The Economic Benefits of the Biodiesel Blenders' Credit

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Executive Summary

The United States has been increasing its efforts to combat climate change and reduce the emission of greenhouse gases in recent years, and the increasing prevalence of biodiesel fuel has been an integral part of this strategy.

Biodiesel is a renewable, clean-burning diesel replacement that can be made from a diverse mix of resources such as soybean oil, recycled cooking oil, and animal fats. It can be used in existing diesel engines without modification.

The market for biodiesel was limited until Congress passed a $1 tax credit for each gallon of biodiesel blended, which first took effect in 2005. Since then production has grown steadily, and in the last few years domestic production has approached two billion gallons.[1] The production capacity of the industry is several hundred million gallons above that amount.

The tax credit has remained in place--albeit with a few temporary expirations that were retroactively restored--since that time. The current tax credit expires at the end of 2022. Letting it expire would harm the U.S. economy and the environment, the data show.

Much like the solar investment tax credit and the production tax credit for wind turbines, the biodiesel tax credit fostered a stable market that gradually boosted production, which lowered production costs and made the fuel more cost-competitive.

Our analysis demonstrates that the market for biodiesel fuel fostered by the biodiesel tax credit supports 64,000 jobs and has a total impact on the economy of approximately $15 billion per annum. A significant body of research also demonstrates that the biodiesel tax credit easily passes a cost-benefit analysis, and that the environmental benefits alone from each gallon of biodiesel that replaces petrodiesel exceed two dollars a gallon, or more than double the cost of the credit.

New production techniques and inputs hold the promise of further boosting productivity and reducing costs in the not-so-far-off future. Extending the biodiesel tax credit is crucial to these developments and the data show that doing so creates significant environmental and economic benefits.

[1] This value only represents domestic biodiesel production. Renewable diesel production surpassed 600 million gallons in 2020. Consumption of biodiesel, renewable diesel and net imports surpassed 3 billion gallons in 2020.

Introduction

Biofuels have proven to be an economically efficient way to reduce smog and greenhouse gas emissions created by cars and trucks. In 2020, the total domestic consumption of biofuels (including biodiesel, renewable diesel and net imports) surpassed 3 billions gallons, displacing carbon intensive fossil fuels in the process. To encourage the development and use of these biofuels, the federal government provides a $1 per gallon tax credit to the blenders of biodiesel. The biodiesel tax credit has been extended a number of times since its inception in 2005, and the current extension expires in 2022.

By all accounts the credit has been a success: In 2020, domestic production of biodiesel alone exceeded 1.8 billion gallons, a hundredfold increase since the credit was enacted in 2005.

While a variety of other factors—reduced production costs, changes in demand, and rising oil prices, for instance—contributed to the increase, the biodiesel tax credit has played an integral role in creating the current robust and viable market.

However, the biodiesel tax credit has faced a modicum of opposition in Congress, as some have objected to what was to be a temporary tax incentive which is now approaching the end of its second decade in existence. A few others--falsely--fear that the increased demand for soy and other sources for biofuels will increase U.S. food prices as well as the cultivation of previously fallow land, and in turn do harm to the environment.

However, these ancillary effects are slight and pale in comparison to the broad-based environmental and economic benefits the biodiesel tax credit creates, and the purpose of this report is to demonstrate that reality. We believe that ending the credit in 2022, when the current legislation providing for it expires, would be inadvisable and would likely devastate the market, resulting in the destruction of thousands of jobs, an increase in greenhouse gas emissions and other local air pollutants, and the undoing of much of what the previous 17 years accomplished—namely, the establishment of a robust market for an important fuel and an essential tool for reversing climate change.

The Incentives for Producing Biodiesel

The biodiesel tax credit (BTC) was first established under the American Jobs Creation Act of 2004. It has effectively remained in place since then, albeit with temporary expirations in 2011, 2014 and 2017 that were subsequently reinstated.

In addition to the BTC, the Environmental Protection Agency mandates annual quotas for biodiesel as part of the renewable fuel standard program. Refiners and importers of petroleum-based diesel fuel (petrodiesel) incur a Renewable Volume Obligation (RVO) for each batch refined or imported. In parallel fashion, producers or importers of biodiesel generate a Renewable Identification Number (RIN) for each batch produced or imported. Those who blend must retire RINs to meet the RVO, with only a small percentage of biodiesel required for a given volume of petrodiesel.

