

“US Biofuel Policy Effects on Agricultural Commodity Exports”

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US biofuel policies were seen by some observers to be a fundamental cause of the recent surge in agricultural commodity prices. To support the view that these policies were the bugbear behind food price spikes, observers argued that the biofuel policies diverted US agricultural output to ethanol and biodiesel production, leading to lower quantities of US commodities available for export and consequently causing higher world prices. The impact of expanding biofuel production and use on prices became a widely discussed topic, although empirical assessment suggested that this view over-states the role of the US biofuels in explaining the agricultural commodity price spikes as compared to other factors, such as exchange rates, petroleum prices, crop growing conditions in key areas, private stock-holding, public policy responses, and so on (Abbott et al., 2008, 2009; Dewbre et al., 2008; FAO, 2008; Meyers and Meyer, 2008; OECD-FAO, 2008; Trostle, 2008; Timmer, 2008; Westhoff, 2008).

Looking ahead, however, continued policy support for biofuels could resurrect these worries about the magnitude of impact on trade – and prices. Use mandates, biofuel use tax credits, and ethanol import tariffs represent the three main elements of US biofuel policy at present. The biofuel use mandates created by the Renewable Fuel Standard (RFS) under certain conditions requires biofuel producers to maintain their purchases of a feedstock at a level high enough to meet the mandate even if crop prices soar with falling yield or other market shocks. In this case, the mandate for biofuel use can draw crops and crop products away from other uses, including trade.

Here, we explore some of the implications of the three main elements of US biofuel policies for US agricultural commodity prices and exports. We use a range of possible market environments to take into account the potential for biofuel policy effects on markets to vary widely with market conditions, which is particularly true of minimum use mandates. There are reasons to take our findings with some caution, however. First, we represent US policies according to our understanding about how they will be implemented because final rules are not available at the time of writing. Second, our focus on US policies and markets leads us to use a model that represents US agricultural trade directly, instead of identifying the supplies, demands, prices, and policies of trading partners. If US policy is implemented differently than we assume or if the other countries respond to changing conditions in the US in a way that differs from past behavior, then the results of these experiments could be different.

Background

There are three key elements of US biofuel policies that we address in this paper. Two are the somewhat complementary set of tax credits for biofuel use and tariffs on ethanol imports. These policies are not new, and are part of broader energy policies that date back at least to the 1970s (Duffield and Collins, 2006). Fuel blenders receive a tax credit for every gallon of biofuel used. The current rate for ethanol is \$0.45 per gallon, and it is set to expire at the end of 2010. The biodiesel tax credit is \$1.00 for a gallon of biodiesel and it will expire at end 2009. The ethanol tariff includes two parts. A small *ad valorem* tariff is universally applied. Imports from countries in the Caribbean Basin Initiative are exempt from the other part, a specific tariff currently set at \$0.54 per gallon, but this tariff is levied on imports from other sources, including Brazil.

The third element of US biofuel policy is the Renewable Fuel Standard (RFS), which sets minimum biofuel use levels that blenders must meet. It was introduced by the Energy Policy Act of 2005 and expanded by the Energy Independence and Security Act (EISA) of 2007. This policy involves a set of overlapping mandates with various greenhouse gas reduction targets and feedstock restrictions, although the exact workings are a subject of speculation pending implementing legislation (Thompson et al., 2009). The EISA states that biofuel use must grow to 36 billion gallons by 2022, of which ethanol made from corn starch can account for no more than 15 billion gallons. At least a billion gallons of biodiesel must be in use by 2012. The other fuels required by the mandate must be comprised of “advanced” biofuels that achieve a higher greenhouse gas reduction threshold, likely including sugar-based ethanol imported from Brazil, and cellulosic biofuels. The legislation permits any component of the RFS to be waived.

