IMPACT OF THE SALES AND USE TAX EXEMPTION FOR BIODIESEL ON THE ECONOMY OF ILLINOIS

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Proceeds from the sale of certain biodiesel blends are exempt from the Illinois state sales tax. Beginning in July 2003 there is a full exemption from the 6.25 percent sales tax on biodiesel blends exceeding 10 percent (B11 or higher) and a 20 percent exemption for blends ranging from B1 to B10. This exemption is scheduled to expire on December 31, 2018.[1] This study examines the impact of the biodiesel industry for Illinois since the sales and use exemption was implemented and estimates the impact on the Illinois economy of the exemption for biodiesel from sales tax in terms of the employment, income, and Gross Domestic Product (GDP) directly and indirectly supported by the industry.

Diesel fuel and Biodiesel use in Illinois

According to the U.S. DOE's Energy Information Administration,[2] prime suppliers delivered 1.7 billion gallons of No. 2 diesel fuel to final users in Illinois in 2011. Nearly 80 percent of this fuel, or 1.32 billion gallons, was used on-highway. Accurate statistics on biodiesel use are not tracked. However since the full sales tax exemption applies to blends above B10, the National Biodiesel Board estimates that biodiesel blends of 11 percent (B11) and higher account for the vast majority of biodiesel sales. Assuming that the vast majority of all on-highway diesel fuel

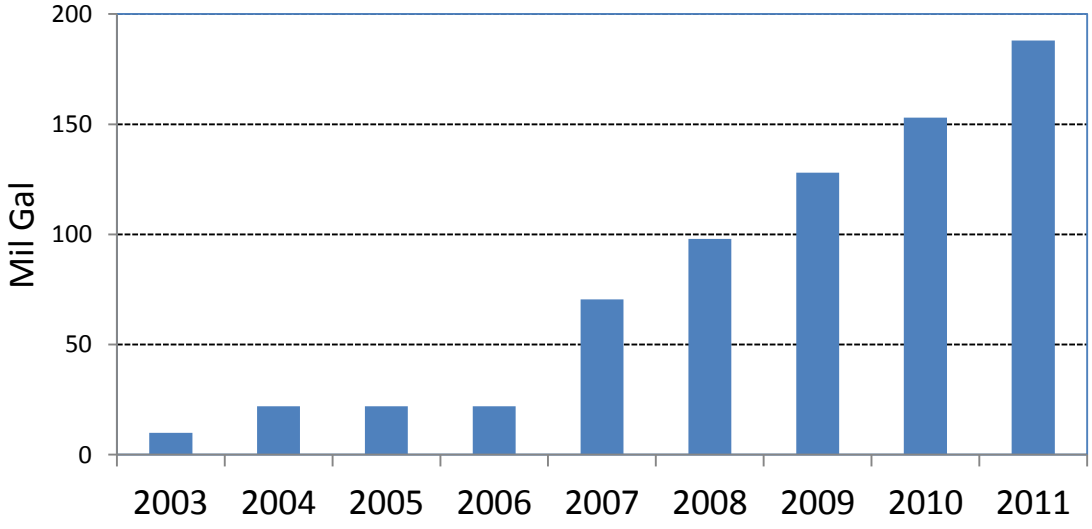
[1] The sales tax exemption for biodiesel was scheduled to expire on December 31, 2013. Passage of Senate Bill 397, enacted as Public Act 97-0636 in December 2011, extends the exemption through 2018. Earlier this year the U.S. Congress passed and President Obama signed legislation to deal with the "fiscal cliff" that included an extension of the Federal excise tax exemption for biodiesel.
[2] EIA Petroleum Marketing Monthly. Prime Suppliers Report

sold in Illinois contains a biodiesel blend of 11 percent or higher, this indicates a demand base in 2011 of 145.4 million gallons of B100.[3]

The full exemption for B11 and higher blends represents a 6.25 percent reduction in price relative to regular diesel fuel and, as such, provides a demand incentive for biodiesel and diesel sales. Removal of this incentive will effectively reduce demand for biodiesel, the incentive to produce biodiesel, and the overall demand for diesel in the State of Illinois. Removal of the sales tax exemption would also result in the decrease in the number of truck stops in Illinois. The substantial growth in truck stop assets infrastructure and related sales in recent years has been motivated primarily by this exemption. During the time period in which the exemption has been in place, Illinois increased its number of truck stops while nationally, the number of truck stops decreased.

