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Impact on Merchant Refiners and Blenders from Changing the RFS Point of Obligation

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Executive Summary

The Environmental Protection Agency has proposed to deny a request to move the point of obligation under the Renewable Fuel Standard (RFS) from oil refiners to fuel blenders. Supporters of the request argue that those refiners who do not have the fuel blending capabilities of large, integrated oil companies are in danger of going out of business due to their need to buy RINs (Renewable Identification Numbers) to show compliance with the RFS. We demonstrate that this claim is false and that moving the point of obligation would have no impact on refiner profits. The key point that is neglected in the arguments of those who want to move the point of obligation is that added refiner costs from complying with the RFS are passed on to blenders through higher gasoline prices. We show that high RIN prices, holding constant gasoline consumption levels, have no impact on profits of refiners, blenders, or integrated oil companies. Moving the point of obligation from refiners to blenders similarly will have no impact on profit levels other than moving administrative costs of showing compliance from refiners to blenders. High RIN prices that result from substitution of ethanol for gasoline impact refiner profits from a loss of market share to biofuel producers. This loss of profits from lost market share is consistent with the objective of the RFS to substitute biofuels for gasoline. Moving the point of obligation from refiners to blenders would have no impact on this loss.

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The Environmental Protection Agency (EPA) has proposed to decline a request to change the obligated party under the Renewable Fuel Standard (RFS) biofuel blending requirements. Currently, producers and importers of gasoline and diesel are obligated parties and must demonstrate compliance by acquiring a sufficient number of blending credits called Renewable Identification Numbers (RINs).[1] The request of EPA was to move the point of obligation from refiners to blenders of biofuels. Supporters of the request argue that making blenders the obligated parties would increase the efficiency and fairness of the program. Opponents of the request argue that moving the point of obligation to blenders would increase program complexity and administrative costs without doing anything to further the goal of the RFS. Understanding the potential impact of moving the point of obligation requires a good understanding of how the current system works. To facilitate understanding, we limit our analysis of the RFS to the markets for ethanol and gasoline.[2]

To begin, it is useful to categorize current obligated parties into two groups: owners of refineries with downstream gasoline blending, distribution, and/or retailing assets and owners of refineries who do not own downstream assets. The former are familiar, branded vertically integrated oil companies such as Shell and BP. Because they both produce and blend fuel downstream, these 'integrated' oil companies acquire most of their RINs by purchasing ethanol that carry RINs at their blending facilities. The latter group are made up primarily of smaller refining companies, and are referred to as 'merchant' or 'independent' refiners. Merchant refiners do not blend fuel downstream and thus are unable to acquire RINs through blending, and must therefore buy RINs from other parties such as downstream fuel blenders, who are not obligated under the RFS, or integrated oil companies who generate more RINs than they need.

Investor Carl Icahn is among those who advocate moving the point of obligation. He is also a vocal opponent of the RFS and has a large financial stake in CVR Energy, a merchant refining business. He claims that the current system is unfair to merchant refiners because they have to buy RINs on the open market, as compared to those refineries who own blending operations. For example, Icahn wrote an opinion piece in the Wall Street Journal recently that concisely stated how he thinks the RFS currently works: [3]

> "Those blenders, often gas-station chains, earn windfall profits by generating RINs that the merchant refiners are

[1] Each gallon of biofuel produced by a qualifying plant carries with it a RIN that is separated when the biofuel is blended with gasoline or diesel. The RIN can either be sold on the RIN market or turned in to EPA to show compliance with the RFS.
[2] Limiting analysis to the blending of gasoline and ethanol greatly reduces the complexity involved in accounting for the interactions of RINs generated by biomass-based diesel and those generated by ethanol without unduly limiting understanding of the impacts of changing the point of obligation.
[3] Icahn, C. "If Oil Refiners Crash, So Will the Economy." *Wall Street Journal*, November 21, 2016.

> forced to buy to comply with the law. Big integrated oil firms are practically exempt: Most of them blend more fuel than they refine, meaning they end up with excess RINs to sell."

Mr. Icahn's view is that blenders benefit from the RFS, merchant refiners lose, and integrated companies break even. He believes that moving the point of obligation to blenders would take away their windfall profits and help merchant refiners.

In this policy brief, we start by analyzing the claims of Mr. Ichan (and others) regarding who wins and loses under the current RFS system. We do this by examining the financial situation of each of these players when RIN prices are high and when they are zero to clarify the gains and losses from RIN prices. We examine two scenarios regarding ethanol mandates. The first scenario is a mandate level that can be met if all consumers buy E10, which is a blend of 10% ethanol and 90% gasoline. Practically all U.S. gasoline today is E10. The second scenario is a mandate level that can only be met if enough motorists buy E85, which contains approximately 70% ethanol and 30% gasoline. Last, we discuss the implications of moving the point of obligation from refiners to downstream blenders under each of these two scenarios.