This means that a market for RINs exists and that pure petrodiesel can be sold by one distributor if another has an excess of RINs (as would occur with sales of 100% pure biodiesel, labelled B100 diesel).[2] RINS theoretically represent the marginal cost of complying with the renewable fuel standard mandate and their price indicates the gap between the cost of producing biodiesel and the price needed to induce market consumption. In effect, the RIN price is equal to the difference between the biodiesel supply cost and demand price.

However, RIN prices are directly impacted by feedstock prices, the BTC itself, and the volumetric mandate. Elimination of the BTC would increase RIN prices, simultaneously increasing costs on blenders while reducing prices to producers. As a result, these nested mandates mean that reducing or eliminating the BTC would greatly reduce domestic biodiesel production, resulting in significant environmental, economic and employment losses.

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[2]RINs can be used during the year of biodiesel production, and for one year beyond, but expire afterwards. Further, RINs for more advanced alternative fuels can be used for less advanced fuels, but not vice-versa. Specifically, RINS for biodiesel (D4) or cellulosic biofuel (D3/7) can be applied to either advanced biofuels (D5) or total renewable fuel (D6, which is mainly ethanol), but not vice-versa, and advanced biofuels (D5) RINs can be applied to meet the total renewable fuel (D6) standard but not vice-versa (see slide 10 here https://cleancities.energy.gov/files/u/news_events/document/document_url/84/2_-Session_0_-_RIN_101_-_FINAL.pdf).

The Biodiesel Tax Credit is Cost Effective

One of the original rationales for the BTC and quota was that biodiesel represents an alternative to petrodiesel that reduces carbon emissions and climate change risk, and hence improves sustainability. In 2020, 62% of biodiesel was produced using soybean oil, corn oil accounted for 11%, canola oil 9%, waste cooking oils 9% and animal fats 9%.[3] Recent research comparing biodiesel to petrodiesel continues to find strong environmental performance advantages for each of these feedstocks, supporting the original rationale for the biodiesel tax credit: Biodiesel emits 74% less greenhouse gases on a CO2 basis, as well as 40-50% less methane than petrodiesel. In addition, biodiesel emits 50% less carbon monoxide, 60% less volatile organic compounds, 50% less particulate matter and two-thirds less hydrocarbons. These improvements remain true even after accounting for EPA's mandated use of ultra-low sulfur diesel.[4]

Numerous studies show that the subsidy provided through the biodiesel tax credit is a cost-efficient way to improve the environment. For instance, a study by Charles Wassell and Timothy Dittmer in *Energy Policy* examined the difference in biodiesel versus petrodiesel emissions for a range of local air pollutants, including carbon monoxide, volatile organic compounds, sulfur dioxide, nitrogen oxide and particulate matter. The authors estimate the monetary value of improvements in local air quality impacts associated with a change to soy-based biodiesel are up to $2.09 per gallon relative to petrodiesel, *apart from any benefits from reducing greenhouse gases.*

Given that biodiesel is one of the least carbon-intensive fuels on the market and produces substantial reductions in greenhouse gas emissions when displacing petrodiesel, incorporating the value of these improvements is important in fully describing the true set of environmental benefits experienced. Even under these conservative estimates, which examine only the local air pollution benefits from

[3] Results calculated from Table 3: U.S. Inputs to Biodiesel Production found at https://www.eia.gov/biofuels/biodiesel/production/biodiesel.pdf; The economic contraction caused by COVID skewed these numbers slightly from historical averages.

[4] In 2010 all highway diesel sold in the U.S. had to meet the ultra-low sulfur standard and in 2014 all non-road diesel had to meet the same standard (EPA no date b). These EPA mandated changes modestly improved the environmental impacts of petrodiesel relative to the emissions experienced prior to implementation of the ultra-low sulfur standard.

biodiesel use, the study finds the external benefits outweigh the required subsidies and are economically efficient.

