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Disruptive Policy Impacts on Biodiesel Investment: The Third Leg in 3-T Policy

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Disruptive Policy Impacts on Biodiesel Investment: The Third Leg in 3-T Policy

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RESEARCH GOAL

The 3-Ts in policy are type, timing, and transience.

- **Type** -- determining the correct kind of policies.
(e.g., standards, subsidies, or taxes)
- **Timing** -- when a policy should be instigated.
- **Transience** -- the length and consistency of a policy.

The literature is void in presenting research directed toward the **transience** of energy policies.

Considering transience, empirical results demonstrate the importance of consistent policies underlying the likely adoption of alternative energy. Specifically, the U.S. production of biodiesel is investigated under shifting, on and off again, federal tax credits.

HYPOTHESIS

Hypothesis: The inconsistent tax credits lead to market uncertainty, which have a pronounced negative impact on the decisions to invest in a biodiesel refinery.

- 1) If there exists a high probability of a tax credit being implemented in the near future, then biodiesel investors will want to delay investment.
- 2) With a current tax credit, as the probability of the credit being withdrawn increases, biodiesel investors will want to capitalize on this tax credit before it is withdrawn.

POLICY

U.S. Biodiesel Subsidies

The two programs that affect the demand for U.S. biofuels are:

- Renewable Fuel Standard (RFS).
- Blender Tax Credit (BTC).

Year	Biodiesel Mandate (billion gallons)	Tax Credit Existence (\$1.00 per gallon)
2005	—	Yes
2006	—	Yes
2007	—	Yes
2008	—	Yes
2009	—	Yes
2010	1.15	No
2011	0.80	Yes
2012	1.00	No
2013	1.28	Yes
2014	1.28	No
2015	1.28	?

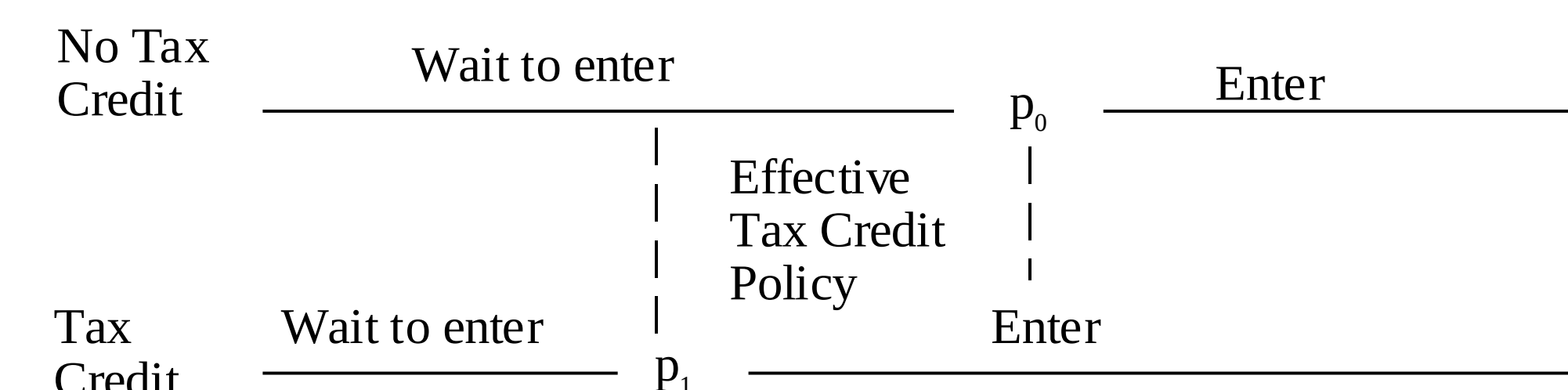
The history of government policy uncertainty coupled with annual changes in the RFS does not provide a stable policy platform for a young and maturing biodiesel industry. Such inconsistent policy has the potential of disrupting investment by limiting biodiesel producers' access to financing.

METHODOLOGY

Incorporating Poisson processes into a real options model

Assumptions

- The net price (price minus variable cost of production) per gallon of biodiesel follows a geometric Brownian motion.
- The policy switching regime of the discontinuous federal tax credit of \$1.00 per gallon of biodiesel is modeled as a Poisson jump process.
- Starting with a state when the credit is not in effect, the probability that it will be implemented in the next short interval of time dt is $\lambda_1 dt$, and when the credit is initially in effect, the corresponding probability that it will be withdrawn is $\lambda_0 dt$.