We have strived to make this analysis understandable to non-economists. The cost of doing this is a fairly detailed explanation of fundamental economic forces that affect market outcomes of all widely traded commodities. While much of what we write here may seem obvious to our colleagues, given the amount of misinformation that has made its way into the public debate about this issue, we decided that the costs were worth the benefits of increasing the chances that the future of the RFS will be based on sound economic analysis.

Impact of RIN Prices on Markets for Gasoline and Blended Fuel

To begin, consider a situation much like we have today with a high ethanol blending mandate and high RIN prices. For illustrative purposes, assume that the wholesale price of gasoline blendstock is $1.65 per gallon, the wholesale price of ethanol is $1.50 per gallon and the price of RINs is $1.00.[4]

To see the impact of high RIN prices, we start with the market for gasoline. By most accounts, the market for gasoline, particularly at the wholesale level, is competitive. There are many buyers and sellers, ensuring that fundamental supply and demand forces determine market prices. Currently, all producers and importers of gasoline are obligated under the RFS to acquire a certain number of RINs for each gallon of gasoline they produce or import. Thus, the per-gallon cost of acquiring the required number of RINs is equivalent to a per-gallon 'tax' on gasoline production. A per-unit production tax increases the cost of producing gasoline. This is depicted in Figure 1, where the supply

[4] These prices are representative of their levels in early December, 2016.

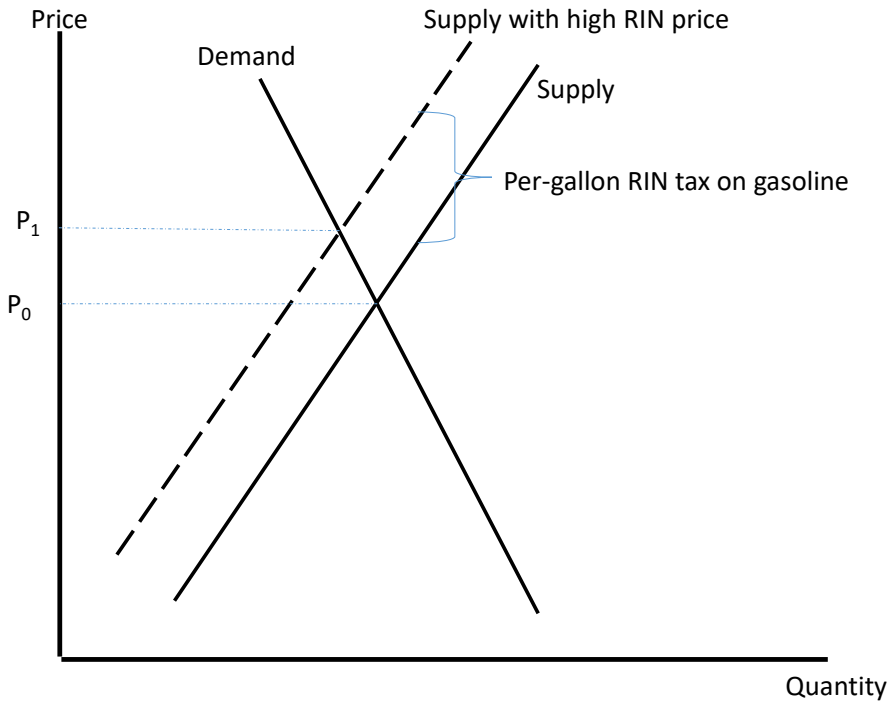

Figure 1. Impact of a high RIN price on supply curve of gasoline.

curve of gasoline shifts up vertically by the amount of the RIN tax. The vertical shift in the supply curve increases the market-clearing price for gasoline from P_0 to P_1.

In Mr. Icahn's view, merchant refiners are harmed by the RFS because they have to pay the tax by buying RINs. Proof of this is contained in the financial statements of merchant refiners that show a cost for RIN acquisition. However, this view ignores the impact of the RIN tax on the market price of gasoline. All producers and importers are subject to the RIN tax. Hence, the market-clearing price of gasoline with a high RIN price is higher than it would otherwise be. It is indeed true that the income statements of merchant refiners with a zero RIN price would show lower costs, but they would also show lower revenues because the market-clearing gasoline price would be lower. Therefore, the net impact of high RIN prices on the profits of merchant refiners is less than the cost of RINs. How much less depends on what portion of the RIN tax gets reflected in higher gasoline prices. To answer this question requires an exploration of the market for blended fuel.