In 2018, an analysis by Ken Ditzel, Venki Venkateshawara, Scott Nystrom, Katie O'Hare and Michael Nagle attempted to estimate the dollar value of the greenhouse gas emission reductions occurring from biodiesel displacement of petrodiesel. They relied on EPA estimates that petrodiesel emits 29.3 lbs of greenhouse gas emissions per gallon compared to only 10.8 lbs per gallon for biodiesel, which represents an 18.5 pound reduction.[5] Combined with the fact that 1.6 billion gallons of biodiesel were produced in 2017, they estimated that biodiesel resulted in net greenhouse gas reductions of 14.8 million metric tons.[6] Applying a value of $50 per metric ton as the social cost of carbon[7] to the estimated greenhouse gas reduction, the authors estimate that the biodiesel industry produced $750 million in greenhouse gas reduction benefits to the U.S. economy in 2017.

A recent study by Matthew Winden, Nathan Cruze, Tim Haab and Bhavik Bakshi published in *Energy Economics* places a value on the environmental performance differences between soy-based biodiesel and petrodiesel by examining a comprehensive set of emissions impacts. These impacts included differences in direct and indirect greenhouse gas emissions and local air quality pollutants (carbon monoxide, nitrous oxide, volatile organic compounds, sulfur dioxide, nitrogen oxide, phosphorus and particulate matter), all of which impact human health and the environment, as well as the resource use intensity of the fuels.[8]

The damage measurements include the entire "well-to-wheel" life-cycle of biodiesel and petrodiesel, from harvest or extraction through final use. The study

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[5] https://www.govinfo.gov/content/pkg/FR-2010-03-26/pdf/2010-3851.pdf

[6] This calculation is derived by taking the 18.5 pound/gallon reduction in GHGs and multiplying by the number of biodiesel gallons displacing petrodiesel (1.6 billion) to arrive at the net pound reduction in GHGs. This is then converted to metric tons to determine the total number of metric tons reduced.

[7] The social cost of carbon (SCC) is a measure that reflects the societal value of reducing carbon emissions by one metric ton.The SCC provides a monetary value of the damage to society associated with adding one metric ton of carbon dioxide to the atmosphere in a given year. In principle, it includes the value of all climate change related impacts, including effects on agricultural productivity, human health risks, property damages from increased natural disasters, etc.

[8] The indirect land use change impacts came from EPA data estimating acreage changes (domestic and international) from changes in biofuel demand and the corresponding change in greenhouse gas emissions the acreage changes would generate. These changes were found to be modest and even after incorporating them, the environmental, health and resource benefits of biodiesel far outweighed those of petrodiesel.

constructs the damage estimates for each fuel using a life-cycle impact assessment, which models the physical emissions of fuels in terms of environmental and economic impacts, thereby creating a link between the physical emissions of fuels and the environmental, health and resource damages society experiences. The authors estimate that U.S. consumers value the aggregate environmental, health and resource improvements generated by soy-based biodiesel at $3.89 per gallon relative to the impacts experienced under petrodiesel.

The substantial reductions in greenhouse gas and local air pollutant emissions, as well as resource use reductions generated by biodiesel that displaces petrodiesel, are clearly valued by U.S. consumers. This more comprehensive estimate of the benefits from biodiesel use further reinforces the case that the external benefits substantially outweigh the cost of the subsidy and are economically efficient.

An analysis by John Urbanchuk, an economist at Delaware Valley University, supports the observation that the biodiesel tax credit is cost-effective at improving the environment. He notes that the quota means that obligated parties have two ways to meet the RVO requirements: They can either purchase biodiesel (B100 with an attached RIN) to blend with petrodiesel or they can purchase excess RINs in the marketplace and sell pure petrodiesel. When the sum of prices for petrodiesel and a RIN are below the price of B100, obligated parties have no economic incentive to purchase biodiesel.

Obligated parties such as blenders then have one of two options: First, they can stop purchasing biodiesel (with its accompanying environmental and economic benefits), which drives down demand and puts pressure on producers to exit the market. Or, as Scott Irwin, an agricultural economist at the University of Illinois, argues, blenders have to compete by reducing biodiesel prices, with the lower prices being passed back to the producers. Again, this puts pressure on producers and threatens industry viability.