The RFS introduces a kink in biofuel markets. The RFS disallows biofuel consumption to fall below a given target level. This policy could have an impact if the petroleum price fell and dragged gasoline prices very low, so that consumer demand for alternative fuels, such as biofuels, falls below the mandated quantity. Alternatively, poor growing conditions in key agricultural production areas that drive biofuel processor feedstock prices sharply higher would lead them to reduce the quantities supplied below the mandated quantity. In either case, as long as the RFS puts the burden of meeting the mandate on fuel blenders, the blenders will have to work to meet the mandates even if that means they bid their feedstock prices up on the one hand while discounting their prices to retailers on the other hand.¹ In other words, the RFS could make blenders lose money on every gallon of biofuels that they trade. This situation can vary among

¹ We side-step the question of ethanol pricing. In particular, how much are consumers willing to pay for ethanol relative to a given gasoline price? We assume that consumers tend to switch voluntarily to fuels with low ethanol inclusion rates as the ethanol price approaches energy equivalence, but that a discount is necessary to induce E85 expansion at least in the short run. If we assumed a greater or lower willingness to buy ethanol, then the petroleum price at which mandates become binding (for a given set of other factors) would also change.

the different components of the mandate. For example, the overall mandate may not be binding even though the mandate on biodiesel is binding.

The implications of the RFS for trade in agricultural commodities and biofuels can vary from approximately nothing in the case that the RFS is not binding to a very strong effect if it is binding and forces more feedstocks to be converted into biofuels than would occur otherwise. Analysis of how this policy affects markets is very sensitive to the context. If petroleum prices are high and crop production is ample, then the mandates might be met without any trouble. However, if the petroleum prices tumble or yields falter, then this policy can have a direct effect on markets.

The tax credit and tariff have clearer effects save for their interaction with the RFS. The tax credit to fuel blenders for each gallon of biofuel encourages them to buy and sell more fuels eligible for the subsidy. Thus, they will be quick to compete with one another to buy some more ethanol and biodiesel from biofuel producers and to sell the additional quantities to retailers, knowing that they could lose up to \$0.45 per gallon and still come out ahead because of the tax credit. The effect of the tax credit would normally be to encourage more biofuel production, with consequently higher feedstock demands and prices. The ethanol tariff directs some part of US demand for this biofuel to suppliers in the US instead of foreign sources. This policy will tend to lower imports of ethanol from Brazil and increase production in the US.

The effects of the tax credit and tariff depend on whether or not the RFS mandates are binding. If the RFS is binding, then changes in other policies might have little effect on the quantities of biofuels used. Binding restrictions on biofuel use mean that policies that subsidize blenders to use more may only affect their costs per unit, not the quantities they trade. A tariff might affect where they buy, but not the total volume traded if the overall mandates are binding.

If the Brazilian ethanol made from sugar qualifies as an advanced biofuel and there are few alternatives made in the US, then the blenders could be compelled by this submandate to import ethanol from Brazil in order to meet the mandate despite the disincentive of the tariff. In this case, the blenders would have little choice but to pay the tariff in order to get a hold of the right type of biofuel to meet their obligations under the RFS.

Various studies have addressed one or some components of US biofuel policy. Gardner (2007) applies his classic model of the vertical chain from corn to ethanol to calculate welfare implications of both biofuel and corn policies. He estimates that the effect of introducing a \$0.51 per gallon ethanol tax credit on the total of feed and export corn uses is a reduction of 107 million bushels, -1.3% in relative terms, in the short run and 674 million bushels, -7.2%, in the long run. Birur et al. (2008) assess how the overall US mandate and an EU mandate affect agricultural commodity markets using a version of GTAP, finding that the US corn price nearly doubles and the EU oilseed price does double, with share of US coarse grain exports in production falling from 23% to 10%. Westhoff et al. (2008) and Meyer et al. (2009) use the FAPRI-MU structural model to trace out domestic market effects of US biofuel policies, identifying the potential redundancy of subsidy and mandate. By varying input data over ranges of possible values, these authors estimate policy impacts in instances with and without a binding mandate. In Westhoff et al., the average increase in corn exports if all three of the key policy measures are eliminated is 19%. Meyer et al. find an average 25% increase if only the ethanol support policies are eliminated and in a context with updated basic trends in petroleum prices. In both these exercise, authors highlight the range of possible results and their dependence on the context. In a series of papers, de Gorter and Just (2008, 2009a, and 2009b), represent the overall biofuel use mandate as a minimum percent requirement, find that some part of the subsidy can be

ineffective, and explore the welfare effects of different elements of US biofuel support, including negative welfare effects outside the US. Tyner and Taheripour (2008) base a model on perfect arbitrage and break-even pricing, calibrate it to 2006 data, and estimate that the effects of an ethanol use subsidy or the RFS vary over a range of petroleum prices from \$40 to \$120 per barrel at \$20 increments. Their results suggest that removing the subsidy (without any RFS in place) causes the corn price to decrease by \$0.56 per bushel or 34% at the lowest petroleum price tested, \$0.89 (34%) at \$60 petroleum, 0.93 (28%) at \$80, \$0.94 (23%) at \$100, and to fall by \$0.96 per bushel or 20% at a petroleum price of \$120 per barrel. The estimated corn price effects if removing the RFS (without a subsidy in place) are a reduction of \$0.82 per bushel (42%) if the petroleum price is \$40 per barrel, \$0.59 (26%) at \$60, and \$0.13 (5%) at \$80, but they find no effect of the RFS on corn price if the petroleum price is \$100 or \$120.

