baseline, however USDA Chief Economist Robert Johansson stated this was the measure used in the press conference announcing the MFP2 program.

relatively close to the highest level that occurred over 2009-2018, payment rates increased a modest 24%. For corn where 2017 exports to China were negligible, payment rates increased by 13 times. The payment rate for cotton increased over 300% because cotton exports to China in 2011 were much larger than exports in 2017. In general, there is a remarkably strong relationship between the increase in MFP payment rates and difference between 2017 values of US exports to China and the maximum value of US exports to China over the 2009-2017 period. Some of the observed change in payments may have been due to changes in retaliatory tariffs to other countries, updates to the predicted trade flows based on 2018 data, or unknown changes in model parameterization, but updating the base period of export value seems to be the major factor driving MFP2 rates above those seen in MFP1. USDA appears to have changed the methodology, at least in part, to address concerns from corn growers about the low payment rate under MFP1.[7] USDA argues that using the maximum value of trade from previous years as the baseline accounts for other tariff and non-tariff measures imposed by these countries before the trade war began in 2018. Instead of modeling cross-commodity impacts such as those from soybeans to corn directly, USDA redefined the export baseline, which generated a higher payment rate for corn.

For MFP2, USDA faced a further complication in estimating payment rates. Unlike MFP2, it announced that it would provide MFP payments for 2019 prior to the conclusion of spring planting. To avoid influencing decisions about acreage allocation during planting, it specified that the program would make payments on a per-acre basis, with all planted acres of given crops eligible for payments at a county-specific payment rate. It later announced that these county-level payment rates were based on commodity-specific payment rates calculated using a procedure

[7] In the press release interview on July 25, 2019, Rob Johanssen said, "One thing we heard, in particular from corn growers for example, was that in 2017 they didn't export very much to China because China had already been putting in place various trade non-tariff measures that were preventing U.S. corn from being shipped to China." Available at: https://www.usda.gov/media/press-releases/2019/07/25/usda-announces-details-support-package-farmers

similar to that used for MFP1. Commodity-specific payment rates given above were multiplied by historic county-level acreage and yield for each crop, summed across commodities, and divided by acreage all MFP-eligible crops to determine the county MFP2 per-acre payment rate. We discuss how this procedure led to spatial differences in MFP payments below.

Comparison of MFP Rates and Estimated Trade Damage

The MFP payment rate methodology chosen by USDA generates aid payments in dollars per unit terms that are roughly similar to realized changes in export value in most cases. However, MFP payment rates are greater than the estimated price impacts of the tariffs estimated using global trade models and time-series counterfactual analysis of prices. In figure 3, we compare the commodity-specific payment rates for MFP1 and MFP2 to the decline in the value of US exports to China for that commodity. In each case, we also include estimated price decreases due to the tariffs from the studies discussed above. To make these comparable across commodities, we state these as a percentage of the 2018-19 season average farm price forecast from May 2018. For each version of the MFP, we consider a separate base period for export value. In the top panel of figure 3, we calculate the percentage change in per-unit export value as the difference in post-trade-war, 2018-19 marketing year US-to-China export value and pre-trade-war 2017-18 marketing year export value. In the bottom panel, we replace the 2017-18 marketing year base period with the maximum marketing year export value to China for the commodity from the period 2009-2018.

For both MFP1 and MFP2, comparing payment rates to export value changes assesses the degree to which the USDA model-derived estimates of changes in export value align with realized changes. Generally, MFP1 and MFP2 payment rates match estimated changes in export value. In the case of MFP1, payment rates slightly overstate the actual decrease in export value. This difference may have been due to USDA estimates factoring in tariffs imposed by other countries such as the European Union and others whose export value we do not consider here.

In the case of MFP2, payment rates are much higher than MFP1 for all commodities but they are slightly less than the change in export value in 2018 relative to the maximum from the past decade. This may be because the maximum occurred in a year with higher prices than in 2017 or 2018 and we do not know whether USDA valued baseline exports at the historical price or at current prices. However, our crude approximation using actual export value data does a satisfactory job of tracking the change in MFP rates from 2018 to 2019.

We also compare the MFP rates to the estimated impacts of retaliatory tariffs on US price levels in figure 3. Unlike the MFP methodology or the observed change in trade value, these price change estimates account for the global rebalancing of trade that occurs in response to a tariff-induced trade disruption and measure a price impact rather than the value of a change in quantity. The price impact estimates are substantially lower than the MFP or trade-value measures with only one important exception: corn under MFP1. Because some of these trade models were able to capture important cross-commodity impacts (lower soybean prices stimulating corn supply and lowering corn price), they estimated price impacts for US corn of about 2%, relative to the MFP1 payment rate of 0.2%. In every other case, MFP payment rates were higher than price impacts.

One important example of higher MFP payment rates is cotton. Trade models estimate small impacts of Chinese retaliatory tariffs on US cotton prices. This is in part because US cotton exports are diversified and China matters less as an export destination than it might have in the past. China only accounted for 16% of the value of US cotton exports in 2017-18. Recall that the estimated effect of a 25% tariff on US cotton exports was a decrease of US cotton prices of only 1.2-1.3% (Zheng, et al. 2018, Liu and Hudson 2019). The MFP2 cotton payment rate was about

33 times greater than this estimated impact. This is largely due to how USDA redefined the base period to determine MFP2 payment rates; the dollar value of baseline US cotton exports to China for MFP2 was taken from the 2010-2012 period (shown in figure 2) when US export quantities to China were about double that in 2017-18 and world cotton prices were higher (Muhammad, Smith, and MacDonald 2019).

Figure 3 highlights how redefining the baseline export level for MFP2 led to dramatically higher payment rates, even though the estimated price change was not greater in 2019 than 2018. If anything, research such as Adjemian et al (2019) suggests that trade war price impacts may have decreased over time.

Spatial Distribution of Trade Aid across Counties

Figure 4 illustrates how the MFP payment rates by commodity translate to differences in payments across counties. Spatial disparities in payments are expected because the value of agricultural production, the mix of crops, and therefore the economic impacts of the trade war are not homogenous across counties. It is important for policymakers to have information on relatively how large the MFP payments are across different regions.