In both circumstances, the effective market price of biodiesel (B100) is set at the price of petrodiesel plus the RIN price, and this price can fall below the cost of production. The biodiesel tax credit provides a buffer between the effective market price (determined by petrodiesel plus the RIN price) and the actual cost of production of biodiesel (which is often higher), thereby maintaining industry viability. The issue is that the prices that determine biodiesel industry profitability (feedstock, B100, petrodiesel and RINS) can be unpredictable and quite variable.[9] The uncertainty dampens investment in the market. The tax credit effectively provides the margin necessary to ensure a modicum of profitability for producers and incentivize industry investment.

The Economic Impact of Biodiesel

In addition to its significant environmental benefits, the biodiesel tax credit generates a variety of domestic economic activity via capital investments, operations, purchases, and employment. Moreover, the industry and its supply chain employment generate additional jobs and economic activity in other sectors through its employees' spending in the broader economy.

The impact that the production of biodiesel fuel has on the nation's economy goes beyond the direct economic activity resulting from its actual production, and economic models incorporate three distinct channels by which biodiesel fuel impacts the broader economy.

Direct effect – This is what we can directly observe and measure from the direct economic activities in the facilities producing biodiesel. It includes labor and capital expenditures as well as anything paid to subcontractors. For example, a direct impact would include purchases of soybean feedstock from local farms as well as the workers employed at facilities producing biodiesel.

[9] Price uncertainty and volatility for: soybean oil (2016-2021) https://tradingeconomics.com/commodity/soybeans; B100 (2014-2020) https://www.statista.com/statistics/1200903/us-b20-retail-fuel-price/; Ultra Low Sulfur Diesel (2007-2021) https://www.eia.gov/dnav/pet/PET_PRI_GND_DCUS_NUS_W.htm; and RINS (2013-2020) https://www.eia.gov/todayinenergy/detail.php?id=48196

Indirect effect – This is what results from the increase in economic activity—such as employment and capital expenditures—of the suppliers to the producers of biodiesel. When a biodiesel production facility makes a capital investment or hires more workers to increase output, its suppliers (including but not exclusively farmers) must typically do the same, and the model estimates this increase. For example, a farmer expanding capital or hiring in response to the increased soybean feedstock demand from the biodiesel industry would constitute an indirect impact.

Induced effect – This is the impact from increases in household spending due to the employment supported—either directly or indirectly—by the economic activity of the facilities producing biodiesel. How much the workers spend and where they spend that income impacts the economy. For example, when the workers spend a portion of their income earned in the biodiesel industry at grocery stores and restaurants, it constitutes a portion of the induced impact of the industry.

The dollar value sum of these three channels' impacts collectively quantify the total economic activity.

Two recent studies estimated these impacts in an attempt to determine the total economic activity attributable to the biodiesel industry. An analysis by Ken Ditzel, Venki Venkateshawara, Scott Nystrom, Katie O'Hare and Michael Nagle that used data from 2017 found 124 facilities across the country producing biodiesel that employed a total of 2,300 people.

The industry generated $5.1 billion in revenue, while its total economic impact to the U.S. Gross Domestic Product, including that which resulted from its indirect and induced spending, was $21.6 billion. The economic activity supported 62,000 total jobs, $3.8 billion in wages and benefits, and $1.8 billion in federal, state, and local tax revenue.

A 2019 analysis published by LMC International estimated that the biodiesel industry generated nearly $18 billion in total U.S. economic activity while creating 66,000 jobs and $2.6 billion in compensation for workers across the value chain--similar numbers as in the previous study.

Our Analysis

We begin by estimating the value of the greenhouse gas emissions reduction that results from switching to biodiesel from petrodiesel. Life-cycle greenhouse gas emissions estimates for B100 and petrodiesel are taken from the U.S. Government's Argonne National Laboratory Greenhouse gasses, Regulated Emissions, and Energy use in Technologies (GREET) Model. In Table 1, the emissions factors (Column 1) and energy density (Column 2) for petrodiesel, as well as biodiesel derived from different feedstocks are provided. Raw emissions (Column 3) and the emissions reduction experienced under each biodiesel feedstock, relative to petrodiesel (Column 4) are provided in metric tons of carbon dioxide equivalents (CO_2e) per gallon.