Illinois is the nation's second largest biodiesel producer with five operating biodiesel plants with an estimated annual production capacity of 188 million gallons.[4] As shown in Figure 1, biodiesel capacity in Illinois has increased significantly since the sales tax exemption was implemented.

Figure 1
Illinois Biodiesel Capacity



[3] Detailed data about the blend breakdown of biodiesel sold in Illinois is not available. For purposes of this study we assumed that all biodiesel sold is a B11 or higher blend.
[4] National Biodiesel Board

The sales tax exemption increases consumer demand for biodiesel. As reported in our earlier study, discussions with each of the four firms producing biodiesel in Illinois confirm that the sales and use tax exemption was a major factor in their decision to locate in and expand production in Illinois.[5] Since the sales tax exemption reduces the price of diesel fuel blended with biodiesel, increased demand supports production and economic activity that would likely not exist in the absence of the exemption. In other words, removal of the sales tax exemption would likely result in plant shutdowns and a decrease in production and the economic benefits that flow from biodiesel production.

The impact of the sales tax exemption is illustrated by comparing the growth of biodiesel sales in Illinois to neighboring states in the eight years since the tax exemption was implemented. This is shown in Table 1. According to the EIA, sales of No. 2 diesel fuel in Illinois averaged 4,429 thousand gallons per day since the sales tax exemption was implemented. This represents a 21.9 percent increase in diesel sales compared to the six-year period prior to implementation of the tax incentive. The four states bordering Illinois with significant interstate traffic experienced an average increase of 13.2 percent over the same period.

Table 1. Prime Supplier Sales, No. 2 Diesel (Thou Gal per Day)

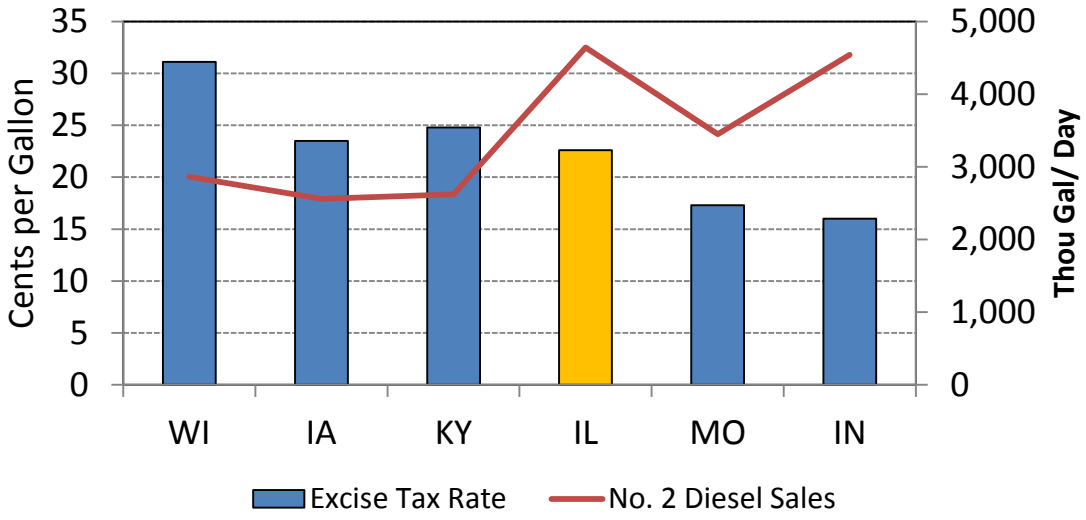
State	1997-2003	2004-2011	% Change
U.S.	117,571	137,967	17.3%
Illinois	3,633	4,429	21.9%
Indiana	3,904	4,265	9.2%
Missouri	2,857	3,295	15.3%
Wisconsin	2,264	2,645	16.8%
Iowa	1,984	2,253	13.6%

Source: EIA Prime Supplier Sales Volumes

[5] These plants include Incobrasa Industries in Gilman, IL, Midwest Biodiesel Products in South Roxana, Renewable Energy Group (REG) plants in Danville and Seneca, and Stepan Company in Milsdale.

