Brief Literature Review: Selected Topics Regarding Sustainable Agriculture and Economic Incentives

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The purpose of this very brief review is to provide context for how four types of policy tools could affect growers' pesticide use by presenting studies of their effects in other settings. Subsidies, cost-sharing and other direct financial benefits are considered in the context of the adoption of sustainable agricultural practices. Insurance is presented in the context of crop insurance. Taxes based on product characteristics are presented in the context of taxes on sugary beverages. Procurement policies are presented in the context of encouraging more organic production. The review is not comprehensive for any of these topics, nor is it intended to be. It begins with a short summary of key findings and their implications for enhancing the sustainability of pest management, followed by the published abstracts for all articles, organized by topic.

1 Enhancing Adoption of Sustainable Agricultural Practices With Economic Incentives

U.S. Code Title 7, Section 3103 defines sustainable agriculture as "an integrated system of plant and animal production practices having a site-specific application that will, over the long-term: 1) satisfy human food and fiber needs; 2) enhance environmental quality and the natural resource base upon which the agriculture economy depends; 3) make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; 4) sustain the economic viability of farm operations; and 5) enhance the quality of life for farmers and society as a whole." Producers, consumers, and governments all can play a role in ensuring a sustainable agriculture system by promoting healthy environment, economic profitability, and social and economic equity (UC Sustainable Agriculture Research and Education Program, 2021). This literature review focuses on the role of crop growers and governments.

There are many practices including organic farming (e.g., nonuse of synthetic chemicals), soil conservation (e.g., conservation tillage, cover crops), nutrient management (e.g., fertilizer use requirement), integrated pest management (e.g., biological control, habitat manipulation), and others that can be used by growers to meet the sustainability objectives (UC Sustainable Agriculture Research and Education Program, 2017a,b,c,d,e, 2021). Although these practices have the potential to promote environmental benefits, growers may not implement certain practices due to the lack of economic benefits, which necessitates government programs to impose regulations and/or provide economic incentives.

Regulations for promoting sustainable agriculture such as command-and-control are typically mandatory (e.g., standard setting, permission, and prohibition) and require monitoring and enforcement. Under the regulatory approach, trading programs may be designed to ensure cost efficiency. For example, permit trading programs have been established in several U.S. states to facilitate compliance with Total Maximum Daily Load (TMDL) restrictions for impaired waters restoration (Ribaudo, Savage, and Aillery, 2014).

In contrast, economic incentives can be voluntary, mandatory, or a combination of the two. Most agri-environmental programs such as Conservation Reserve Program (CRP) and Environmental Quality Incentive Program (EQIP) in the U.S. are voluntary (Garnache et al., 2016). To encourage growers to adopt sustainable practices, agricultural subsidies are one of the most common economic instruments used by policymakers. Agricultural subsidy can take several forms: subsidized crop insurance, disaster payments, tax credits, cost-sharing contracts between governments and growers, and stewardship payments for program enrollment (Harris, Swinton, and Shupp, 2014; Schoengold, Ding, and Headlee, 2015; Claassen et al., 2017; Wallander et al., 2019). Enforcement can be strengthened by withholding the subsidies if growers fail to comply with the contracts and implement the practices (Ribaudo et al., 2011; Palm-Forster, Suter, and Messer, 2019). Taxes are another popular instrument (Palm-Forster, Suter, and Messer, 2019). Unlike subsidies, which compensate growers for adopting practices promoting sustainable agriculture, taxes penalize growers for taking actions impeding the development of sustainable agriculture.

Because of the voluntary nature of many agri-environmental programs, understanding the factors affecting program enrollment and practice adoption is essential for designing effective policies. The literature has documented the role of weather conditions (e.g., drought), field characteristics (e.g., soil quality), commodity price, production cost, extents of financial assistance, stringency of program requirements (e.g., number of years on a contract), current management status, and growers' beliefs, management skills, and risk attitudes (Hellerstein and Malcolm, 2011; Claassen, 2012; Ma et al., 2012; Wallander et al., 2013; Schoengold, Ding, and Headlee, 2015; Ribaudo, Key, and Sneeringer, 2017; Wallander et al., 2019; Yeh, Gomez, and Lin Lawell, 2020; Blumberg, Goemans, and Manning, 2021; Hughes, Reeling, and Ma, 2021; Sellars et al., 2021). These factors could vary across regions and/or growers, and the presence of variations indicates the ineffectiveness of one-size-fits-all policies and the necessity to factor it into the policy-design process (Nickerson and Hand, 2009; Claassen et al., 2017).

2 Mitigating Risk With Crop Insurance

The federal multiple peril crop insurance program seeks to stabilize farm incomes by protecting farmers from downside risk due to reduced yields and, in some programs, revenues. Farmers are protected against losses from natural causes, such as drought and disease. Premiums are subsidized by the federal government. Intuitively, as subsidies for crop insurance increase, a larger percentage of U.S. farmers purchase crop insurance (O'Donoghue, 2014). Moreover, when insurance is framed as an investment, take-up rates increase (Luckstead and Devadoss, 2019). Enrollment has been shown to improve farm productivity (Kurdyś-Kujawska et al., 2021) and increase resilience to adverse financial events (Glauber et al., 2021; McFadden and Hoppe, 2017). The strength of these effects varies spatially (Hungerford and O'Donoghue, 2016), across farmer income levels (Farrin, Miranda, and O'Donoghue, 2016), and farmer experience (Zhao et al., 2020).