Table 1
GHG Emissions Factors and Energy Density for B100 and Petrodiesel

Fuel	**Emission Factor** [a] (g CO_2e / MJ)	**Energy Density** [a] (MJ / gal LHV)	**Emissions** [b] (MT CO_2e / gal)	**Emissions Reduction** [c] (MT CO_2e / gal)
Petrodiesel	90.47	136.62	0.0124	
Soy Biodiesel	29.80	126.21	0.0038	-0.009
Canola Biodiesel [d]	30.00	126.21	0.0038	-0.009
Tallow Biodiesel	19.00	126.21	0.0024	-0.010
Corn Oil Biodiesel	13.60	126.21	0.0017	-0.011
Used Cooking Oil Biodiesel [e]	20.19	126.21	0.0025	-0.010

a.) Source: Argonne National Laboratory (2021). Values derived from GREET Model, except for Used Cooking Oil which was obtained from the California Air Resources Board. b.) Emissions are the product of Emissions Factor and Energy Density divided by 1,000,000 to convert from grams (g) to metric tons (MT). c.) Emissions reductions are the difference in each biodiesel feedstock relative to petrodiesel. d.) Indirect land use changes are not included for Canola Biodiesel. e.) The Used Cooking Oil Biodiesel emissions factor was calculated from CARB data by averaging all Used Cooking Oil/Waste Oil Biodiesel (BIO) current certified carbon intensity values.

Petrodiesel emits 0.0124 metric tons of CO_2e per gallon while soy- and canola-based biodiesel emit only 0.0038 metric tons of CO_2e per gallon. This represents a 70% net reduction resulting in 0.009 fewer metric tons of CO_2e emission per gallon when soy- or canola-based biodiesel replace petrodiesel. Similar results show used cooking oil, tallow, and corn oil biodiesel emit 79%, 81% and 86% less CO_2e emissions per gallon respectively compared to petrodiesel. These reductions correspond to 0.01 fewer metric tons of CO_2e emissions per *gallon* relative to petrodiesel.

In 2019, 1.896 billion gallons of biodiesel were produced in the U.S.[10] 58% of the production used soy feedstock, 14% used corn oil, 11% used recycled cooking oil, 10% used canola oil and 7% was animal fats.[11] These percentages correspond to 1.088 billion gallons of soy biodiesel, 261.7 million gallons of corn oil biodiesel, 214.9 million gallons of waste cooking oil biodiesel, 183.5 million gallons of canola biodiesel and 147.5 million gallons of animal fats based biodiesel. The reductions in metric tons of CO_2e emissions per gallon associated with each type of feedstock from Table 1 are multiplied by the number of gallons used of each feedstock in place of petrodiesel to arrive at an aggregate emissions reduction. The results indicate that the 1.896 billion gallons of biodiesel used displacing petrodiesel in the U.S. in 2019, resulted in a net decrease of 17.95 million metric tons of CO_2e greenhouse gas emissions.[12]

For 2020, the Federal Government used a central value of [$51 per ton] for the social cost of carbon, while New York State has recently proposed a central value of [$121 per ton] for the social cost of carbon. We can apply these SCC values to the greenhouse gas reductions generated by biodiesel to estimate the dollar value of the social benefits. This value ranges from a low of $915.44 million when using the Federal Government's $51 per ton carbon cost, to $2.17 billion when using the $121 per ton value proposed by the State of New York.[13] This demonstrates the efficacy of subsidizing the biodiesel tax credit in promoting substantial climate change improvements.

[10] 2019 production values and feedstock percentages were used as the emissions factors derived from the GREET Model correspond to 2019 data (Although these values are the most up-to-date, they reflect the state-of-world and technology in 2019).
[11] https://www.eia.gov/biofuels/biodiesel/production/archive/2019/2019_12/table3.pdf
[12] Tallow emissions reductions values were applied to all animal fats.
[13] These values are found by multiplying the SCC by the 17.95 million metric tons of CO_2e emissions reduction.

We also calculated the aggregate environmental benefits of the biodiesel industry (including greenhouse gas emissions, local air pollutant emissions and resource use changes) by taking the $3.89 per-gallon estimate of these benefits and aggregating it over domestic use. The substantial value of the net improvements in environmental, health and resource outcomes can be seen when examining the aggregate domestic production of biodiesel and the petrodiesel it displaced.