The sales tax exemption improves the competitive position of Illinois vis-à-vis neighboring states. As can be seen in Figure 2, diesel fuel excise taxes in Illinois are roughly equivalent to Iowa and Kentucky and higher than Missouri and Indiana.[6] These states are directly east and west of Illinois and are connected by major interstate highways.

Figure 2
Diesel Fuel Excise Tax Rates (Jan 1, 2012)



Economic Impact

As indicated above, the full exemption from sales tax for biodiesel reduces the effective price to the consumer by 6.25 percent and stimulates demand.[7] The effect on demand of a reduction in price can be estimated by applying demand elasticities to the change in price. A recent study by the Freight Policy Transportation Institute at Washington State University examined consumer response to biofuels and found that "Due to the relatively short period of ethanol availability in the marketplace and consequent data limitations, the literature on demand estimation is minimal." (Khachatyran, 2011) The literature on biodiesel is even scarcer. However, since biodiesel acts much like ethanol as an alternative to petroleum-based fuel, the elasticity

[6] http://www.taxadmin.org/fta/rate/mf.pdf
[7] The 6.25 percent sales tax impacts the price consumers see at the pump. The 6.25 percent sales tax is a minimum amount. The actual tax may be more depending on whether the local municipality collects more than the 1% state minimum. However if repealed the Illinois Treasury will recover only 5 percent of the 6.25 percent tax. The remainder is shared with the County and Municipality.

estimates for ethanol relative to gasoline can be used as a proxy for biodiesel relative to diesel fuel. The Washington State authors found that household demand for ethanol as a close substitute to gasoline is sensitive to gasoline/ethanol relative prices. The authors examined the responsiveness of biofuels demand to gasoline over the period 2003 to 2008 and sub periods: pre (2003-2006) and post (2007-2008) EISA. The own elasticity of ethanol demand was estimated to be -3.26 for the whole period; -2.6 and -4.11 for prior and post EISA periods. The interpretation of this is that a 10 percent increase in ethanol (biodiesel) prices would result in a 41.1 percent decline in demand.

The authors suggest that one of the reasons that the change in quantity of ethanol demanded is proportionately larger than change in price (i.e., demand is elastic) is that consumers have quick access to close substitute fuel – gasoline – at almost zero search cost.[8] This also is the case for biodiesel in Illinois. Another explanation for the high elasticity estimate advanced by the authors was consumers' concerns related to ethanol's corrosive characteristics. This may be analogous to concerns over biodiesel's alleged cold weather properties. Considering these conditions, consumers may show high sensitivity to small price increases by decreasing their consumption of biofuels or by switching to gasoline or regular diesel.

Using the demand elasticities cited above (-4.11 for the 2007-2008 post EISA period), a 6.25 percent reduction in the consumer price of biodiesel (B11 or higher blends) results in a 25.7 percent increase in demand. Looking at this another way, removing the sales tax exemption would not only reduce biodiesel demand in Illinois, it would reduce the overall diesel demand in Illinois by 25.7%. On a 2011 demand base of 145.4 million gallons this amounts to 37.4 million gallons of biodiesel.

The primary economic impact for Illinois from the sales tax exemption for biodiesel stems from the economic activity generated by biodiesel production. In short, the Illinois economy benefits from the added economic activity associated with producing 37.4 million gallons of biodiesel that would not exist but for the tax exemption.