The challenge we address is how the main US biofuel policies affect trade while taking into account not a single given set of external market conditions but instead an array of possible settings. Our method is distinct from others in at least one of the following ways. First, by addressing the three key policies at once, we can take into account their interactions. For example, the ethanol import tariff is directly related to the sub-mandate that is most likely to be met by imported sugar-based ethanol. Second, we represent all four of the mandates, of which three are modeled as minimum volumes that might or might not be binding. This raises our third distinction relative to others who might approach this sensitivity in a stylized way, such as “high” and “low” scenarios revolving around one or two factors, or not at all. We use stochastic simulations to test the results over many hundreds of possible contexts, each with its own values for petroleum prices, crop yield perturbations, and other key external drivers.

Analysis

We approach this challenge using a structural economic model that represents US biofuel and main agricultural commodity markets. As in other parts of the model, a key feature of the biofuel model is its representation of policies, as well as the various types of supplies and demands (Thompson et al., 2008). This model is created and maintained by the Food and Agricultural Policy Research Institute at the University of Missouri (FAPRI-MU) for policy analysis over a forward-looking, 10-year baseline. The baseline was developed in early 2009 and represents market conditions assuming current or announced policy is kept in place (FAPRI-MU, 2009). In this baseline, the biofuel tax credit and ethanol tariff are extended for the full period of the baseline, even though existing legislation would let them expire. The different components of the RFS are preset by US legislation until 2022, and these paths are imposed on the baseline. We assume that the cellulosic biofuel mandate is waived and a much lower volume is produced and used domestically.²

The links between commodity markets and biofuel markets are represented. The feedstock prices for biofuel refiners depend on crop and crop products – mostly corn and soybean oil – and the demand for feedstocks to make into biofuel adds to the overall demand for agricultural products. Biofuel policies that drive ethanol refiners to buy more corn compete with other users, so the corn price is bid higher leading other types of corn buyers to scale back their use as best they can. Co-products of biofuels are also included. The chief example is distillers grain co-produced with ethanol that is typically used as a feed input that substitutes for grains and to a lesser extent oilseed meal. Growing corn oil fractionation is represented, too. This co-product implies greater competition in vegetable oil markets as well as changes in the value of

² We assume that there is no offsetting increase in the volume of other biofuels necessary to meet the overall mandate – an outcome permitted by the EISA.

distillers grains. Eventually, the crop supply quantities change as producers respond to price signals largely by reallocating crop land in the medium-term. These effects are represented in this model.

Our focus is on US markets and we do not use a global model of corn or other crop product markets. Instead, exports or imports of each commodity is modeled as a single reduced-form equation that implicitly reflects how supplies and demands in other countries would respond to changes in US prices. It may be the case that trade-to-price relationships might change sharply if for example a large price shock leads to a policy response that limits the effects in foreign markets. We set aside such possibilities, however, and maintain our focus on US markets so we can simulate over a range of settings.

The baseline is characterized by a partially stochastic or montecarlo simulations. The structural economic model is not changed, but conditioning factors are varied over a range of possible values. Petroleum prices, crop yields, and demand shocks are all important unknown factors that can affect market outcomes dramatically. These and other factors are not assumed to be fixed values that correspond to a particular set of assumptions. Instead, the external factors are varied according to their historical distributions, taking covariance into account. Each set of random perturbations in external factors generates a new set of biofuel and agricultural commodity prices and quantities. We repeat this exercise 500 times to generate 500 different possible evolutions of markets over the next 10 years.