Table 2 provides the domestic production for biodiesel from 2010 through 2020. The share of production that soy biodiesel comprises in the market has risen from roughly 46% in 2010 to 62% in 2020. Using the $3.89 per gallon estimate of the environmental, health and resource improvements generated by soy biodiesel relative to petrodiesel and multiplying by soy biodiesel's share of production allows us to compute the estimated external value provided to U.S. residents from the use of soy biodiesel.

During this timeframe, the annual aggregate benefits of *soy biodiesel alone* displacing petrodiesel from 2010 to 2020 have increased from an initial value of $614 million in 2010 to over $4.3 billion in 2020.

These estimates do not reflect the relative improvements generated from other forms of biodiesel such as canola, tallow, and recycled cooking oil, which have been valued in other contexts at $1.43, $1.58, and $2.85 per gallon for a 5% biodiesel blend relative to petrodiesel. As such, these estimates only account for the benefits associated with the soybean-based share of biodiesel production relative to petrodiesel and therefore constitute a conservative, lower-bound estimate of actual total benefits.

Even so, the value is substantial and demonstrates that reductions in harmful emissions that result from substituting biodiesel for petrodiesel have resulted in real-world, meaningful environmental, health and resource benefits for the United States, consistent with the original rationale of the biodiesel tax credit.

Table 2
Renewable Fuel Standards, Biodiesel Domestic Production and Imports

Year	Renewable Fuel Standard	Production (millions of gallons)	Imports	Total
2010	1,150	343	7	350
2011	800	967	20	987
2012	1,000	969	36	1,005
2013	1,280	1,359	342	1,701
2014	1,640	1,270	192	1,462
2015	1,730	1,268	352	1,621
2016	1,900	1,569	709	2,278
2017	2,000	1,596	394	1,990
2018	2,100	1,857	167	2,024
2019	2,100	1,725	171	1,896
2020	2,430	1,817	197	2,014

Sources: U.S. Environmental Protection Agency, Renewable Fuel Annual Standards, and the U.S. Energy Information Administration's Monthly Biodiesel Production Report.

We also measured the aggregate economic impact of the biodiesel industry by examining the jobs and activity that this industry creates through the production of biodiesel input ultimately blended into petroleum diesel. In effect, the industry begins on the farm and encompasses the entire biodiesel manufacturing and distribution process.

As seen in Table 3, our analysis indicates that the biodiesel industry supports roughly 64,000 jobs in the U.S. The jobs provide $3.6 billion in wages and benefits and the industry's total economic effect is roughly $15 billion per annum.

Table 3
U.S. Economic Impact of the Biodiesel Industry

Impact Type	Employment	Labor Income	Output
Direct Effect	23,000	$1.0 billion	$5.0 billion
Indirect Effect	21,000	$1.4 billion	$6.3 billion
Induced Effect	20,000	$1.1 billion	$3.7 billion
Total Effect	64,000	$3.5 billion	$15 billion

A related--but distinct--question is what would happen to the market if the biodiesel tax credit were to permanently expire, a question our model can also address.

We conceptualize the biodiesel fuel market as having two distinct parts--the production and the distribution--and their cumulative effect supports 64,000 jobs. On the production side, it is clear that the agriculture sector would continue to develop crops for alternative purposes. Note that the price of these crops may decline due to reduced demand, or farmers may switch to lower value commodities. However, the overall industry would continue to plant, harvest, and process their output. On the distribution side, about one-third of the total jobs supported--or just under 20,000--are involved in or created by the distribution of the fuel. This part of the industry would likely be unaffected as well, since ending the credit would not have a major impact on demand for the fuel: just the supply. Most of the domestic demand would then be met by foreign producers, but the substitution of foreign for domestic production would not greatly impact the distribution.

The major loss of employment resulting from elimination of the biodiesel tax credit would occur in the biodiesel manufacturing industry itself. The expiration of the biodiesel tax credit would lead to the elimination of approximately 3,000 jobs employed directly in the business of creating biodiesel. The loss of these jobs and this portion of the industry would then reverberate through the supply chain upstream and downstream. There would be associated losses in indirect economic impacts through the upstream supply chain that is associated with biodiesel manufacturing, as well as downstream induced economic impacts through diminished consumer spending. The total employment losses would be between 7,500 and 9,000 jobs, assuming that a small portion of the domestic industry remains in place for some period.