Illinois also benefits from increased expenditures for a wide range of non-fuel goods by truckers and other drivers who patronize truck stops in Illinois. Because of the sales tax exemption, it is

[8] Ibid.

likely that truckers and others using the Interstate highway system wait until they enter Illinois to refuel. Accurate statistics for truck stop sales and the number of additional stops is not available. However a 2011 study conducted at Virginia Tech for the National Association of Truck Stops provides some insights that can be used to estimate the additional non-fuel expenditures associated with the increased diesel sales, and consequently, the biodiesel sales tax credit (O'Brien et.al, 2011). The study authors surveyed expenditures at truck stops and travel plazas and found that consumers spent about 12.5 cents of every dollar spent on fuel for non-fuel items. (O'Brien et.al, 2011; Table 5b). If we assume that because of the sales tax exemption diesel sales in Illinois between 2004 and 2011 increased more than the national average during the same period, this amounts to an additional 73.5 million gallons per year. At an average retail price of $3.98 per gallon this amounts to an additional $292 million in fuel sales. Using the O'Brien results that consumers spent 12.5 cents on non-fuel goods for every dollar spent on fuel, additional non-fuel sales as a result of the sales tax exemption amounted to an estimated $36.5 million additional spending annually.[9] These sales include services provided locally as well as goods not necessarily produced in Illinois (i.e. tires, oil and lubricants, or truck parts), so only a portion of the value of these non-fuel sales will directly impact the Illinois economy.[10] Assuming an average retail margin of 34 percent, this amounts to an additional direct impact of $8.8 million from corollary sales at truck stops and plazas upon which sales tax would be levied.

The economic impact of biodiesel production stems from expenditures by the biodiesel industry for raw materials, other goods, and services that represent the purchase of output of other industries. The spending for these purchases circulates through the state economy generating additional value-added output, household income, and employment in all sectors.

Annual expenditures to produce 37 million gallons of biodiesel are estimated at $152 million, of which feedstocks – soybean oil and other fats and oils – account for 83 percent. [11] Biodiesel is made by "refining" fats and oils such as virgin vegetable oil, animal fats and tallow, and waste

[9] These increases are incorporated in the overall economic impact results of the IMPLAN model.
[10] The share of spending that is applicable to the local economy was estimated by assuming 100 percent of the value for services and the retail margin for goods estimated by IMPLAN model. The average for all non-fuel goods and services amounts to 33.6 percent.
[11] Production costs for biodiesel were estimated using 2011 average prices for feedstocks and other inputs. The production cost model is consistent with those published by Iowa State University. Prices were sourced from USDA Economic Research Service and Agricultural Marketing Service, and the Energy Information Administration.

grease and used cooking oils. The primary feedstock for biodiesel in the U.S. – and Illinois -- is soybean oil. Illinois is the nation's second largest producer of soybeans and soybean oil. According to the Energy Information Administration, soybean oil accounts for nearly 55 percent of the methyl-ester (biodiesel) produced in the U.S; other oils such as canola and industrial grade corn oil account for another 20 percent, with the balance divided between inedible tallow and animal fats and other fats and oils such as yellow and brown grease. Given Illinois' prominence as a producer of soybeans and soybean products, virtually all expenditures for inputs for biodiesel production will occur in Illinois. That is, leakage or spending out of state will be minimal. Consequently, these activities will directly benefit the Illinois economy. The biodiesel production costs used in this study are consistent with soybean oil based biodiesel costs such as those published by Iowa State University (Hofstrand).

Methodology

We estimate the impact of the biodiesel industry on the Illinois economy by applying expenditures by the relevant supplying industry to the appropriate final demand multipliers for value added output, earnings, and employment. To understand how the economy is affected by an industry such as biodiesel production it is necessary to understand the way in which different sectors or industries in the economy are linked to each other. For example, in the renewable fuels production sector, the biodiesel industry buys soybean oil from the oilseed processing industry and methanol from the petroleum refining industry. The oilseed processing industry then buys soybeans from the agriculture sector, which purchases crop production products and fertilizers made from natural gas from the agricultural chemicals industry, which in turn purchases products and services from a range of other industries. The petroleum industry uses natural gas as a feedstock for methanol. These are referred to as backward linkages. Use by other sectors of feedstocks like natural gas as an input, such as in manufacturing operations, is called a forward linkage. The natural gas production and transmission industries are linked through both forward and backward linkages to other economic sectors in each state's economy.

The household sector is linked to all sectors as it provides the labor and management needed by each. In turn, changes that affect the incomes of the household sector typically have more

significant impacts compared to a change in the sales of other sectors. This is because households typically spend most of their income in both retail and service industries.