We first examine the impact of RINs on blenders' profits from producing and selling 1,000 gallons of E10. First, consider what happens with an RFS ethanol blending obligation of exactly 10%, which corresponds to being able to meet the blending mandate with E10. Fuel blenders compete with other blenders for market share. Given sufficient competitive pressures, the market price for E10 will reflect blenders' cost of producing E10 plus enough profit to keep them in business. We assume that the profit level needed to keep them in business is the same whether RIN prices are high or low. Thus, we can safely set this profit level equal to zero without impacting our analysis.[5]

[5] The required profit margin to keep blenders in business will be reflected in margins between wholesale and retail blended fuel price, which empirical evidence shows is unaffected by high RIN prices.

Blenders who pay $1.50 for a gallon for 100 gallons of ethanol receive both 100 gallons of the physical product (ethanol) and 100 RINs. Thus, the total cost of producing 1,000 gallons of E10 is $1,635—$1,485 for 900 of gasoline (at $1.65 per gallon) plus $150 for 100 gallons of ethanol, which includes 100 RINs. With a $1.00 RIN price blenders' net cost of ethanol—the physical product—is only 50 cents per gallon. Competition between blenders will result in an E10 price that reflects the net cost of ethanol rather than the total cost. Therefore, the revenue generated from 1,000 gallons of E10 and 100 RINs is $1,635—$1,535 from the E10 and $1,000 from the RINs. Thus, the profit level above that needed to keep the blender in business (i.e., windfall profits) is zero. These calculations are shown on the left side of Box 1(a).

The RFS blending obligation implies that oil refiners must acquire one RIN for every nine gallons of gasoline they produce. With a RIN price of $1.00 this equates to a "RIN tax" on gasoline of 11.11 cents per gallon ($1.00 divided by 9). As shown on the right side of Box 1(a) refiners receive $1,485 for selling 900 gallons of gasoline and pay a total RIN tax of $100 on those sales ($0.1111*900).

Box 1(a): Refiners Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $1.00 RINs, a 10% biofuel mandate, and no substitution of ethanol for gasoline.

Blender Costs:

Gasoline:	$1,485
Ethanol:	$150
Total:	$1,635

Blender Revenue:

E10 sales:	$1,535
RIN sales:	$100
Total:	$1,635

Merchant Refiner RIN Costs:

RIN purchases:	$100
Total:	$100

Merchant Refiner Revenue:

Gasoline sales:	$1,485
Total:	$1,485

Our conclusion that blenders do not obtain windfall profits when prices are high contradicts Mr. Icahn's claims. It is easy to reconcile our conclusion that blenders break even with Mr. Icahn's opinion that they make windfall profits from RINs if Mr. Ichan believes that windfall profit can be measured from RIN revenue reported on blenders' financial statements (equal to $100 for 1,000 gallons of E10 sales in the example above). However, just as RIN costs do not measure lost profits of merchant refiners, RIN revenues do not indicate windfall profits of blenders because blenders' costs of gasoline and ethanol must also be considered.

Now consider what would happen to blenders and merchant refiners if the RIN price falls to zero (see Box 1(b)). With a zero RIN price, the RIN tax drops from 11.11 cents per gallon to zero. As shown in Figure 1, a drop in the tax on gasoline will shift the gasoline supply curve down and the market price of gasoline will fall back to P0. If we assume that the RIN tax was fully reflected in the price of gasoline—a topic that we turn to next—the market price of gasoline falls from $1.65 per gallon to $1.539 per gallon. This drop in the price of gasoline means that the cost of producing E10 drops also. However, a zero RIN price now means that the cost of ethanol, the physical product, increases from 50 cents to $1.50 per gallon, increasing the cost of producing E10. The cost of producing E10 with a zero RIN price is now $1,385 for the 900 gallons of gasoline plus $150 per 100 gallons of

ethanol, for a total cost of producing E10 of $1,535. RIN revenue with a zero RIN price is zero. This means that both costs and revenues for blenders equal $1,535 and the blender again breaks even.

It is easy to show that profits to merchant refiners are also unaffected by the drop in RIN prices. With a $1.00 RIN price, the cost of acquiring enough RINs to meet the obligation of producing 900 gallons of gasoline is $100. Revenue from producing the 900 gallons with a $100 RIN cost is $1,485. Thus, revenue minus RIN cost is $1,385. With a zero RIN price the cost of RINs is, by definition, zero. However, revenue from selling 900 gallons of gasoline is now $1,385. Thus, revenue minus RIN cost does not change, which means that the profit levels of merchant refiners are not impacted at all by higher RIN prices, despite the fact that their financial statements show a RIN cost when RIN prices are not zero.