We build from Westhoff et al. (2008) and Meyer et al. (2009) by focusing on the effects of the three elements of US biofuel policy on US crop exports. We compare two sets of partially stochastic simulation results. In the baseline, we maintain all policies at their current or announced levels. In the second case, we allow tax credits and the specific ethanol tariff to expire

and we eliminate the RFS completely from marketing year 2009 on. We solve the model twice over the same set of 500 sets of randomly determined external factors, once for the baseline and once for the no-policy scenario. Thus, for each set of exogenous data, we have one solution with baseline policies and one solution without any biofuel support. These two outcomes are sets of matched pairs. The difference between the two values of a matched pair gives an estimate of how the policies affect markets for the given set of external factors. The difference between the base and scenario simulations is an estimate of how removing the US biofuel policies would affect this variable. The difference depends on the external conditions, such as petroleum price, in the chosen year, but also on the events of previous years. It takes time to increase biofuel production capacity or for consumers to switch from one fuel to another.

The results are represented below using both general measures relating to the mean and overall distribution and by showing matched pairs. Results are presented to highlight the sensitivity of the analysis to the petroleum price.

US biofuel policy effects

Results are expressed as changes caused by the elimination of RFS, biofuel tax credits, and ethanol specific tariff for each of the 500 market solutions. The averages of marketing years 2012 to 2018 are computed and compared.

The average of all simulation results indicate a decrease in ethanol use by 37%, the farm corn price 13% lower, and soybean oil price down by 30% if support is eliminated (Table 1). Whereas the mean ethanol use in all simulations is 17.0 billion gallons with support, removing these three measures results in an average of 10.7 billion gallons of use. Given the capacity that is already built and the likelihood of some consumer demand even without support, especially in

cases with high petroleum prices, ethanol use does not vanish at least in the medium-term even if support is eliminated.

The median results are similar, but somewhat lower in terms of ethanol use and a bit greater for the soybean oil price. The distribution suggests a wide range of results for ethanol use especially. The 10th percentile with support is 16.5 billion gallons, but the 10th percentile without support is about half as much, at 8.4 billion gallons.³ In contrast, the difference in 90th percentile results is a 24% reduction, from 17.6 billion gallons to 13.3 billion gallons. Although less dramatic, the effects also tend to be larger for corn and soybean oil prices when they are lower to begin with.

Table 1. Summary statistics of key market indicators, differences in 2012-2018 averages.

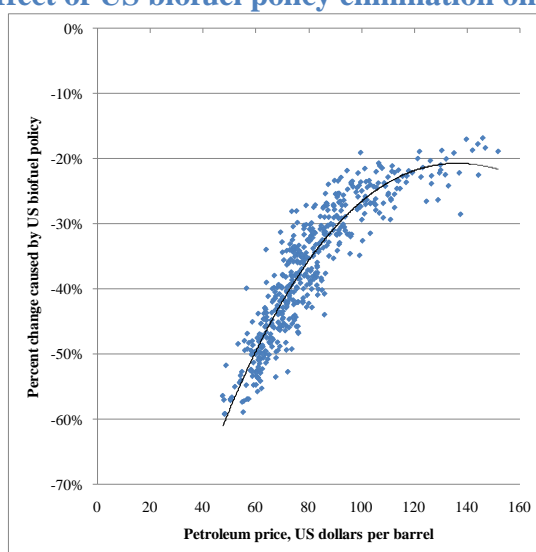
Results	Ethanol use			Corn price			Soybean oil price			
	Base	Scenario	Difference	Base	Scenario	Difference	Base	Scenario	Difference	
	(billion gallons)			(dollars per bushel)			(cents per pound)			
Mean	17.0	10.7	-37%	4.07	3.53	-13%	47.9	33.3	-30%	
Median	16.8	10.6	-37%	4.05	3.52	-13%	47.7	32.9	-31%	
Percentiles	10%	16.5	8.4	-49%	3.76	3.17	-16%	43.8	28.6	-35%
	20%	16.6	9.0	-46%	3.85	3.28	-15%	45.4	30.1	-34%
	80%	17.0	12.4	-27%	4.31	3.78	-12%	50.6	36.6	-28%
	90%	17.6	13.3	-24%	4.41	3.93	-11%	52.1	38.4	-26%

The matched pairs show that the simulated effects of US biofuel policies on ethanol use are sensitive to the petroleum price (Figure 1). The RFS has the greatest effect when binding, and is most likely to be binding when petroleum prices are low. Thus, its removal will lead to larger reductions in ethanol use when the petroleum price is low. The elimination of the tax credits will tend to increase prices to consumers and discourage biofuel use, whereas eliminating the tariff tends to lower consumer prices for ethanol-blended fuels. These effects dominate if the mandates