This study utilizes an economic model known as IMPLAN (Impact Analysis for Planning) to develop this understanding of the economy, including the sectors that support the biodiesel industry, the links between them, and the level of economic activity. IMPLAN is a commonly used economic input-output (I-O) model. I-O models are constructed based on the concept that all industries within an economy are linked together; the output of one industry becomes the input of another industry until all final goods and services are produced. I-O models can be used both to analyze the structure of the economy and to estimate the total economic impact of projects or policies. For this analysis, a model for the Illinois economy was constructed using 2011 IMPLAN software and data (the most recent available) and used to estimate economic impacts of the biodiesel industry.

IMPLAN models provide three economic measures that describe the economy: value added; income; and employment.

- Value added is the total value of the goods and services produced by businesses in the State and are generally referred to as GDP. It is equivalent to the sum of labor income, taxes paid by the industry, and other property income or profit.

- Labor income is the sum of employee compensation (including all payroll and benefits) and proprietor income (income for self-employed work). In the case of this analysis, demand for soybean oil to produce biodiesel supports farm income through higher crop receipts than would be the case without biodiesel production. The impact of this higher farm income is evaluated on a gross basis in this analysis. That is, the model does not factor in the distributional effects on consumers from higher soybean or soybean oil prices (i.e. reduced spending on non-food goods and services).

- Employment represents the annual average number of employees, whether full or part-time, of the businesses producing output. Income and employment represent the net economic benefits that accrue to the region as a result of increased economic output.

Three types of effects are measured with a multiplier: the direct, the indirect, and the induced effects. The direct effect is the known or predicted change in the local economy that is to be studied. The indirect effect is the business-to-business transactions required to produce the direct effect (i.e. increased output from businesses providing intermediate inputs). Finally, the induced effect is derived from spending on goods and services by people working to satisfy the direct and indirect effects (i.e. increased household spending resulting from higher personal income).

Results

What has the Biodiesel Industry meant to the Illinois Economy: 2004-2011?

The biodiesel industry has provided a substantial economic benefit to Illinois. The Illinois biodiesel industry has grown from less than 20 million gallons per year in 2003 to its current capacity of 188 million gallons. As indicated earlier, industry participants stated that the sales tax exemption was a key factor in their decision to locate and expand in Illinois. Other factors include proximity to large supplies of feedstocks, a large population and driver base, and the fact that Illinois has a major network of interstate highways used by over the road trucks. Illinois is the nation's second largest producer of soybeans and soybean oil, has a large livestock and meat processing industry, and has major urban areas that generate large supplies of waste grease and oil.

Further, the incentive has also increased the overall diesel demand throughout the state and consequently has been the stimulus to increase the number of truck stops built within the state. National and regional travel center operators have increased the number of new sites and acquisitions of existing sites based upon the exemption and the recent 2011 extension of the exemption for an additional 5 years. With a loss of 25.7% of the state's diesel volume, the incentive to grow and acquire truck stops in the state will be lost, or worse, would result in truck stop closures.

The economic impact of the biodiesel industry is provided by the expenditures associated with construction of new capacity and ongoing production operations. As shown in Table 2, using biodiesel capacity as a base, the biodiesel industry has supported nearly 9,000 jobs in all sectors of the State economy by 2011. In addition the biodiesel industry generated $1.66 billion

of household income, and was responsible for more than $3 billion of Illinois GDP between 2004 and 2011.

Table 2. Economic Contribution of the Biodiesel Industry to Illinois: 2004-2011[12]

	GDP (Mil $)	Household Income (Mil $)	Employment (Jobs)
Construction	$513	$358	2,312
Annual Operations	$2,502	$1,310	6,378
Total	$3,015	$1,660	8,690

Economic Impact of the Biodiesel Sales Tax Exemption

If the sales tax exemption is eliminated the demand for biodiesel will decline and put the Illinois biodiesel industry at risk. As pointed out earlier the presence of the sales tax exemption and resulting robust "home" market for biodiesel was a major factor is the decision for firms to locate in Illinois.