Example 1(b): Refiners Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $0 RINs, a 10% biofuel mandate, and no substitution of ethanol for gasoline.

Blender Costs:	**Merchant Refiner RIN Costs:**
Gasoline: $1,385	RIN purchases: $0
Ethanol: $150	Total: $0
Total: $1,535	
Blender Revenue:	**Merchant Refiner Revenue:**
E10 sales: $1,535	Gasoline sales: $1,385
RIN sales: $0	Total: $1,385
Total: $1,535	

The fact that profits of blenders and merchant refiners are not impacted at all in this somewhat simplified example clearly shows the fallacy of Mr. Icahn's logic. One must account for how RIN prices impact both costs and revenues of blenders and refiners before making conclusions about who is hurt or helped by high RIN prices. In the above example, neither blenders nor refiners are impacted at all by RIN prices because prices for the physical products adjust to reflect the RIN tax.

Note that the conclusions from the examples above would also hold for an integrated refiner. The balance sheet of an integrated refiner would also show a net impact of RIN of zero.

Impact of Substitution of Ethanol for Gasoline

Our conclusion that refiners are unaffected by high RIN prices depends on the assumption that the market price of gasoline increases by exactly the per-gallon RIN tax. If this is the case, then refiners pass on all of their costs of paying the tax to blenders who pass on their higher costs to consumers. Figure 1 shows that a high RIN price leads to a drop in gasoline consumption. If this is the case, part of the burden from the tax on gasoline is on refiners. This can be seen in Figure 1 with the difference $P_1 - P_0$ being smaller than the RIN tax on gasoline. The question then becomes, when does a high RIN price impact gasoline consumption?

There is no question that consumers buy more E10 when its price is lower. This is evidenced by the substantial increase in fuel use in the last few years with sharply lower fuel prices. Thus, the demand for E10 slopes downward. As discussed above, because high RIN prices increase the market price of gasoline, one effect of RIN prices is to increase the cost of

producing E10. However, high RIN prices also lead to lower ethanol blending costs that offset the effects of higher gasoline prices. In a world where E10 is the only fuel, the net effect on the price of E10 of high RIN prices is zero: higher gasoline prices are offset by lower ethanol blending costs and the price of E10 remains constant. In this E10 world, profits of gasoline producers and blenders are unchanged by RIN prices.

EPA's 2017 ethanol mandates cannot be met only with E10. EPA has decided to set mandates that can be met with 15 billion gallons of corn ethanol. For 2017, total E10 consumption is projected to be 142 billion gallons, which implies ethanol-in-E10 consumption will be 14.2 billion gallons.6 E10 represents about 99% of all consumption of blended gasoline in the United States, such that total fuel consumption through various blends is about 143.4 billion gallons. If 15 billion gallons of ethanol are to be consumed in 2017, then about 800 million gallons of ethanol need to be consumed in either E85 or E15. To keep things reasonably simple, let's assume that all of this additional ethanol consumption will be consumed in E85. Research has shown that most consumers will not choose E85 unless its price is low enough to save them money on a cost per mile basis.[7] The mechanism through which the E85 price can be lowered is from an increase in the RIN price, because, as discussed above, a higher RIN price lowers the blending value of ethanol thereby lowering the cost of producing E85.

If consumption of E85 increases, consumption of E10 decreases. That is, E85 substitutes for E10. Fewer gallons of E10 implies fewer gallons of gasoline are consumed because E85 contains about 30% gasoline, whereas E10 contains 90% gasoline. Thus, as RIN prices rise to induce more consumption of E85, consumption of gasoline drops. A lower level of gasoline consumption with high RIN prices means that the market price for gasoline increases by less than the RIN tax, a situation that is depicted in Figure 1. This means that not all of the RIN tax is passed on to blenders in the form of higher gasoline prices. A portion of the tax is paid by refiners. Thus, when we move away from an E10 world into a world where E10 and gasoline consumption are reduced because of high RIN prices, then profits of refiners will be somewhat lower with high RIN prices than with zero RIN prices; how much lower can be easily calculated.

An increase in ethanol consumption of 800 million gallons above the level that can be consumed in E10 means that the equivalent amount of gasoline will not be consumed if total miles traveled remain unchanged. Accounting for the lower fuel economy of ethanol means that 536 million fewer gallons of gasoline will be consumed because EPA has pushed ethanol mandates from 14.2 to 15 billion gallons. This represents a decrease in gasoline consumption of 0.4% (0.536/129.2).