Data Description

The first row of maps shows the average payment per acre. For MFP1, we calculate the total MFP1 payments received in the county divided by the acres of non-specialty crops eligible for payments under MFP2. MFP1 payments for non-specialty crops at the county level were obtained by a Freedom of Information Act (FOIA) request from the Farm Service Agency. Acres of non-specialty crops are 2018 planted acres from the Farm Service Agency (FSA). The MFP2 payment per acre is the county payment rate provided by the FSA.

The second row of maps shows the payment for an average farm size calculated as

$$Payment\ per\ Farm = \frac{PaymentRate \times Program\ Acres}{Farms\ with > \ 100\ acres} \times \frac{Cropland\ of\ farms > \ 100\ acres}{Total\ Cropland}.$$

The payment rate is the amount per acre described in the previous paragraph. Program acres are the 2018 planted acres of eligible crops from FSA. The number of farms (i.e., operations) with greater than 100 acres of harvested cropland in 2017 is from the Census of Agriculture. Acres of cropland harvested for farms that have greater than 100 acres and total cropland harvested in 2017 are also from the Census of Agriculture. The Census of Agriculture includes all farms with greater than $1,000 of agricultural sales, so the Census includes "hobby farms" that account for little production. Our goal is to provide an estimate of the average payment for commercial farms so we exclude operations with less than 100 acres of cropland. The last term in the calculation adjusts for the fact that our estimate of the number of farms may not reflect all farms with program acres, so we scale the program acres by the ratio of harvested cropland acres among farms with greater than 100 acres to the total harvested cropland acres.

The third row of maps in figure 4 shows the county MFP payment relative to the cash rental rate from NASS (National Agricultural Statistics Service). There are two complications for deriving a set of cropland cash rental rates for all counties: (i) there are missing rental rates for any given year and (ii) NASS reports irrigated and nonirrigated rental rates separately but MFP2 gives a single payment rate for the county. We interpolate missing rental rates in 2017 using the prediction from a regression that uses the lagged county rental rate and the contemporaneous district-level rental rate as predictors.[8] This interpolation method provides a predicted rental rate

[8] We estimate a separate regression for each potential lag length. If rental rates were available in several previous years, then the interpolated rental rate is the average of the predictions using each lag length.

if a rental rate was observed for some previous year in that county. If there were no observed rental rates since 2009, then we use the district-level rental rate for the county. We then take a weighted average of the irrigated and non-irrigated rental rates, with the share of cropland irrigated as the weight. The share of cropland irrigated is calculated as 2017 irrigated cropland acres harvested divided by 2017 cropland acres harvested.[9]

An important caveat to these maps is that they represent the total payments and may not represent the amount accruing to farm operators. If land is rented on a crop share basis, then the landowner receives a portion of the payment according to the split in the rental agreement. Of course, the ultimate beneficiary of the MFP payments may not be the individual who directly receives payment from the government (Kirwan 2009, Goodwin, Mishra, and Ortalo-Magne 2012, Hendricks, Janzen, and Dhuyvetter 2012). Landowners may have not lowered rental rates due to the additional MFP payments and could have ultimately captured the benefits. Addressing the incidence of MFP payments on landowners versus tenants is beyond the scope of this paper.

Discussion

Panels A and B of Figure 4 illustrate that the average MFP payment rate increased in nearly all counties between MFP1 and MFP2, but increased relatively more in the Southern Plains and Southeastern United States (figure A1 in the supplementary appendix shows the percent change in payment rates). For example, the average payment rate in Illinois increased from $48/acre to $69/acre from MFP1 to MFP2. In Texas, the average payment rate increased from $12/acre to $61/acre and in Georgia, the average payment rate increased from $22/acre to $92/acre. The increase in payment rate in the South is attributed to a substantial increase in the payment rate for cotton. As shown in figure 3, payments to cotton as a percentage of price increased from 9% to

[9] If 2017 irrigated cropland acres harvested was missing, then we use the average acres from 2007 and 2012. If there is no irrigated rental rate data and less than 10% of the county is irrigated, then we use the nonirrigated rental rate.

40%. Large increases in payments in the Plains where soybeans are a minor crop are driven by an increase in payment rates for sorghum, corn, and wheat.

It is not necessarily appropriate to compare average payment rates in the Corn Belt to payment rates in the Plains because productivity differs across counties. It is better to compare the magnitude of the payments on a per farm basis or relative to cash rental rates. Farm-level payment rates adjust for larger farm size in low-productivity areas. Since cash rental rates are a dollar-denominated economic measure of productivity, the resulting measure is a unit-less percentage that is directly comparable across counties.

Panels C and D in figure 4 show the average payment per farm for a farm of average size in each county (figure A2 in the supplementary appendix shows the percent change in average payment per farm). Payments per farm are especially large in the Mississippi Delta region. In the Mississippi Delta region of Arkansas and Mississippi, the average payment per farm was $109,000 for MFP1 and $191,000 for MFP2. For comparison, the average payment per farm in Illinois was $38,000 for MFP1 and $55,000 for MFP2. There were 13 counties that received a payment greater than $100,000 per farm under MFP1 and 112 counties under MFP2.

The largest payments per farm for MFP2 occur in Nueces County, Texas and Coahoma County, Mississippi. Farms in Nueces County, Texas receive a payment rate of $147/acre and the average farm size is 2,377 program acres for an average payment of $349,000 per farm. Farms in Coahoma County, Mississippi receive a payment rate of $150/acre and the average farm size is 2,147 program acres for an average payment of $322,000 per farm. These payments for average-sized farms exceed the maximum payment of $250,000 per individual under MFP2, though a single farm may have multiple individuals receive payments to avoid the payment cap.

Panels E and F of figure 4 show the geographic disparities in MFP payments relative to rental rates. In the Corn Belt, MFP2 payments are about 30% as large as rental rates while MFP2 payments are similar in magnitude or larger than rental rates in the southern half of the US. For example, in Iowa, the average payment rate was $49/acre for MFP1 and $69/acre for MFP2, but the average cash rental rate is $200/acre. In contrast, the MFP2 payment rate is over twice as large as the rental rate in Alabama. The average cash rental rate in Alabama is $44/acre, but the average MFP1 payment rate in Alabama is $35/acre and the average MFP2 payment rate is $93/acre. In Kansas, the average payment rate was $27/acre for MFP1 and $52/acre for MFP2—smaller than the average rental rate of $62/acre.