As indicated earlier, full exemption for biodiesel blends above 10 percent (B11 and higher) of the 6.25 percent Illinois sales tax supports biodiesel demand and production of more than 37 million gallons. The key results for annual operations to produce 37.4 million gallons of biodiesel supported by the sales tax exemption are summarized in Table 3.[13]

[12] This impact does not explicitly include the effect of additional corollary retail sales associated with increased diesel fuel use.

[13] It is important to note that this study estimates the economic impact of only the biodiesel production that results from the sales tax exemption not the entire 145 million gallons consumed in Illinois.

Table 3. Economic Impacts of a 6.25 percent Sales Tax Exemption for Biodiesel for Illinois

	Direct	Indirect	Induced	Total
Annual Operations				
GDP (Mil $)	$7.70	$60.1	$23.3	$91.6
Household Income (Mil $)	$3.42	$39.3	$13.0	$55.6
Employment (Jobs)	18	739	281	1,038
Corollary Retail Sales				
GDP (Mil $)	$4.9	$7.6	$5.6	$18.1
Household Income (Mil$)	$4.9	$5.1	$3.1	$13.1
Employment (Jobs)	167	142	66	376
Total Impact				
GDP (Mil $)	$12.7	$68.2	$28.9	$109.7
Household Income (Mil $)	$8.3	$44.4	$16.1	$68.8
Employment (Jobs)	185	881	348	1,414

Employment

Jobs are created from the economic activity supported by biodiesel production. While soybean processing and biodiesel production are not labor-intensive industries, accounting for an estimated 166 full time equivalent jobs in manufacturing, the economic activity resulting from the full operations of the biodiesel industry supports a much larger number of jobs in the economy. When the direct, indirect and induced jobs supported by biodiesel production and the corollary retail sales associated with increased biodiesel use are considered, the sales tax exemption supports more than 1,400 jobs in all sectors of the State economy.

The distribution by economic sector of jobs supported by the tax exemption is summarized in Table 4. Since biodiesel production is more capital than labor intensive, the number of direct jobs supported by biodiesel production is relatively modest and is concentrated primarily in the manufacturing sector. However, the direct jobs associated with the retail activities of gas stations and truck stops and plazas that sell diesel fuel and biodiesel blends is substantial. The

increased retail activity resulting from higher biodiesel use stimulated by the sales tax exemption is estimated to support 465 direct jobs in the trade sector.

Table 4. Employment Impacts by Industry (Full Time Equivalent Jobs)

Industry	Direct	Indirect	Induced	Total
Agriculture		172	0	172
Construction		23	3	26
Manufacturing	18	223	5	245
Transportation & Public Utilities		79	9	88
Wholesale & Retail Trade	167	223	76	465
Services		159	249	408
Government		5	5	9
Total	**185**	**882**	**346**	**1,414**

Most of the agriculture jobs supported by the biodiesel industry are farm workers and laborers associated with soybean production. However, a wide range of jobs in support activities related to crop production ranging from farm managers and bookkeepers to farm equipment operators are supported by soybean production.

As the impact of the direct spending by the biodiesel industry expands throughout the economy, the employment impact expands significantly and is spread over a large number of sectors. An illustration of the employment impacts of the biodiesel industry for Illinois is provided by the experience of the Renewable Energy Group. REG currently operates five biodiesel plants nationally, two of which are in Illinois. REG reports that they utilize more than 5,000 truck trips for feedstocks and finished products annually for the five plants.[14] Weighting truck trips by the share of REG production accounted for by the two Illinois plants indicated that the two plants account for nearly 2,900 trips per year or 13 per day based on a 220 day operating year.

[14] Personal conversation with REG.

Income

Economic activity and associated jobs produces income. The economic activities created by the sales tax exemption places $68.2 million in the pockets of Illinois households. The distribution of income gains by industry is summarized in Table 5.