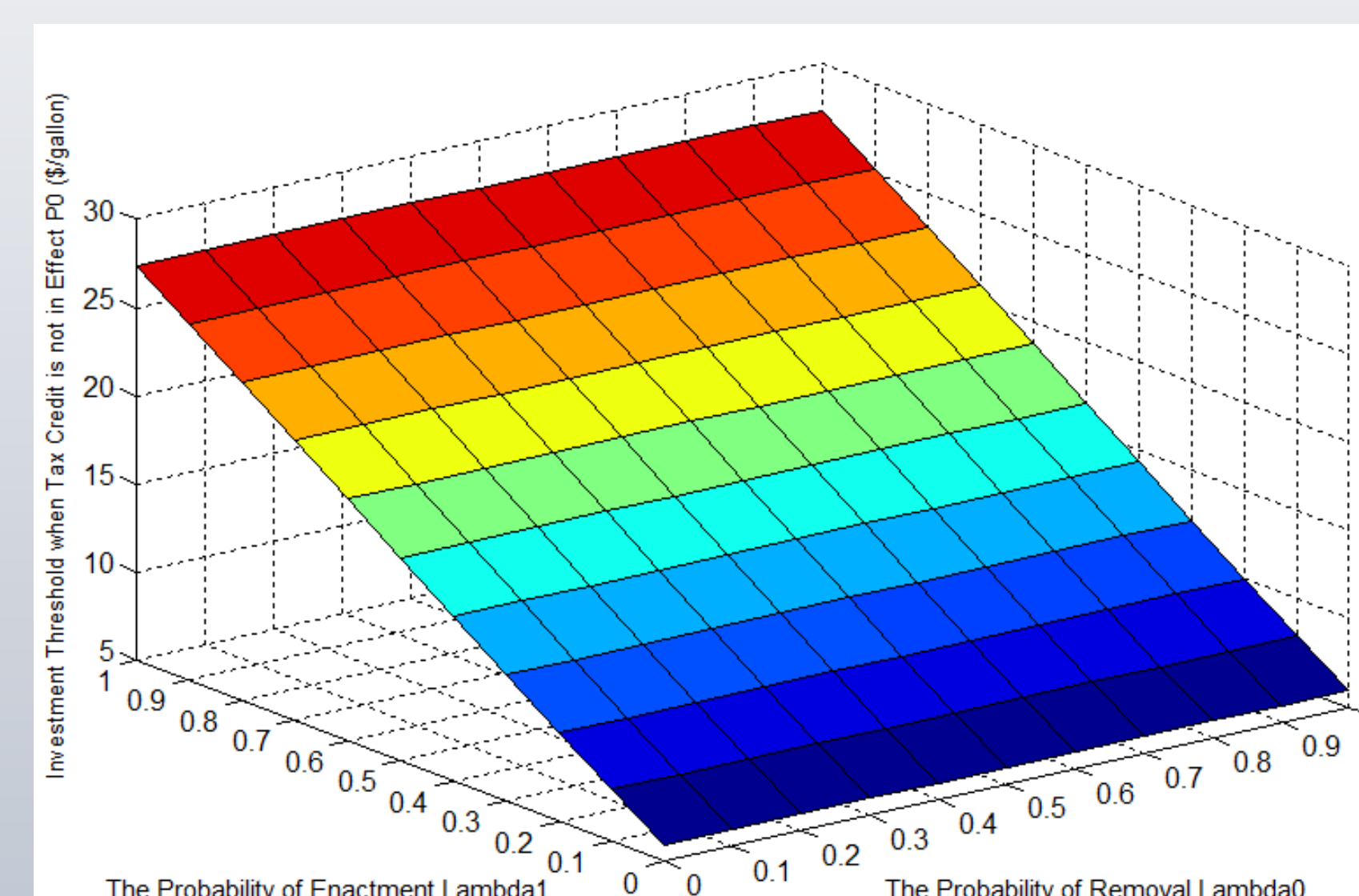


- Over an interval of low prices, a biodiesel refinery will not be initiated regardless if the tax credit is allowed.
- Over a higher price interval, the refinery will be initiated with a tax credit and not without. The hope is the possibility of a future tax credit.
- Beyond this interval, regardless of the tax policy, the biodiesel refinery will be built.