Within-County Distribution of Trade Aid

The previous section discussed how MFP payments differed across counties, but there are also differences in payments across farms in the same county. To examine these disparities we use farm-level data from the Kansas Farm Management Association (KFMA). For those farms in the KFMA database, the average payment for MFP1 was about $37,000 per farm and for MFP2 was about $58,000 per farm (Paulson, Featherstone, and Hadrich 2020).[10] The 90th percentile for MFP1 payments was about $90,000 and for MFP2 was about $130,000 (Paulson, Featherstone, and Hadrich 2020).

Changing the payments from commodity-specific production to a county-level payment rate for planted acreage results in substantial differences in MFP1 and MFP2 within a county in

[10] These calculations are slightly different from the per farm calculations in the previous section because the KFMA calculations only include the MFP payments that are paid to the farm operator by accounting for crop share rental splits. KFMA tends to represent commercial farms and excludes most of the very small farms, so average farm size in KFMA is larger than the Census estimate. Projected MFP2 payments are calculated using the county payment rate for the respective farm times the 2018 planted acres of eligible crops and adjusting for crop share.

Kansas. Figure 5 shows a histogram of the percent change (i.e., $\frac{MFP2-MFP1}{MFP1} \times 100$) in MFP payments across KFMA farms with greater than 400 crop acres. MFP payments increase for most farms in Kansas due to the increase in the average payment rates under MFP2, but MFP payments are expected to decrease for 7% of farms.[11] About 35% of farms have a 0-50% increase in payments and 25% have a 50-100% increase in payments. The distribution of relative changes is highly skewed to the right where 16% of farms have an increase in payments greater than 300%.

Some of the changes in MFP payments arise because MFP1 payments were based on 2018 yields, but most of the change is due to differences in cropping patterns across farms within a county. Consider the following four examples of changes in MFP payments for a set of actual, but anonymized KFMA farms. In example 1, farm 1 is located in a county in western Kansas. Farm 1 planted 94% of its acres to corn and 6% to wheat in 2018.[12] Corn comprises a smaller share of acres in the county than on farm 1. While the MFP payment rate for corn increased 13 times from 2018 to 2019, farm 1's MFP payments are expected to increase by more than 35 times—from less than $5,000 to more than $175,000. The county payment rate in 2019 for farm 1 is much larger than it would be if calculated specifically for the farm's typical crop mix. We do not take a position as to which version of MFP better reflected the economic losses to farm 1, but it is clear that the change in program rules resulted in substantial changes in the distribution of benefits. For example 2, consider farm 2 that produces 100% alfalfa. Farm 2 received $0 in MFP1, but receives the same county payment rate as all other farms in the same county in MFP2.[13]

[11] This number differs from Paulson, Featherstone, and Hadrich (2020) who find that payments did not increase for 13.8% of Kansas farms because some farms had no change in MFP payments and we only consider those farms with more than 400 crop acres.
[12] We round the estimates of MFP payments to avoid disclosing individual farmer data.
[13] USDA calculated trade damages for alfalfa of $2.81/ton, but this would lead to much smaller payments for an alfalfa farm than using the county average crop mix. The average alfalfa yield in Kansas (2014-2018) is 3.8 tons/acre, implying a payment of $10.68/acre compared to the county average MFP2 payment of $52.33/acre.

Examples 3 and 4 compare changes in payments for farms in the same county. In example 3, farm 3A plants 70% soybeans and 30% wheat while farm 3B plants 33% corn, 33% soybeans, and 33% wheat. MFP payments decrease by 14% for farm 3A and increase by 30% for farm 3B. MFP payments decrease for farm 3A because this farm produces more soybeans than average in the county and MFP2 uses the county average crop mix to determine the payment rate. In example 4, farm 4A is 86% irrigated and farm 4B is 0% irrigated. MFP2 payments do not differentiate by irrigation status so the irrigated yields for farm 4A are pooled together with nonirrigated yields to create a single payment rate per planted acre. Payments for farm 4A increase by 33% but payments increase by 450% for farm 4B.

Political Implications

Trade aid provided through MFP is large and not perfectly targeted to farm-level trade related losses. This may have adverse domestic political consequences for the agricultural sector. When negotiating future Farm Bills, lawmakers may question the need for farm support programs given the magnitude of past trade aid payments. Critical press coverage of MFP1 payments included news of a single farm receiving multi-million-dollar payments.[14] MFP2, being larger in aggregate, is likely to generate similar headlines. Lawmakers may also raise concerns about why farmers were compensated for trade damages but other affected industries (including other parts of the agriculture sector) were not compensated. Finally, the MFP may also spark conflict between the legislative and executive branches as the executive branch has bypassed Congress's power of the purse (Coppess et al. 2019). By making payments under the authority of the Commodity Credit Corporation, the presidential administration determined how program benefits were apportioned

[14] For example, the Washington Post ran an article with the headline "Trump's $16 billion farm bailout will make rich farmers richer, report says" on July 31, 2019. Available at: https://www.washingtonpost.com/business/2019/07/31/trumps-billion-farm-bailout-will-make-rich-farmers-richer-hasten-small-farm-failure-study-says/

without Congressional approval and forced Congress to fund the program by replenishing CCC funds after the fact (Clayton 2019).

The policy response to trade aid programs may reach outside the US. European Union and other WTO members are already criticizing MFP payments and alleging they may violate international trade rules and complicate future agricultural negotiations (Baschuk 2019). Glauber (2019) estimates the aggregate measurement of support (AMS) that the US will report to the WTO. He finds that the US will exceed its AMS commitment if (i) non-specialty crop MFP payments are reported as product-specific support or (ii) if the payments are reported as non-product-specific support and the total value of production in 2019 is 1.6% smaller than USDA projects. If the US exceeds its AMS commitment or if other countries successfully challenge the MFP payments in the WTO, then other countries could impose punitive actions against the US (Glauber 2019).

A final concern with trade aid is that it could distort planting and storage decisions that lead to decreases in crop prices. Though MFP1 was tied to 2018 production, it had a negligible impact on 2018 planting decisions because it was announced only after crops were planted. MFP2 sought to reduce distortions by tying payments to total planted acres rather than farm- and commodity-specific production. However, planting was delayed in much of the U.S. in 2019 and some farmers may have planted more acres—rather than claim a prevented planting indemnity—because MFP2 payments were tied to planted acres. All else equal, more planted acres implies greater production and lower prices. Similarly, MFP payments may lower the opportunity cost of storing commodities in hope of receiving higher prices. In fact, USDA undersecretary Bill Northey explicitly suggested MFP payments were intended to help farmers “pay for storage” (Wiesemeyer 2019). Greater crop inventories, like higher production, imply lower future prices. Large stocks could also create a resurgence of old supply management policies and a movement backward from market-oriented policies (Zulauf et al. 2019).