As is the case with employment, the direct impact on income by the biodiesel industry is limited to wholesale and retail trade and manufacturing. However, the biodiesel industry also supports income for farmers who benefit from the demand for feedstocks, which leads to both increased production acreage and higher prices.[15]

Table 5. Income Impacts by Industry (Million 2012 $)

Industry	Direct	Indirect	Induced	Total
Agriculture		$7.87	$0.03	$7.90
Construction		$1.42	$0.20	$1.62
Manufacturing	$3.34	$12.61	$0.406	$16.35
Transportation & Public Utilities		$4.79	$0.62	$5.41
Wholesale & Retail Trade	$5.01	$7.67	$2.91	$15.58
Services and Government		$9.66	$11.68	$21.34
Total	$8.35	$44.01	$15.84	$60.20

[15] Increased demand for soybean oil to produce biodiesel raises soybean oil prices. This stimulates both soybean production/soybean crush demand which, in turn, increases soybean meal production and reduces soybean meal prices to the benefit of livestock and poultry producers.

Fiscal Impacts

The sales tax exemption for biodiesel supports additional tax revenue for the Illinois State Treasury. This revenue is derived from several sources and is detailed in Table 6. Removal of the sales tax exemption would eliminate these revenue streams.

- The personal income, sales, and corporate income tax receipts that result from the economic activity generated from the production of 37.4 million gallons of biodiesel and loss of 25.7% of overall diesel fuel sales.

- Sales tax revenue from on-highway diesel fuel sales that would result from lower demand caused by imposition of the sales tax.

- Reduced receipts from Underground Storage Tank (UST) and environmental fees on the gallons represented by lower fuel demand in Illinois.

- Additional tax revenue from increased gaming activity at truck stops associated with increased miles driven in Illinois. Video gaming was introduced in Illinois in October 2012 and truck stops are among approved locations for gaming devices. At the time of this writing, 26 truck stops in Illinois have been licensed to have video gaming and there are 80 applications pending. Currently, truck stops are restricted to five gaming devices per location. Video gaming receipts are taxed at a 35 percent rate with 30 percent retained by the State and the remainder returned to local governments. A 2009 study on estimated revenues from video gaming in Illinois estimated mean revenue per machine of $45,000 in 2008 (Arduin, Laffer & Moore, 2009). Assuming 110 truck stops with five machines each and annual revenue of $50,552 per machine[16], this suggests total revenue of $27.8 million annually. Further assuming that video gaming activity would change by the same amount as biodiesel demand, the sales tax exemption would support $7.1 million in gaming revenue and $2.1 million of State tax revenue.

[16] $45,000 in 2008 is equivalent to $50,552 in 2012 dollars using the CPI as an inflator.

Table 6. Illinois Tax Revenue Supported by the 6.25 percent Sales Tax Exemption for Biodiesel

Revenue Source	(Mil $)
Reduced diesel sales	$63.84
Corollary Sales	$8.44
UST and Environmental Fees	$3.73
Gaming Receipts	$2.10
Personal Income	$1.76
Corporate Income	$0.37
Total Revenue	$80.24

The Illinois State Comptroller estimated the cost of the biodiesel exemption and discount at $107 million for FY 2011. This is a gross estimate of the program costs and does not account for the additional tax revenue supported by the economic activity and diesel fuel sold in Illinois as a result of the sales tax exemption. Accounting for the benefits provided by biodiesel the true costs of the program are only $26.7 million.

Conclusion

The biodiesel industry has made a substantial contribution to the economy of Illinois. Between 2004 and 2011 the biodiesel industry has accounted for more than $3 billion of GDP, provided consumers with nearly $1.7 billion of income, and supported nearly 9,000 jobs in all sectors of the economy. Illinois is a major producer of biodiesel for several reasons; however producers cite the tax exemption as a major factor for locating in and expanding production in Illinois. Elimination of the sales tax exemption removes a major incentive for biodiesel firms to remain in Illinois. Loss of the industry means loss of economic activity and jobs.

The full exemption for biodiesel from the 6.25 percent Illinois sales tax is an effective demand incentive that supports more than 1.3 billion gallons of diesel fuel blended with biodiesel use and 145 million gallons of B100. The economic activity that is generated by this industry increases final demand for Illinois farmers and businesses and supports more than 1,400 jobs in all sectors of the State economy and nearly $69 million of household income.

Elimination of the sales tax exemption for biodiesel will not provide the windfall in tax revenue suggested by looking only at the gross expenditures data published by the State of Illinois.

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