[6] EPA's mandates for 2017 could be met with more than 15 billion gallons of ethanol if imported sugar cane ethanol is used to meet part of the advanced mandate. Mandates could also be met with less than 15 billion gallons of ethanol if biomass-based diesel consumption exceeds its own mandate. Consideration of these RFS complexities are not needed to analyze how changing the point of obligation impacts blenders and refiners.
[7] See Pouliot, S., and B.A. Babcock. "Feasibility of Meeting Increased Biofuel Mandates with E85." *Energy Policy* 101 (2017) 194–200.

With a 15 billion gallon mandate, the blending obligation is roughly 10.5% of total motor fuel, which translates into needing 105 RINs for every 900 gallons of gasoline.[8] With a RIN price of $1.00 this corresponds to a gasoline RIN tax of 11.68 cents per gallon. If the refiner could pass the entire RIN tax on to the wholesale price of gasoline, then it would sell gasoline at $1.6558 (1.539+0.1168). A drop in consumption of 0.4% with a supply elasticity of 0.5 implies a drop in the price of gasoline of -0.8% (-0.4%/0.5). The RIN tax is not entirely passed to the wholesale price of gasoline, such that from a $1.6557 wholesale gasoline, the price paid to refiner declines by 1.3 cents to $1.6425. This means that the refiners pay 1.3 cents of the 11.68-cent RIN tax. Blenders pay 10.35 cents.

Example 2(a): Refiners Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $1.00 RINs, 10.5% biofuel mandate, and substitution of ethanol for gasoline.

Blender Costs:

Gasoline:	$1,479
Ethanol:	$150
Total:	$1,629

Blender Revenue:

E10 sales:	$1,529
RIN sales:	$100
Total:	$1,629

Merchant Refiner RIN Costs:

RIN purchases:	$105
Total:	$105

Merchant Refiner Revenue:

Gasoline sales:	$1,479
Total:	$1,479

Example 2(b): Refiners Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $0.00 RINs, 10.5% biofuel mandate, and substitution of ethanol for gasoline.

Blender Costs:

Gasoline:	$1,374
Ethanol:	$150
Total:	$1,624

Blender Revenue:

E10 sales:	$1,624
RIN sales:	$0.00
Total:	$1,624

Merchant Refiner RIN Costs:

RIN purchases:	$0
Total:	$0

Merchant Refiner Revenue:

Gasoline sales:	$1,374
Total:	$1,374

The change in refiner profits due to the RIN tax from producing 900 gallons of gasoline can now be calculated, under the assumption that the blending obligation is maintained at 10.5%. With a $1.00 RIN price, revenue from the 900 gallons is $1,479, the cost of RINs to the refiner is $105, and total refiner revenue minus RIN cost is $1,374. With a $0 RIN, the price of wholesale gasoline is $1.527, making the revenue of the refiner from 900 gallons of gasoline $1,374. The cost of RINs is zero, such that the total refiner revenue minus the RIN cost is $1,374. Thus, with a $1.00 RIN price, the profit from 900 gallons of gasoline relative to revenue with a $0 RIN is the same. That is, a drop in the RIN price has no impact on refiner profit if the blending obligation is held constant. If the drop in the RIN price from $1.00 to zero is the result of a drop in the blending obligation from 10.5% to 10.0%, then the refiner saves 11.68 cents per gallon in RIN costs, whereas the gasoline price drops by only 10.38 cents per gallon. In this case, the drop in the RIN price increases refiner profits by 1.3 cents per gallon.

[8] Thus, the blending obligation is calculated as 15/(142/0.99) = 10.46%. Alternatively, this corresponds to an ethanol to gasoline ratio of 15/((142/0.99) - 15) = 11.68%. Thus, for 900 gallons of gasoline, the mandate requires 105 (900*11.68%) gallons of ethanol.

Multiplying this profit increase by 129 billion gallons of gasoline indicates that the profits of refiners would increase by approximately $1.68 billion, which represents 0.8% of their revenue generated from selling gasoline. This example shows that refiners are not harmed by having to pay for RINs but rather are harmed by the drop in consumption of gasoline that accompanies increased ethanol consumption.

Thus, in contrast to the earlier simplified example where refiners are not affected by RIN prices, when increased RIN prices result in a drop in gasoline consumption then profits of refiners will be somewhat lower. However, the amount by which refiners' profits drop is a small fraction of their total cost of acquiring RINs because blenders still pay a large share of the RIN tax, a cost that blenders pass on to consumers through the price of blended fuel.