President Trump also indicated in August 2019 that he intends to implement another round of trade aid in 2020 if no trade deal is reached.[15] The authorizing language in the CCC Act likely means that 2020 MFP payments must be tied to 2020 production in some form. To the extent that the early announcement of these payments affects 2020 planting and production decisions, future trade aid could distort production to a greater degree than previous rounds of MFP—assuming a trade deal is not reached before 2020. All of these knock-on effects from MFP1 and MFP2 imply greater challenges for agricultural policymakers in the future.

Conclusion

Are farmers made whole by the trade aid? By one aggregate measure, they are in the short run because total trade aid exceeds the decrease in crop prices due to the trade war estimated by most previous economic studies. For some commodities, the difference between MFP payments and estimated price impacts are large (figure 3). However, we also show that some farms have received far less or far more than the true magnitude of their farm-specific trade-related loss because program rules are not targeted to all farm situations. For example, farms highly specialized in corn production were undercompensated for losses under MFP1. In general, MFP2 provides more trade aid dollars to commodities and farms perceived to have received inadequate compensation under MFP1, namely corn-producing farms, without reducing benefits to most other farms. MFP2 dramatically increased payments to corn, but also to some other commodities such as cotton where

[15] President Trump tweeted on August 16, 2019, "As they have learned in the last two years, our great American Farmers know that China will not be able to hurt them in that their President has stood with them and done what no other president would do - And I'll do it again next year if necessary!"

MFP already provided aid well above the estimated price impact of tariffs. MFP2 payments in the South often exceed cash rental rates and provide payments of more than $150,000 for an average sized farm.

In the long run, farmers may not be made whole by trade aid. Trade aid is likely to be a short term policy and will not compensate for long-term losses in market access that could occur even if the U.S. reaches a trade deal with China and tariffs are removed. Between 2009 and 2016, China imported roughly 41% of its soybeans from the United States according to data from FAOSTAT. China may see the U.S. as an unreliable trade partner and seek to expand trade with South America and invest in increasing production within China.[16] There are also several political consequences that could be damaging for agriculture, such as challenges in the WTO and Farm Bill negotiations.

Our analysis compares trade aid to the estimated impact of the trade war and is not a comparison of farm profitability before and after 2018. While the trade war has resulted in substantial economic losses to agriculture, several other factors have also contributed to the sharp crop price declines from the relatively high prices in 2010-2014. Trade aid has provided a large infusion of cash to bolster farm balance sheets (Paulson, Featherstone, and Hadrich 2020), but not necessarily large enough to restore financial conditions to pre-2018 levels. If the US and China reach a trade deal and MFP is discontinued, then farm financial conditions could worsen since the MFP payment rates appear to be larger than the impact of the trade war on commodity prices.

[16] Alternatively, China could leverage the political pressure from agriculture to avoid agreeing to U.S. demands in exchange for larger agricultural purchases.

References

Adjemian, M.K., Smith, A. and He, W., 2019. "Estimating the Market Effect of a Trade War: The Case of Soybean Tariffs." In *Proceedings of the 2019 Annual Meeting, July 21-23, Atlanta, GA*. Agricultural and Applied Economics Association.

Balistreri, E.J., Hart, C.E., Hayes, D.J., Li, M., Schulz, L., Swenson, D.A., Zhang, W. and Crespi, J.M., 2018. "The Impact of the 2018 Trade Disruptions on the Iowa Economy." CARD Policy Brief 18-PB 25, September 25, 2018.

Baschuk, B. 2019. "Trump's $16 Billion Farm Bailout Criticized at WTO." *Bloomberg*, June 17, 2019. https://www.bloomberg.com/news/articles/2019-06-17/eu-china-push-back-against-trump-s-16-billion-farm-bailout

Burns, D., J. Ekblom, and A. Shalal. 2019. "Timeline: Key Dates in the U.S.-China Trade War" *Reuters*, October 10, 2019.

Clayton, C.. 2019 "Lawmakers Spar Over CCC Dispute: House Passes Funding Bill With USDA Funds" *DTN Progressive Farmer*, September 19, 2019.

Coppess, J., G. Schnitkey, K. Swanson, and C. Zulauf. 2019. "The Market Facilitation Program: A New Direction in Public Agricultural Policy?" *farmdoc daily* (9):220, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, November 21, 2019.

Department of Agriculture, Commodity Credit Corporation. 2019. "Trade Mitigation Program." *Federal Register* 84, no. 145 (July 29, 2019): 36456-36464. https://www.federalregister.gov/documents/2019/07/29/2019-15700/trade-mitigation-program

Glauber, J.W. 2019. “Agricultural Trade Aid: Implications and Consequences for US Global Trade Relationships in the Context of the World Trade Organization.” American Enterprise Institute, November 2019.

Goodwin, B.K., Mishra, A.K. and Ortalo-Magné, F., 2011. “The Buck Stops Where? The Distribution of Agricultural Subsidies”. In *The Intended and Unintended Effects of US Agricultural and Biotechnology Policies* pp. 15-50. University of Chicago Press.

Hendricks, N.P., Janzen, J.P. and Dhuyvetter, K.C., 2012. “Subsidy incidence and inertia in farmland rental markets: estimates from a dynamic panel.” *Journal of Agricultural and Resource Economics*, 37(3): 361-378.

Johnson, J., S. MacDonald, L. Meyer, and L. Stone. 2018b. “The World and United States Cotton Outlook” *USDA Agricultural Outlook Forum,* February 23, 2018. https://www.usda.gov/oce/forum/2018/commodities/Cotton.pdf

Kirwan, B.E., 2009. “The incidence of US agricultural subsidies on farmland rental rates.” *Journal of Political Economy*, *117*(1): 138-164.

Landler, M, and A. Swanson. 2019. “Trump, Stung by Being Attacked as Soft on China, Pushes Ahead on Tariffs.” *New York Times*, May 29, 2018.