³ Given that there are 500 simulation outcomes for each of these variables, they can be ranked and then the 10th percentile is the 50th smallest result and so on. The results in the table report the percentiles of each data series even though these may be different simulations in base and scenario cases. For example, the base simulation result that gives the 90th percentile result might not be the one that gives the 90th percentile result among all scenario simulations.

are not binding, which is frequently the case when petroleum prices are high, but may be overwhelmed by the effects of RFS elimination if the mandates are binding. The average reduction is 37%, as shown before, but this average spans a range of only a few percent lower to a reduction to less than one-half of the baseline level. The magnitude of the simulated result is clearly linked to the petroleum price up to a kink somewhere around an average price of USD 100-120 per barrel.

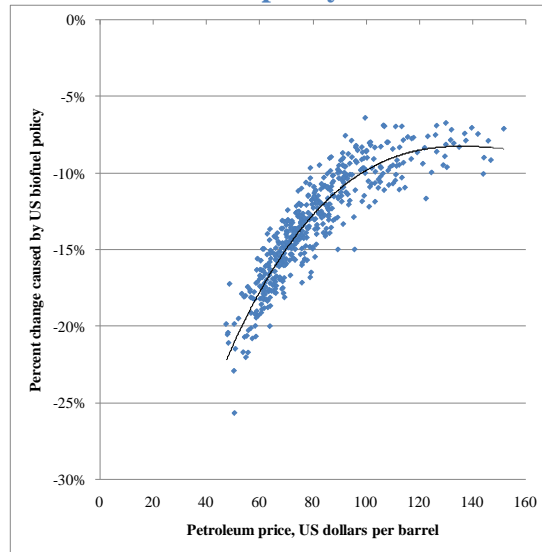
Figure 1. Effect of US biofuel policy elimination on ethanol use.



Notes: source is authors' calculations using the FAPRI-MU stochastic model; the percent change shown is the reduction in the average value for marketing years 2012-2018 if US biofuel mandates, tax credits, and specific ethanol tariff are eliminated; each point represents the results of one out of 500 simulations for that variable in that year; and the trend line is only added for the reader's convenience.

The effect of eliminating the biofuel support on corn prices is negative for 2012-2018 averages (Figure 2). While the average effect was seen to be a reduction of 13%, or \$0.54 per bushel, the reductions at one extreme are 20% or more, but no more than 10% at the other extreme. The magnitude of effects of eliminating biofuel support on corn prices is clearly tied to the petroleum price and is, again, not a linear relationship given that the effect (in relative terms) roughly stabilizes above the petroleum price range at which ethanol use tends to exceed mandated volumes.

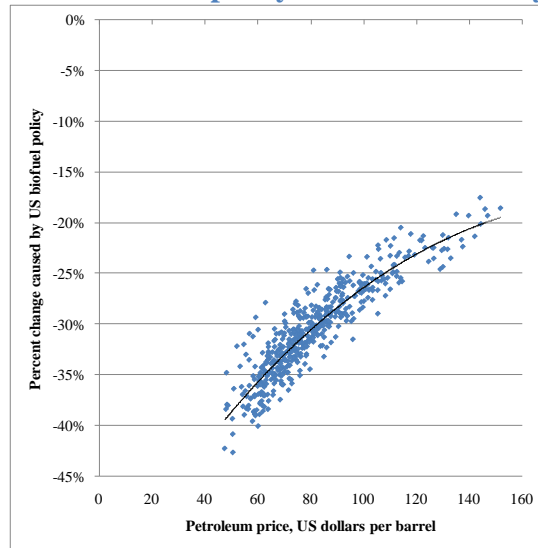
Figure 2. Effect of US biofuel policy elimination on corn price.



Notes: see notes to Figure 1.

The effect of lower support to biofuels also has direct effects on US soybean oil markets (Figure 3). We assume that biodiesel made from soybean oil counts towards the biodiesel mandate. Without the mandate or the tax credit \$1 per gallon of biodiesel used, the soybean oil price falls by 30% on average, or \$0.15 per pound. The range extends from less than 20% reduction if a high petroleum price would sustain considerable biodiesel use without the mandate to 40% if a low petroleum price discourages consumers from adopting biodiesel unless it is cheap.