The reason why a high mandate leads to high RIN prices is that a low ethanol blending value is needed to bring E85 prices down enough to induce consumers to buy enough E85 to meet expanded ethanol targets. With a $1.00 RIN price, a 50-cent ethanol blending value, and $1.6434 gasoline, the wholesale price of E85 will be $0.84 per gallon. If the wholesale-to-retail markup is 75 cents per gallon for both E10 and E85, the retail price of E85 will be about 30% lower than E10, which translates into an 11% savings in cost per mile. Our research has shown that when consumers get this kind of discount then many of them start to buy E85 instead of E10.

Our analysis of the impacts of high RIN prices differs sharply from those who advocate moving the point of obligation to blenders. Thus, it is no surprise that we conclude that moving the point of obligation would have little-to-no impact on the distribution of gains and losses from high RIN prices or on the overall effectiveness of the program. This conclusion also sets aside the issue of whether the administrative complexity of the RFS program would be increased by moving the point of obligation to blenders.

Impact of Changing the Point of Obligation

An EPA decision to move the point of obligation to blenders would force blenders to accumulate enough RINs to show compliance with the RFS. Presumably, the obligation would depend on the quantity of gasoline the blender sells domestically. To analyze the impact of this change we start as before with a blending obligation of 10%.

Impact in an E10 World

The RIN obligation from producing 1,000 gallons of E10 is 100 RINs. The blender acquires RINs by buying 100 gallon of ethanol and separating them when the ethanol is blended with 900 gallons of gasoline. Moving the point of obligation from the refiner to the blender means that the blender no longer sells the RINs to refiners, but rather keeps them and turns them into the EPA to show compliance with the RFS. Thus, there would be no need for a RIN market if 100% of gasoline-based fuels contained 10% ethanol because blenders would produce no other fuel.

Because the refiner no longer pays the RIN tax, the supply curve of gasoline is never affected by the RIN tax, as shown in Figure 1. In this E10 world, where there is no substitution of ethanol for gasoline, the quantity of gasoline consumed does not change, so the price of

gasoline is $1.539 as in the case with a zero RIN price. Because the refiner no longer pays the RIN tax, the lower price of gasoline has no net impact on profits because the tax savings are just offset by the lower gasoline price.

Example 3: Blender Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $1.00 RINs, 10% biofuel mandate, and no substitution of ethanol for gasoline.

Blender Costs:

Gasoline:	$1,374
Ethanol:	$150
Total:	$1,624

Blender Revenue:

E10 sales:	$1,624
RIN sales:	$0.00
Total:	$1,624

Merchant Refiner RIN Costs:

RIN purchases:	$0
Total:	$0

Merchant Refiner Revenue:

Gasoline sales:	$1,374
Total:	$1,374

The lower gasoline price reduces blenders' costs of the gasoline that is used to produce E10. However, these cost savings are exactly offset by the need to acquire the RINs. With a $1.00 RIN price each gallon of gasoline purchased carries with it an obligation to pay an 11.11 cent tax. The RIN tax on blenders can be avoided by blending less gasoline, so the tax varies directly with the amount of gasoline purchased. Thus, the net cost per gallon of gasoline to the blender increases by 11.11 cents, making the net cost per gallon of gasoline used to make E10 equal to $1.65 per gallon. This is exactly the same cost per gallon the blender pays when the point of obligation is on the refiner. Thus, the cost per gallon of E10 remains unchanged, so the consumer price of E10 also remains constant.

Moving the point of obligation to blenders would change the income statement of refiners. They would no longer report RIN costs. However, this reported reduction in cost would not be offset by an increase in profit because of a lower gasoline price. Blenders' financial reports would no longer report RIN revenue; however, profits would not go down because the lower cost of gasoline would exactly offset the lower revenue. In this E10 world, changing the point of obligation from refiners to blenders would have no impact on profits of either.

Impact in the Beyond-E10 World

As discussed above, the simple E10 world does not account for the fact that high RIN prices are caused by blending targets that can be met only if consumers substitute ethanol for gasoline. The impact of moving the point of obligation considering this substitution is a bit more complicated. To analyze this more realistic situation we again use a blending obligation of 10.5%.