Li, M., Zhang, W., and Hart, C.. 2018. “What Have We Learned from China’s Past Trade Retaliation Strategies?” *Choices* 33(2): 1-8.

Liu, B. and Hudson, D. 2019. “A Preliminary Analysis of the Effects of China’s Cotton Tariff on the Chinese and U.S. Cotton Markets," *Estey Centre Journal of International Law and Trade Policy*, 20(1): 15-27.

Muhammad, A., Smith, S.A., and MacDonald, S. 2019. “Impacts of the Trade War on the US Cotton Sector.” University of Tennessee Extension Publication W-835, November.

Paulson, N.D., A.M. Featherstone, and J.C. Hadrich. 2020. "Distribution of Market Facilitation Program Payments and their Financial Impact for Illinois, Kansas, and Minnesota Farms." *Applied Economic Perspectives and Policy*, in press.

Regmi, A. 2019. "Retaliatory Tariffs and US Agriculture." Congressional Research Service Report R45903, September 13.

Sabala, E. and Devadoss, S., 2019. "Impacts of Chinese Tariff on World Soybean Markets." *Journal of Agricultural and Resource Economics*, *44*(2): 291-310.

Stabenow, D. 2019. "President Trump's Aid Not Trade Policy: Skewed Payments Choose Winners and Losers, Fail to Help Farmers Hit the Hardest." *U.S. Senate Committee on Agriculture, Nutrition, and Forestry, Minority Staff Report,* November.

Swanson, K., G. Schnitkey, J. Coppess and C. Zulauf. 2019. "The Trade Conflict – Impact on Illinois Agriculture in 2018," *farmdoc daily* (9):75, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, April 25, 2019.

Taheripour, F. and Tyner, W.E., 2018. "Impacts of Possible Chinese Protection on US Soybeans," GTAP Working Paper no. 83, Purdue University, February 2018.

USDA Interagency Commodity Estimates Committees. 2018a. "Grain and Oilseeds Outlook for 2018" *USDA Agricultural Outlook Forum,* February 23, 2018. https://www.usda.gov/oce/forum/2018/commodities/Grains_and_Oilseeds.pdf

USDA Office of the Chief Economist. 2018. "Trade Damage Estimation for the Market Facilitation Program and Food Purchase and Distribution Program." USDA, September 13, 2018.

USDA Office of the Chief Economist. 2019. "Trade Damage Estimation for the Market

Facilitation Program and Food Purchase and Distribution Program." USDA, August 22, 2019.

Westoff, P., T. Davids, and B.M. Soon. 2019. "A Hybrid Model Approach to Estimating Impacts of China's Tariffs on U.S. Soybeans," In *Proceedings of the 2019 Annual Meeting, July 21-23, Atlanta, GA*. Agricultural and Applied Economics Association.

Wiesemeyer, Jim. 2019. "Pay Caps and Means Test Are Latest Concerns of Some Farmers" *ProFarmer*, May 24, 2019.

Zhang, W. 2019 "Seven things to know about China to understand the trade war." *Ag Decision Maker* 23(4): 1-6.

Zheng, Y., D. Wood, H.H.Wang, and J.P.H. Jones. 2018. "Predicting Potential Impacts of China's Retaliatory Tariffs on the U.S. Farm Sector." *Choices* 33(2): 1-6.

Zulauf, C., K. Swanson, G. Schnitkey, J. Coppess and N. Paulson. 2019. "Assessing Market Facilitation Payments in Hindsight and Implications for Future Policy." *farmdoc daily* (9):179, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, September 25, 2019.