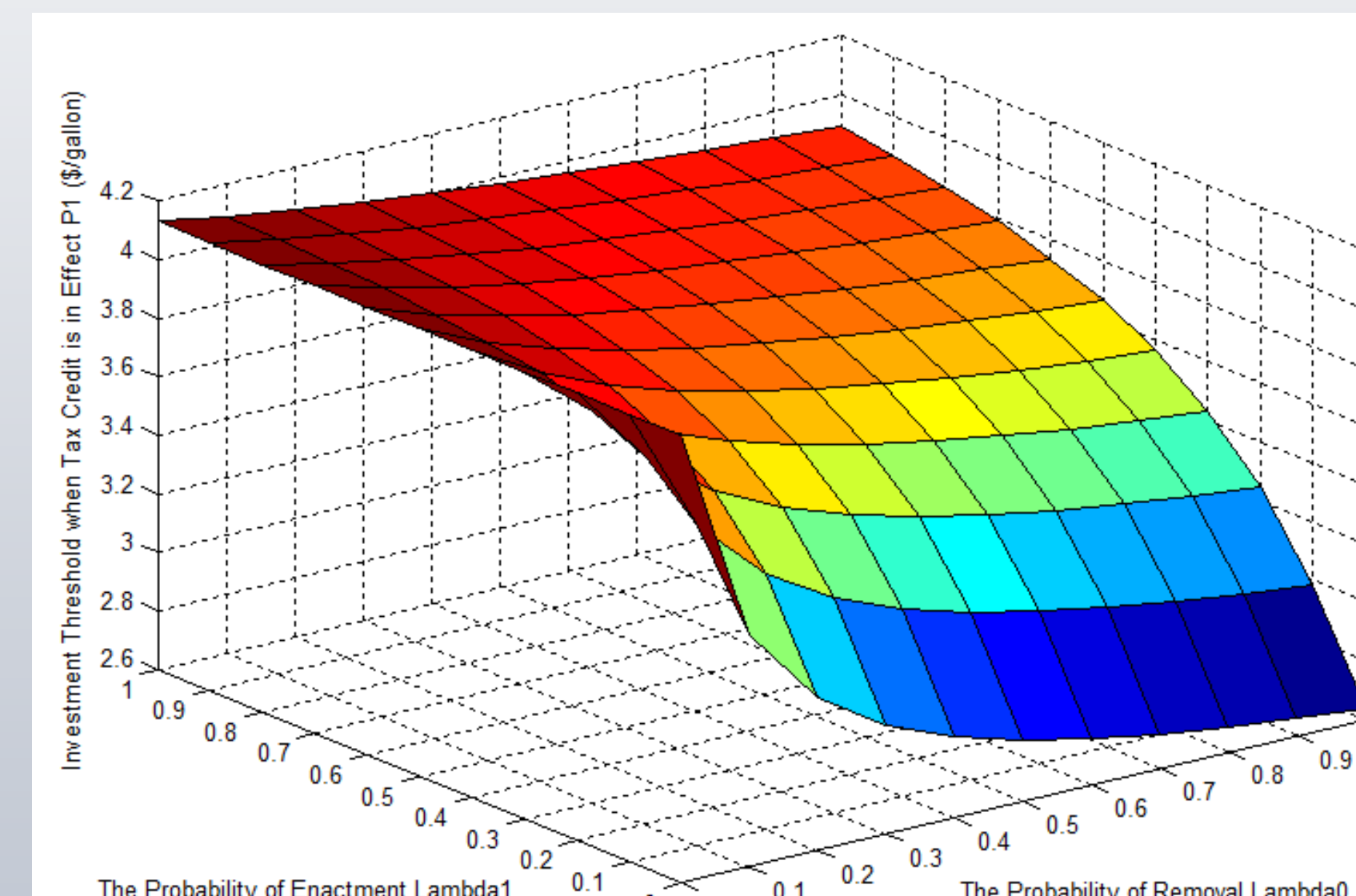
DATA

- Weekly biodiesel price series (\$/gallon) from the USDA Agricultural Marketing Service
- From January 4, 2008 through June 27, 2014
- Normalized by the Producer Price Index (PPI) for crude material

RESULTS



The threshold price P_0 increases with the probability of enactment λ_1 . Even when the tax credit is not in place, there is a slight decreasing trend in P_0 as the probability of removal λ_0 increases.



The threshold price P_1 decreases as the probability of removal λ_0 increases. Even when the tax credit is in effect, there is a marked increase in P_1 as the probability of implemented λ_1 increases.

RESULTS

Considering the ten year 2005 to 2014 period:

- The tax credit was implemented for five consecutive years from 2005 to 2009. After that, there are three transitions from having to not having a tax credit, which are from 2009 to 2010, 2011 to 2012, and 2013 to 2014.
 $\hat{\lambda}_0 = Pr(\text{No tax credit at Year} = t + 1 | \text{Tax credit at Year} = t) = \frac{3}{7}$.
- There are two transitions from not having to having a tax credit, which are from 2010 to 2011 and 2012 to 2013. The tax credit would be implemented within the next year when the tax credit was not in effect this year.
 $\hat{\lambda}_1 = Pr(\text{Tax credit at Year} = t + 1 | \text{No tax credit at Year} = t) = 1$.

$$\hat{\lambda}_0 = \frac{3}{7} \text{ and } \hat{\lambda}_1 = 1 \rightarrow P_0 = 27.400 \text{ and } P_1 = 3.997.$$

- The investment in biodiesel was always questionable without a tax credit, but the likelihood of the implementation of a credit in the near future markedly increases the barrier to current investment.
- With a close to 50% probability the tax credit will be withdrawn, this does not greatly increase the likelihood of currently adopting.

CONCLUSIONS

- The results addressing the transience consideration support the hypothesis of time inconsistent government policies (tax credits) do lead to market uncertainty. This does appear to have a pronounced negative impact on the decisions to invest in a biodiesel refinery.
- However, the results indicate a consistent policy switching regime may not be that disruptive. It is the policy uncertainty that drives the option pricing thresholds and a consistent policy switching does not increase the uncertainty.
- Even a consistent policy switching regime is likely to result in economic inefficiency. These inefficiency take the form of both scale and investment inefficiencies. Scale inefficiency are in terms of determining production level in response to changing policies and investment inefficiency is in terms of annual disjoint biodiesel investment levels.

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