The RIN obligation from producing 1,000 gallons of E10 with a 10.5% blending rate is 105 RINs. The blender can acquire 100 RINs by buying the 100 gallons of ethanol needed to produce 1,000 gallons of E10 and then separating the RINs. The other 5 RINs can be obtained by either buying them in the RIN market or by buying more ethanol and selling it as E85. The cost to the blender of buying the 5 RINs in the RIN market is $5 with our $1.00

RIN price. Blenders will choose to buy ethanol and produce E85 if that costs less than buying the RINs.[9]

The per-RIN cost to the blender of generating RINs to meet the RFS obligation is given by the difference between the price of ethanol and its blending value or the market price of RINs, whichever is less. After arbitrage profits are eliminated the two costs will be the same. Thus, we can conclude that the blender must pay a RIN tax of 11.68 cents per gallon on each gallon of gasoline sold. This cost is either a cash cost of buying the RINs in the RIN market or an opportunity cost of not selling the 5 RINs and instead buying the ethanol and using it to produce E85. In either circumstance, the blending value of ethanol in E85 with a $1.00 RIN price is 50 cents.

We are now in a position to compare the impact on profits of merchant refiners and blenders if the RFS point of obligation were moved to blenders. First, note that as long as the blending obligation is 10.5% and the beyond-E10 portion of the EPA mandate is met with E85, then the quantity of E10 and E85 produced by blenders and purchased by consumers does not change with a change in the point of obligation. This means that consumers pay exactly the same price for E10 and E85 even with a change in the point of obligation. Because consumers pay the same price it must be the case that the cost to competitive blenders of producing both fuels remains the same.

Example 4: Blender Obligation - Blender & merchant refiner profits from 1,000 gals of E10 with $1.00 RINs, 10.5% biofuel mandate, and substitution of ethanol for gasoline.

Blender Costs:	
Gasoline:	$1,374
RINs:	$1.05
Ethanol:	$0.50
Total:	$1,529
Blender Revenue:	
E10 sales:	$1,529
Total:	$1,529

Merchant Refiner RIN Costs:	
RIN purchases:	$0.00
Total:	$0.00
Merchant Refiner Revenue:	
Gasoline sales:	$1,374
Total:	$1,374

No longer faced with the obligation to pay an 11.68 cent per gallon RIN tax, refiners' gasoline supply curve is not impacted by the RIN tax. Instead, it is the demand for gasoline by blenders that shifts down because they must pay a tax on the gasoline they purchase and because fewer gallons of gasoline are consumed with the higher ethanol mandate. The shift in demand yields the same quantity of gasoline as if the point of obligation was at the refiners. The market price of gasoline drops to $1.5266 per gallon. Thus, moving the point of obligation reduces the RIN tax obligation of refiners but it reduces the per-gallon gasoline price by an amount exactly equal to the RIN tax (i.e., 1.5266 = 1.6434 – 0.1168). Thus, refiners do not benefit from making blenders the obligated party. As discussed above, refiners would benefit if the move in the point of obligation were accompanied by a

[9] To generate a net of five RINs from producing E85 would require the blender to produce 7.48 gallons of E85 by buying 5.24 gallons of ethanol and 2.24 gallons of gasoline. More than five gallons of ethanol are needed because of the RIN obligation created by buying gasoline to make the E85.

drop in the blending obligation from 10.5% to 10%, but simply moving the point of obligation would have no impact on refiners' profits.[10]

With no change in the amount of ethanol that is needed to meet blending obligations, the RIN tax that would be paid by blenders is equal to 11.68 cents per gallon of gasoline. This increased cost is exactly equal to their per-gallon cost savings due to the lower market price they pay for gasoline. Thus, on the gasoline side, the cost of producing blended fuel does not change. On the ethanol side, the blending value of ethanol is determined by how high RIN prices need to be to induce enough E85 consumption to meet EPA targets. Given that these targets remain constant with a change in the point of obligation then RIN prices would not change, so the cost of ethanol plus the cost of RINs does not change by making blenders the obligated party. No change in the cost of producing blended fuel means that there is no net change in the cost of producing these fuels or in the profits of blenders.

Discussion & Conclusions

With competitive markets, changing the point of obligation from refiners to blenders has no impact on profits of either blenders or refiners. Because integrated oil companies are refiners and blenders who compete in both the market for gasoline and the market for blended fuel, their profits are similarly unaffected by who is obligated to acquire RINs. However, given the recent publicity surrounding the RFS, members of Congress, their staff and others who have influence over the direction of the RFS may start to believe repeated assertions that the RIN market is causing large financial damages to refiners. We show that these statements have no economic basis and argue that changing the obligated party under the policy would have no effect on the profitability of refiners or blenders.