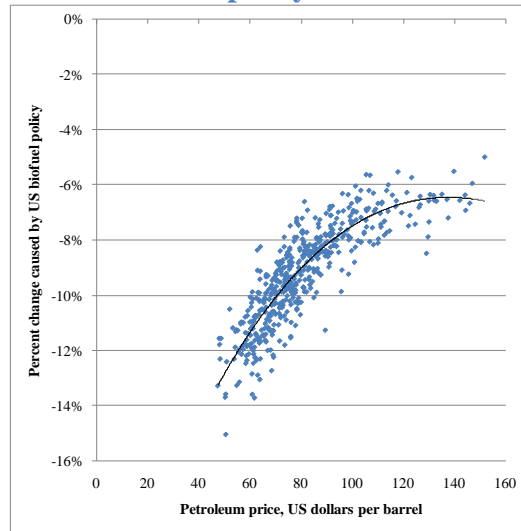
Figure 3 Effect of US biofuel policy elimination on soybean oil price.



Notes: see notes to Figure 1.

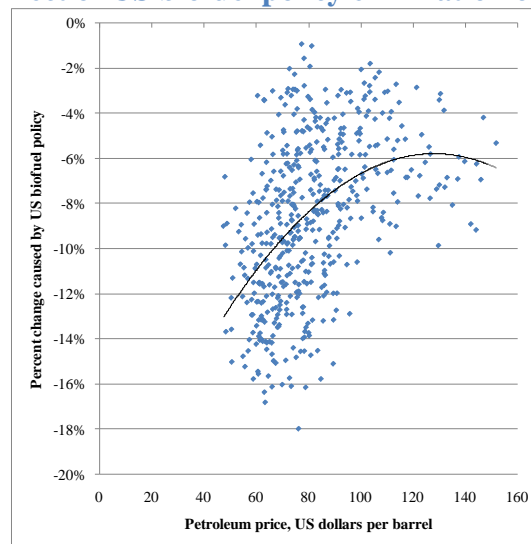
The soybean oil price change reduces the returns of soybean crushing, so fewer soybeans are demanded for crushing in the scenario. Soybean prices start to fall with the soybean oil price. However, this effect is limited by the soybean meal market. Less soybean crush means less meal as well as less oil, so the quantity of supplies in the soybean meal market contract. As the quantity supplied falls, the soybean meal price rises. Another impact through soybean meal markets of eliminating biofuel support works through feed markets. The lower corn prices encourage livestock production, consequently increasing overall feed demand and tending to push the soybean meal price even higher. Thus, the effect of the reduction in soybean oil price on soybean prices is limited in part by rising soybean meal prices. Moreover, soybean supplies are influenced by cross-effects with other commodities as land is allocated among crops. The substitution between corn and soybeans is typically an important relationship, and all the more so given the impacts of the ethanol policy support elimination on corn returns. In all, the average 9% reduction in the soybean price amounts to \$0.90 per bushel over 2012-2018 marketing years, and detailed results show the same sort of relationship to petroleum prices as observed in the case of the corn price (Figure 4).

Figure 4. Effect of US biofuel policy elimination on soybean price.



Notes: see notes to Figure 1.

Figure 5. Effect of US biofuel policy elimination on corn area.



Notes: see notes to Figure 1.

The substitution among crops is the critical element in medium-term supply-side effects, but also a very complicated one as both corn and soybean returns change and it takes time to reallocate crop land. The net effect is less area planted to corn (Figure 5). The average reduction in area is 8%, equivalent to 7.4 million acres. The net result is still some apparent link between

the impacts of US biofuel support and petroleum prices, but a much less pronounced one as compared to the previous indicators' cases.

Agricultural commodity export effects of discontinuing US biofuel support reflect the expected outcome of a decrease in a competing demand and do not show as pronounced a range of results as the previously discussed market indicators (Table 2). Corn exports are about half a billion bushels higher, on average, without biofuel support. Soybean oil export effects are even more pronounced: the elimination of support for soybean oil use as biodiesel leads to a 64% increase, almost 2 billion pounds, on average. The effects are more muted as the chain of cross-effects is extended: the eventual changes in wheat exports are much smaller than the effects on corn or soybean oil exports.