Figures

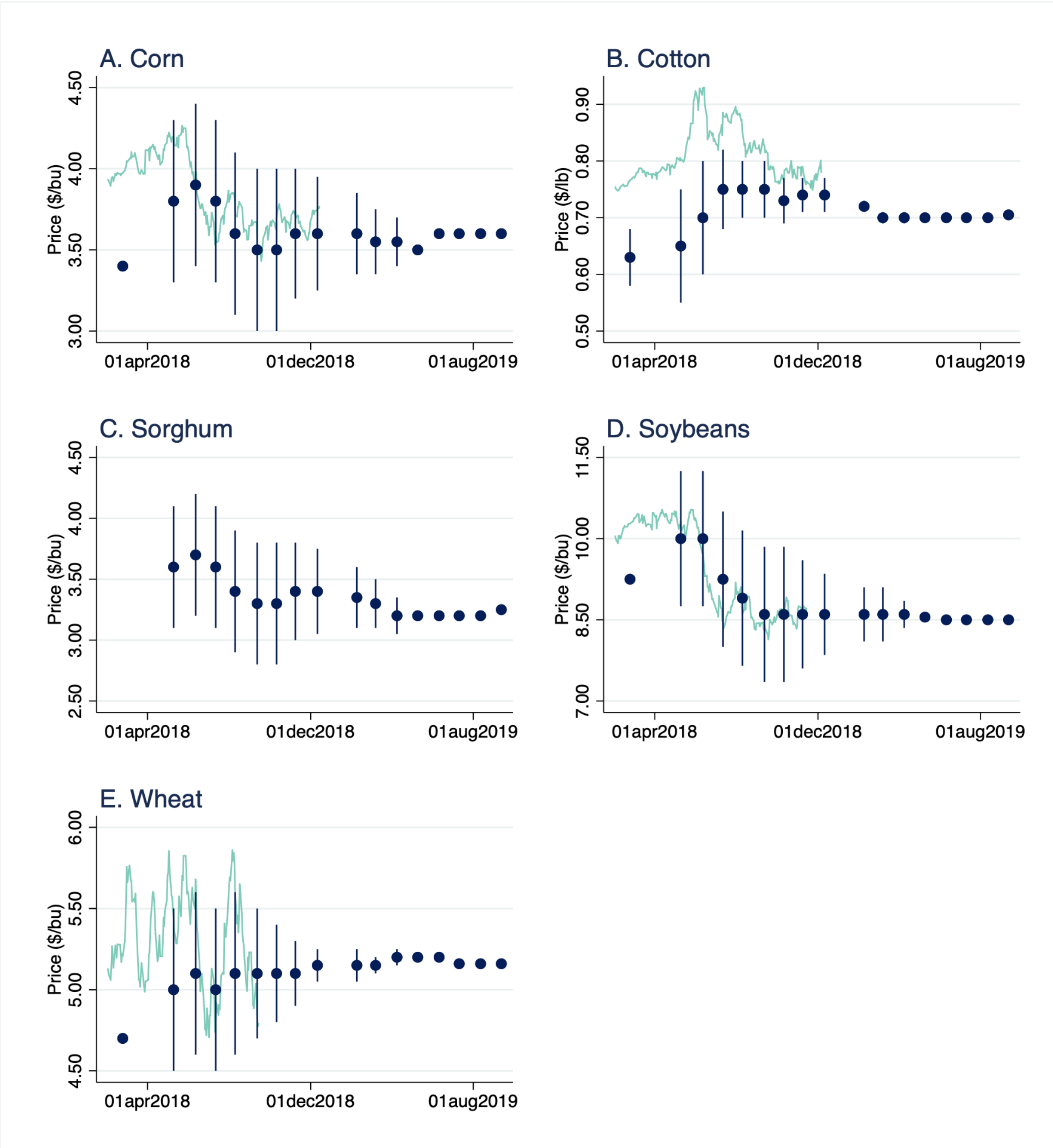

Figure 1. Forecasted Prices for the 2018/19 Marketing Year by Commodity, February 2018 to September 2019.

Note: Blue lines represent price forecasts from the USDA World Agricultural Supply and Demand Estimates, or WASDE (USDA World Agricultural Outlook Board, 2019), except for the February 2018 forecast which comes from estimates released at the USDA Agricultural Outlook Forum (USDA Interagency Commodity Estimates Committees, 2018, Johnson, et al, 2018). These season average price forecasts are given as a range (low and high).. For emphasis, we mark the midpoint of the forecast range. The January 2019 forecast was not issued due to a US federal government *shutdown. Statistics are shown for periods following the end of the marketing year for wheat and cotton because USDA may update the season average price statistic even after the end of the marketing year.*

Teal lines represent the price of the futures contract for 2018 harvest-time delivery. For corn and cotton, this is the December 2018 contract. For soybeans, this is the November 2018 contract. For wheat, this is the Hard Red Winter September 2018 contract.

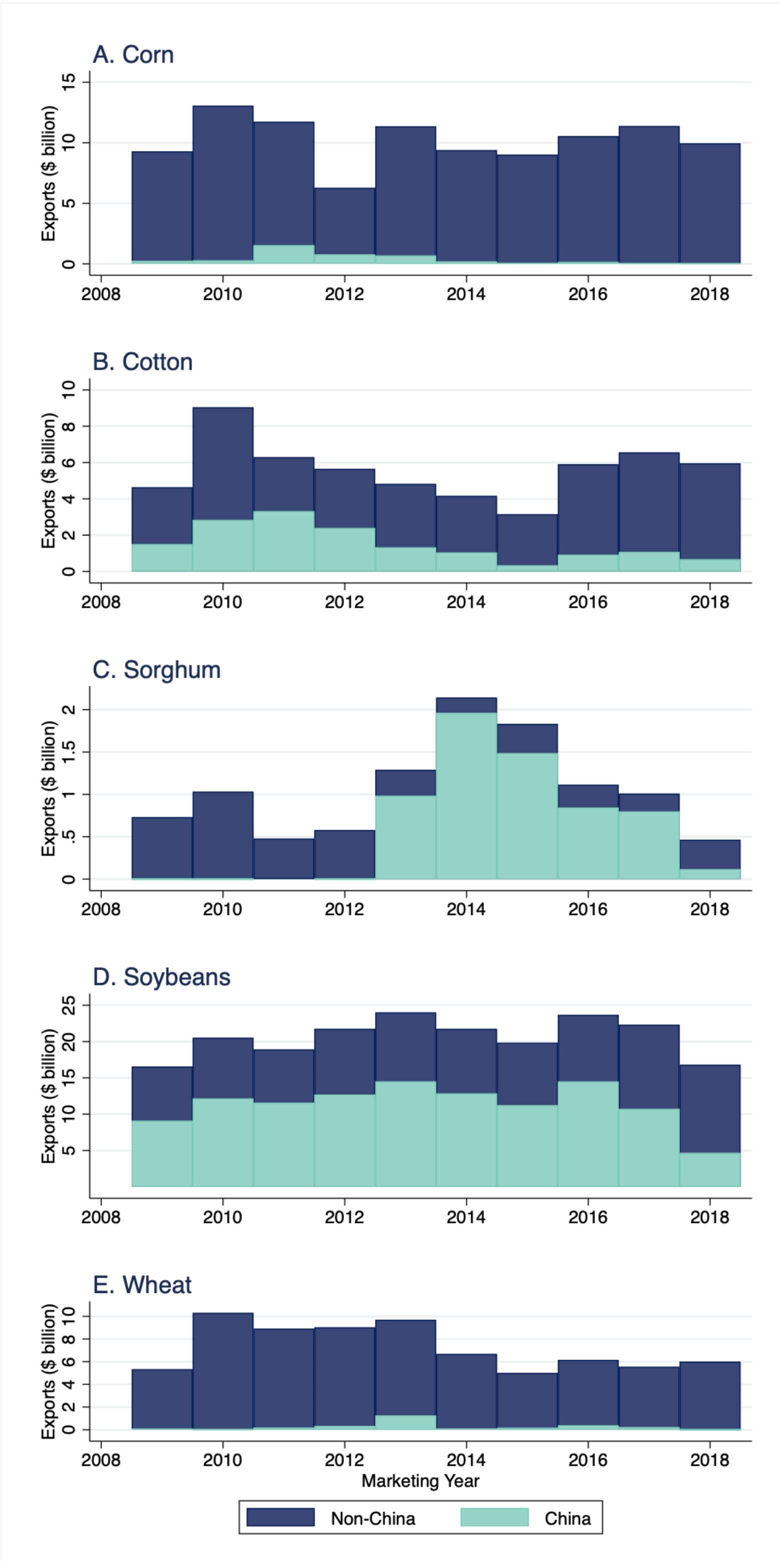

Figure 2. The value of selected US agricultural exports to China and all countries by marketing year

Source: US International Trade Commission, 2019 Note: Panels A-E show exports by commodity aggregated to the 4-digit Harmonized Tariff Schedule code level.