Distribution of Jobs Supported

Table 4 shows the estimated distribution of the jobs created either directly or indirectly across the domestic economy. The retail sector constitutes fully one-third of all jobs created, which reflects the fact that the industry's broader impact on the overall economy is particularly strong, given the size of the industry.

Table 4
Sector Employment Created by the Biodiesel Industry

Description	Employment	Labor Income	Output
Retail	22,500	$726 million	$1,533 million
Finance, Insurance and Real Estate	4,300	$253 million	$1,088 million
Transportation and Warehousing	3,500	$235 million	$606 million
Wholesale	3,500	$307 million	$980 million
Chemical Industry	3,300	$321 million	$3,494 million
Agriculture	3,100	$159 million	$835 million
Building Services	3,000	$145 million	$294 million
Healthcare	2,600	$205 million	$372 million
Food & Accommodations	2,600	$71 million	$193 million
Management & Administrative Services	1,600	$185 million	$321 million

The Efficacy of the Biodiesel Tax Credit

Given the significant environmental and economic benefits attributable to the U.S. biodiesel industry, we would like to understand what would happen if the biodiesel tax credit were to expire. One way to infer how its lapse might impact the market is to examine how the market reacted during the periodic lapses in the biodiesel tax credit in the last decade.

Table 5 provides annual data on biodiesel production for 2010 through 2020. After an initial peak in 2013, production increased from 2015 to 2018, followed by a slight decline in 2019 and a partial recovery in 2020.

Table 5
US Annual Biodiesel Production and status of the BTC

Year	Production millions of gallons	Biodiesel Tax Credit Status	Annual % Change
2010	343	Active	--
2011	967	Retrospective	181.9
2012	969	Retrospective	0.2
2013	1,359	Active	40.2
2014	1,270	Retrospective	-6.5
2015	1,268	Retrospective	-0.2
2016	1,569	Active	23.7
2017	1,596	Active	1.7
2018	1,857	Retrospective	16.4
2019	1,725	Retrospective	-7.1
2020	1,817	Active	5.3

U.S. Energy Information Administration. Monthly Biodiesel Production Report.

While some biodiesel producers may have believed that the credit would ultimately be renewed and applied retrospectively, it was far from certain at the time (one of us served on a committee of jurisdiction the first time the credit expired) and there is no economic rationale for extending a tax break retroactively if its purpose is to encourage a particular behavior: there is no tax credit large enough to induce a change in past behavior.

In the years when the credit is fully active, production increased by 40.2% (2013), 23.7% (2016) and 5.3% (2020). However, each pause in production growth occurred in a year when the tax credit had expired, and output declines tend to become acute in the second year of an expiration.

Producers respond with substantially increased supply during periods when the BTC is active. This continues in the first year of the credit lapse, when producers likely have a strong belief in the likelihood of renewal with retrospective credits. However, when the lapse period extends to a second year or longer, expectations on the likelihood of renewal fall and production declines accordingly. The pattern strongly suggests that biodiesel production is responsive (with a lag) to the biodiesel tax credit.

Conclusion

The biodiesel tax credit has played an essential role in the creation of a robust market for a fuel that has greatly benefited the environment both by reducing greenhouse gas emissions as well as a variety of other local air pollutants in the atmosphere. The nearly 2 billion gallons of biodiesel used in the United States in 2019 reduced greenhouse gas emissions by 17.95 million metric tons of carbon dioxide equivalent emissions, and the cumulative reduction since the inception of the tax credit for biodiesel exceeds 100 million metric tons. The credit supports over 64,000 jobs in the U.S. and adds over $15 billion to the U.S. economy.

Without the biodiesel tax credit between 7,500 and 9,000 of these jobs would be lost, as the domestic market would shrink and much of our remaining biodiesel would likely be imported.

The data and our analysis show that the $1 a gallon credit has been and remains a cost-effective way to boost production of biodiesel fuel. In the absence of a regime that imposes a commensurate tax on the emissions of carbon dioxide, particulate matter, or other pollutants, subsidizing its production is an effective way to achieve such reductions, and has generated environmental improvements valued in excess of $4 billion in 2020 alone.

Given the increasing importance that our society places on protecting the environment and taking steps to mitigate climate change, continuing the biodiesel tax credit would be a sensible policy choice for Congress.

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