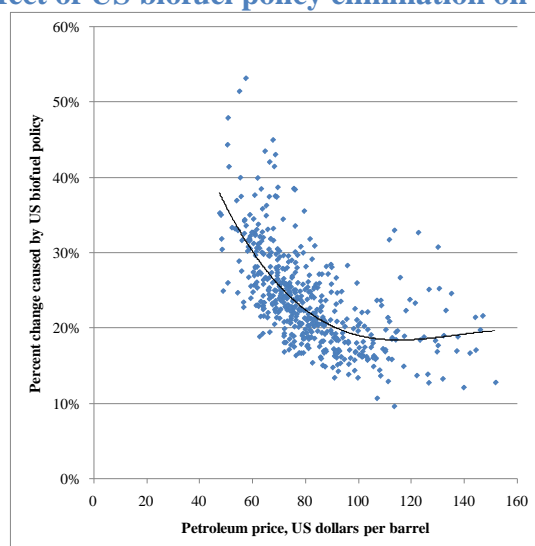
Table 2. Biofuel policy elimination effects on US exports, differences in 2012-2018 averages.

Results		Corn exports			Soybean oil exports			Wheat exports		
		Base	Scenario	Difference	Base	Scenario	Difference	Base	Scenario	Difference
		(billion bushels)			(billion pounds)			(billion bushels)		
Mean		2.12	2.62	23%	2.97	4.86	63.8%	1.08	1.09	1.1%
Median		2.13	2.65	24%	2.96	4.88	64.9%	1.08	1.09	1.2%
Percentiles	10%	1.71	2.13	24%	2.08	3.79	82.1%	0.95	0.96	1.4%
	20%	1.87	2.32	24%	2.36	4.17	76.9%	1.00	1.01	1.6%
	80%	2.40	2.93	22%	3.53	5.54	56.9%	1.16	1.17	1.0%
	90%	2.51	3.06	22%	3.89	5.92	52.4%	1.20	1.21	1.4%

Corn export results varies dramatically, from less than 10% to over 50% even for the average of 2012-2018 marketing years (Figure 6). The range in any particular year is wider still. Much of this variability comes from the fact that exports are expected to be sensitive to price, but also because of the same factors that lead to normal year-to-year variability, such as dynamics of corn markets and underlying variability in exports (so, for example, a given shock from a low

level of exports will tend to be larger in relative terms than if it were from a large level of exports).⁴

Figure 6. Effect of US biofuel policy elimination on corn exports.



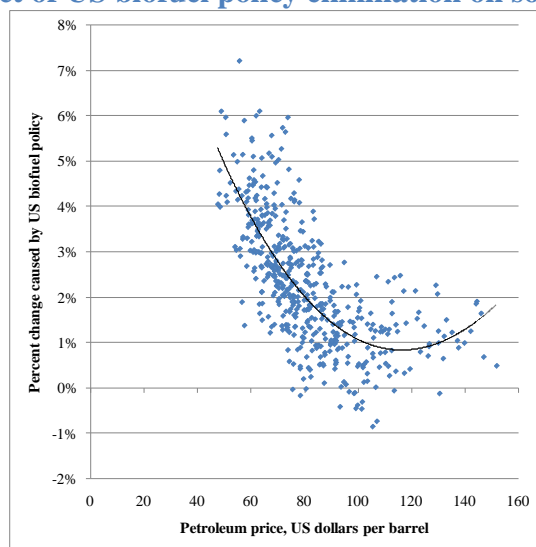
Notes: see notes to Figure 1.

The effect of eliminating the three biofuel support policies on soybean oil exports was observed to be strongly positive, but the net effect on soybean exports is complicated by cross effects, as noted above. One force works to lower soybean exports: a lower corn price tends to increase complementary soybean meal use in feeds and if this dominates other effects then there would be more soybeans allocated to crush and less available for exports. But there are more forces towards greater soybean exports, such as the lower soybean oil demand for biodiesel use that tends to decrease returns to oilseed crush and the reallocation of area from corn to soybeans. The net effect of eliminating biofuel support tends to be an increase in exports this crop, too, and we can observe a similar pattern with respect to petroleum price (Figure 8). The average 2% increase in soybean exports is smaller than for corn or soybean oil exports. Given the smaller net

⁴ This highlights our use of single-equation representations for all trade equations. Our choice makes it feasible for us to introduce export demand variability as one of the stochastic elements of our simulations, but it precludes us from identifying the underlying factors (such as variability in foreign yields, exchange rates, or others) that might explain the historical ranges. Our stochastic method nevertheless should reproduce any historical correlations between trade shocks and the petroleum price.

effect overall with forces in both directions and the dynamics of year-to-year adjustments in area, livestock inventories, and biofuel refinery capacity, the results for soybean exports in any particular year can be negative in some cases, and in some instances even the 2012-2018 average is negative.