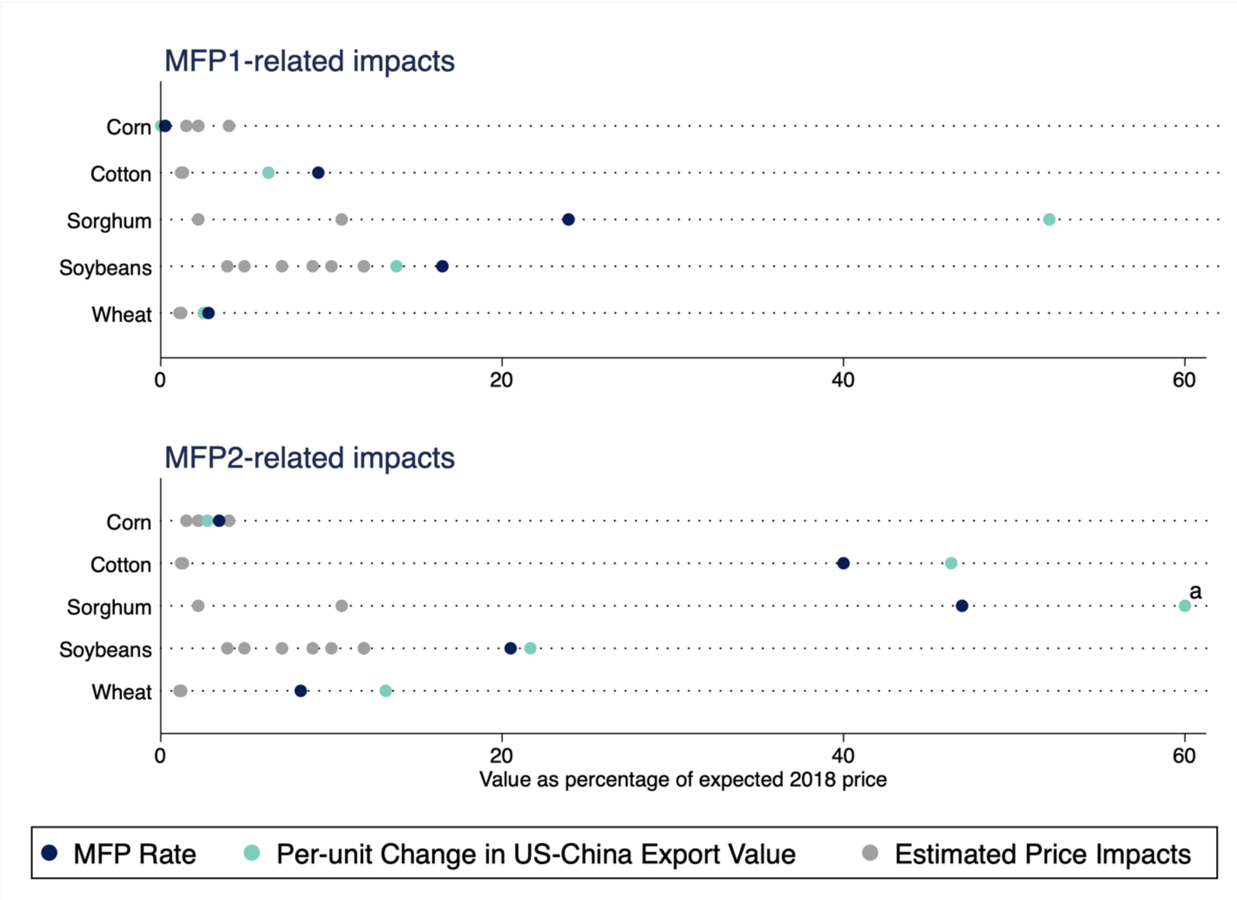

Figure 3. MFP Payment Rates, Observed Changes in US-to-China Export Value (relative to MFP1 2017-18 baseline and MFP2 maximum baseline), and Tariff-related Price Impacts as a Percentage of the Expected 2018-19 Season Average Price by Commodity.

Note: Point a is a truncated value. The actual percentage change per unit in US-China export value for sorghum using the MFP2-baseline export value was 140%. To maintain the clarity of other points on this graph, we truncate the x-axis at 60%.