However, our conclusions are dependent on the assumption that there exists sufficient competition in the markets for RINs and ethanol to keep blenders from colluding. Blenders who are not obligated under the RFS include major retailers of gasoline. In Iowa, such retailers include QuikTrip, Kum and Go, and Casey's. Holiday blends fuel and sells it in Minnesota. Costco is registered to blend fuel and sell RINs as is Circle K and 7-Eleven. According to an article by Blewitt and Mider, Mr. Ichan argues that these independent retailers and big integrated oil companies are colluding to drive the price of RINs higher. They quote Icahn:[11]

> Speculators and investment banks have partnered with gas-station retailers to gang up on refiners that are stuck buying the credits they can't produce, Icahn said. As a result, the RIN market has become "the mother of all short squeezes" for the independents.

[10] Some administrative cost savings would accrue to refiners from moving the point of obligation, but the cost increase to blenders would likely be greater than the cost savings because there are more blenders than refiners.
[11] Laura Blewitt and Zachary Mider. "Icahn Calls on EPA to Fix 'Mother of All Short Squeezes'." Bloomberg Markets, August 15, 2016. https://www.bloomberg.com/news/articles/2016-08-15/carl-icahn-calls-on-epa-to-fix-mother-of-all-short-squeezes.

> "They are also making secret deals with the blenders to entice them not to sell to the refineries but rather to sell to them," Icahn said. "These speculators are 'hoarding' the RINs hoping to get much higher prices as the time nears when refineries are obligated to deliver RINs to the EPA."

Clearly our contention that fuel and RIN markets are competitive runs counter to this view. Economists are generally wary of explaining market prices by widespread collusion among companies. First, collusion is illegal, and if companies are caught entering into such agreements they could be subject to large fines and executives could go to jail. Second, it is not conceivable that disparate companies like Costco, Kum and Go, and Casey's have entered into agreements with BP and Holiday to control the market for RINs. Third, because the incentive to cheat on agreements to increase market prices is so high, it is almost impossible for illegal collusion to last, especially when there are many companies participating. It is extremely unlikely that collusion can be maintained in this market given the presence of a large number of buyers and sellers of ethanol and RINs, particularly over long periods. Fourth, if there were collusion in the RIN market, a clear sign would be that some RINs are left to expire. Collusion typically involves limiting supply so as to increase the price. However, the number of RINs generated is proportional to the number gallons of ethanol produced, which are all eventually sold at retail. Thus, collusion in the RIN market alone can only happen if the quantity of RINs is controlled so that some RINs are left to expire to limit their quantity. Otherwise, collusion in the RIN market would have to be tied to the ethanol market as well, which appears even more unlikely. Thus our assumption of competitive markets is much more plausible than assuming collusion is what determines RIN prices.

Some supporters of moving the point of obligation to refiners argue that blenders are closer in the fuel supply chain to consumers so they are better equipped to make sure that EPA blending targets are met. It is instructive to consider whether the argument is in fact true.

When merchant refiners are the obligated party they must buy RINs from blenders who acquire them from purchased ethanol to make blended fuel. The market price of RINs balances the supply of and demand for RINs. As in any commodity market, if a supplier can find a lower-cost way of producing a product, they will benefit because they can sell more of the product at lower cost but at the prevailing market price. In the market for RINs, blenders have an incentive to produce more RINs at a lower cost because they can sell the additional low-cost RINs at the prevailing RIN price and increase their profits.

Recall that RIN prices reflect the difference between the cost of producing ethanol and its value in blended fuel. At current blending mandates, its incremental value in blended fuel is its value in E85. Every blender has a direct financial incentive to increase the blending value in E85 by making it more widely available or through marketing efforts that convince consumers to buy it at a higher price. Those blenders who are successful can profit because they can sell the acquired RINs at a price that reflects a lower blending value than they achieved. It is this financial incentive that EPA is counting on to make sure that blending targets above E10 are achieved.

If the blenders were made the obligated party, they would compare the cost of buying RINs in the RIN market with their own costs of acquiring RINs through blending, which is the difference between the price of ethanol and their own blending value of ethanol. If the market price of RINs is lower than their cost of acquiring RINs through blending, they will choose to buy RINs. If their cost of acquiring RINs through blending is lower because of successful E85 marketing efforts, then they will choose to acquire RINs by producing and selling E85. Note that the financial incentive to blenders of expanding sales of E85 when they are the obligated party is exactly the same as their financial incentive when refiners are the obligated party. Because their financial incentives are identical, so too is the efficiency with which fueling infrastructure will be expanded to facilitate consumption of biofuels.

The primary reason why fueling infrastructure and consumption of ethanol has lagged expectations is uncertainty about the U.S. commitment to RFS blending targets, not the fact that refiners are further upstream in the fuel supply chain. Thus, if EPA is to continue to push forward with its goal of continuing to expand the biofuel blending mandates, it would be better served to send a stable investment signal to the fuels market rather than undertaking actions like moving the point of obligation.