Figure 7. Effect of US biofuel policy elimination on soybean exports.



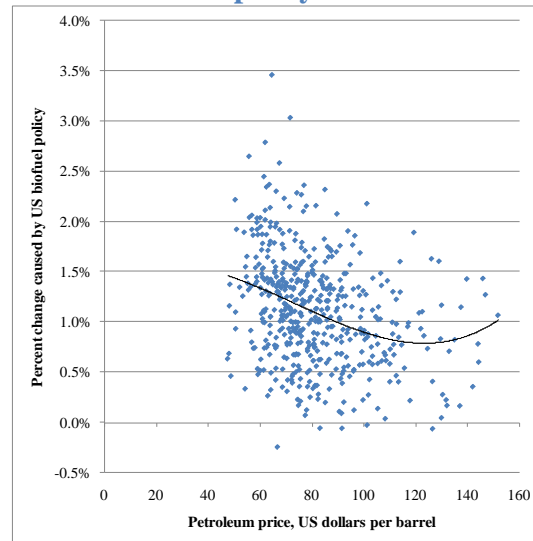
Notes: see notes to Figure 1.

Wheat trade results are scattered over a wide range but still show some relationship with the petroleum price (Figure 8). The average effect is a 1.1%, or 10 million bushel, increase. The relative change can be several times that average, particularly at lower petroleum prices. However, the final effect on wheat exports is quite indirect, working through cross-commodity effects in land use and demands.

The cross-commodity effects go further, as livestock producers respond to the changing feed costs. The elimination of biofuel support typically lowers feed costs as prices for corn and other grains fall, but soybean meal prices often rise. The net effect on livestock producers varies from simulation to simulation, with a 1.3% average effect on the export volume of beef, pork, and chicken, summed using fixed-price weights. The average increase in beef exports is 2.7% and for pork exports it is 3.5%, but the higher meal price takes a particular toll on chicken

production leading to an average reduction in exports of 0.5%. The net effects on total meat export volume can be quite small if the petroleum price is high and rarely approach a 4% increase even at the lower end of the range of petroleum prices explored here.

Figure 8. Effect of US biofuel policy elimination on wheat exports.



Notes: see notes to Figure 1.

Summary

Our analysis stops at the border. While we trace out export demands or import supplies for each of the main US crops and livestock products, and we allow export demands to vary randomly, we do not explore the reasons behind these trade results nor the final consequences. We do not decompose the trade effects into the part that might relate to changes in foreign supplies and any indirect land use changes that underlie those effects, nor do we identify the implications for foreign food consumers. Our analysis tests the sensitivity of the main US biofuel policies to ranges of possible market environments in the US, with particular focus on the petroleum price.

The US biofuel policies include three measures to support biofuel use or domestic production. These are the tax credit to blenders for using biofuels, a specific tariff on ethanol

imports, and the Renewable Fuel Standard that requires a minimum level of use for different sorts of biofuels. In the scenario analysis conducted here, eliminating biofuel support leads to lower output prices for biofuel refiners who respond by decreasing their output, buying less of their feedstocks than they would otherwise. Lower purchases in particular of corn and soybean oil lead to falling prices for these goods and exports rise. Lower soybean oil prices also lead to less crush and consequently higher oilseed meal prices. Feed use typically rises as the lower corn price tends to outweigh the increase in oilseed meal prices, so the livestock sector output expands. Other cross-commodity demand effects play out and crop land is reallocated as soybean returns fall and corn returns fall even more, leading to other changes in the agricultural sector and in US exports. Thus, the initial incidence of these policies is on biofuel markets, but this impact carries over into feedstock and other agricultural commodity markets.

The effects tend to be largest when the mandated levels of biofuel use are most difficult to attain, such as when the petroleum price is low. The effect of mandates on biofuel use range from almost nothing to stringently binding for a market that would otherwise opt for a much lower quantity sold and used. The influence of the petroleum price on the effects of eliminating biofuel policy support on feedstock use is repeated, albeit with some attenuation, in the effects of biofuel support elimination on agricultural exports. As a general rule, the lower the petroleum price, the higher the simulated effect of an elimination of US biofuel policy on agricultural trade, with this link most pronounced for corn and soybean oil, but still apparent for soybean and wheat exports.

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