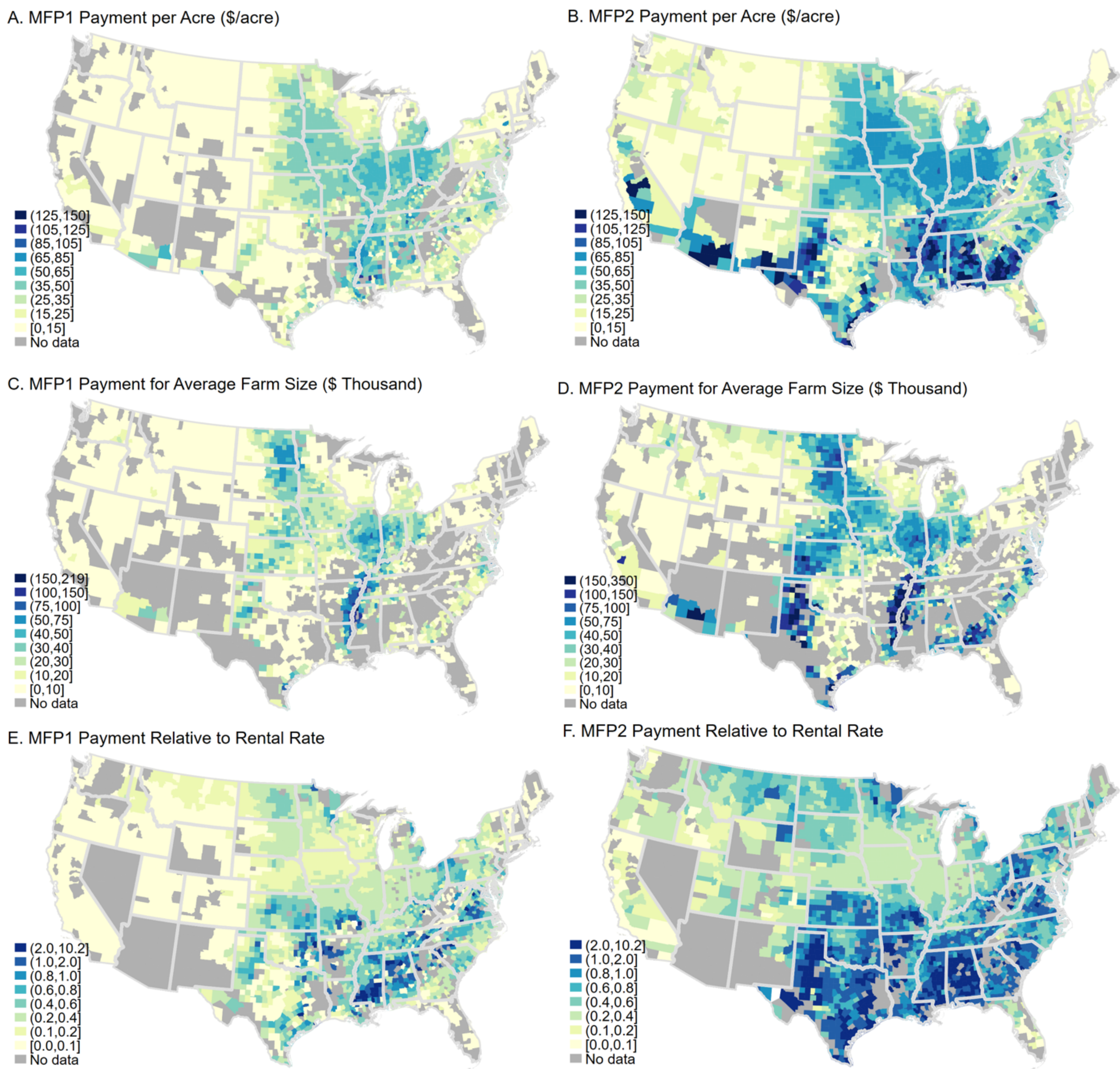

Figure 4. The distribution of non-specialty crop MFP payments across US counties

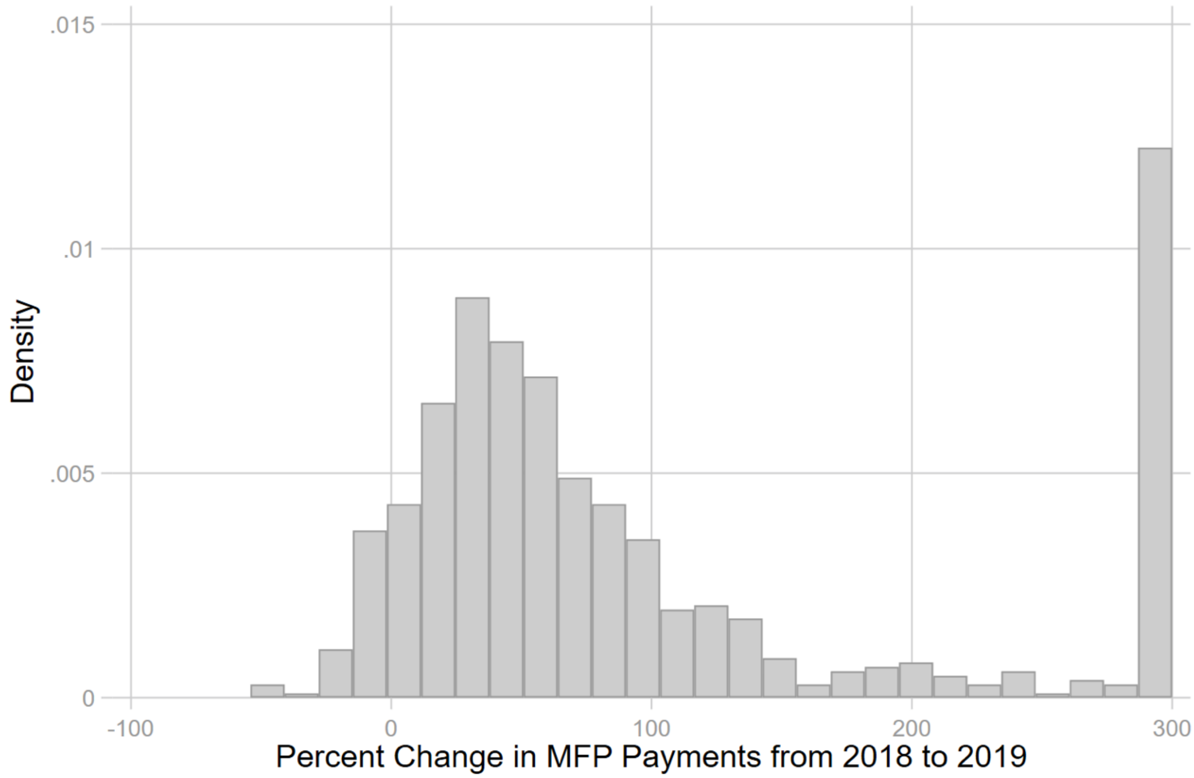

Figure 5. Distribution of the percent change in MFP payments across Kansas Farms

Note: The distribution is truncated at 300% since the distribution is highly skewed. Data are from KFMA farms with greater than 400 acres.

Tables

Table 1. Summary of Estimated Impacts of Retaliatory Tariffs on US Prices and Trade

Method	*Study*	*Publication Date*	*Estimated US soybean price decline*	*Estimated decrease in US soybean export quantity to China*	*Other estimated price declines*
Equilibrium Trade Model	Zheng, et al.	April 2018	3.9%	34.2%	Cotton: 1.2% Sorghum: 10.6%
	Taheripour and Tyner	April 2018	4.9%	69.0%	Corn: 1.5% Sorghum: 2.2% Wheat: 1.1%
	Balistreri, et al.	September 2018	10.0%	-	Corn: 4.0%
	Sabala and Devadoss	May 2019	11.9%	100%	-
	Liu and Hudson	June 2019	-	-	Cotton: 1.3%
	Westhoff, Davids, and Soon	July 2019	8.9%	50.9%	Corn: 2.2% Wheat: 1.2%
Time-Series Analysis	Swanson, et al.	April 2019	11.9%	-	Corn: 2.2%
	Adjemian, Smith, and He	July 2019	7.1%	-	-

Table 2. MFP Commodity-Specific Payment Rates

Commodity (units)	*MFP1 payment rate ($/unit)*	*MFP2 payment rate ($/unit)*
Corn (bushels)	0.01	0.13
Cotton (pounds)	0.06	0.26
Sorghum (bushels)	0.86	1.69
Soybeans (bushels)	1.65	2.05
Wheat (bushels)	0.14	0.41