Precisely because crop insurance mitigates risk, it leads to increased moral hazard by increasing the use of the risk-increasing factor (i.e. feed) and reducing the use of the risk-decreasing factors such as labor and capital (Roll, 2019; Capitanio, Adinolfi, and Santeramo, 2014). Because growers are protected against bad outcomes, they are willing to make riskier decisions and capture higher returns from good outcomes. This suggests that insuring growers against losses in exchange for their use of more environmentally friendly pest management programs may alter their decisions regarding other inputs as well, and could lead to off-setting negative environmental impacts.

However, a key distinction between conventional crop insurance and insurance based on pest management practices is that the latter would be based on one category of input. To the extent that the impact of pest management practices on yield and output quality can be separated from the impact of other inputs, the incentive to adjust those other inputs can be attenuated because growers will not be compensated for losses due to those other inputs. To the extent that it cannot, the moral hazard problem will persist. Growers would have an incentive to increase the use of risk-increasing inputs because the inability to differentiate between the effects of pest management practices and the effect of other inputs on yield or revenue could result in a payout.

Findings regarding the effect of crop insurance on farmers' use of environmentally friendly practices and environmental quality are mixed. While federal crop insurance may increase the likelihood of crop rotation (Claassen, Langpap, and Wu, 2017), it disincentives the use of cover crops (Connor, Rejesus, and Yasar, 2021). Crop insurance has been linked to increased soil degradation (Goodwin and Smith, 2003; Bryant and O'Connor, 2017) and overall environmental degradation (Claassen et al., 2011). Doidge (2020) examines the effect of crop insurance on farmers' adaptations to climate change. Farmers with crop insurance are more likely to make investments that reduce the risk they face from climate change. These investments come in two forms: ecological and capital. On the one hand, ecological adaptations such as planting more resilient crops varieties, applying more fertilizers and pesticides, adopting new tillage practices, and planting cover crops help to reduce farmer risk due to changing climate. On the other hand, purchasing 'time-saving equipment' enables farmers to plant and harvest more quickly, thus

lowering the risk of losses due to weather delays. In both cases, farmers experience a decline in overall risk due to climate change.

These findings regarding the effects of the crop insurance program on producers' decisions suggest that there is scope for an insurance program linked to pest management decisions to incentivize the use of more sustainable practices and products.

3 Altering Purchase Choices Through Attribute-Based Taxes

Taxing a good raises the effective price to buyers. A unit tax is assessed per unit sold, and an ad valorem tax is assessed based on sales revenues. The current pesticide mill tax is an ad valorem tax, assessed at a rate of \$0.021 per \$1. Setting a mill tax based on the characteristics of a pesticide product instead could alter growers' pesticide use decisions.

The effects of a tax based on product characteristics have been studied extensively for taxes on sugary beverages (Allcott, Lockwood, and Taubinsky, 2019). Recently, many jurisdictions have implemented such taxes. The taxes have been shown to reduce consumption of the target drinks (Cawley et al., 2020; Pereda and Garcia, 2020). Some studies have found that consumption of alternative beverages increased (Castelló and Casasnovas, 2020; Powell and Leider, 2020; Colchero et al., 2017; Zhen, Brissette, and Ruff, 2014). Dharmasena, Davis, and Capps Jr (2014) simulate the impact of incorporating a supply response, and find that the supply response results in much smaller changes in quantity than is the case when supply-side effects are included.

The impact of a tax based on a product's characteristics on the consumption of substitutes is an important consideration in the context of pesticides. If, for example, the tax rate was based on the active ingredient's mode of action then growers would have an incentive to substitute into pesticides with more lightly taxed modes of action. This could affect their ability to manage the development of resistance in target pest populations.

Another consideration regarding product substitution is differences in the per-acre cost of using pesticides. The current mill tax, as noted above, is an ad valorem tax. To the extent that pesticides with negative environmental and human health effects tend to be less costly to use on a per-acre basis, the reduction in use from a higher tax rate on those pesticides will be smaller than it would be if all pesticides were equally costly to use.

Zhen, Brissette, and Ruff (2014) compare the outcomes of unit taxes based on calories and on ounces. Using calories as the basis for the unit tax resulted in a larger reduction in calories consumed. Conceptually, in the case of pesticides an alternative could be utilizing a unit tax that's assessed on the recommended label rate. However, the mill tax is assessed at the first point of sale, not at sale to the final user. If different rates are recommended for different crops, using a unit tax would be problematic at best.

Another consideration is the impact on total tax revenues. 'Feebates' are a means of setting a revenue-neutral policy that taxes products with undesirable characteristics and subsidizes products with desirable ones. Greene et al. (2005) examine feebates based on fuel economy rates for cars. Cars with a fuel economy rate above a specific level obtain a subsidy, while those below that pivot point are taxed. The choice of the tax rate determines the change in average fuel economy and total economic impact of the feebate, while the choice of the pivot point determines the allocation of returns between consumers and goverment tax revenues.

4 Altering Production Choices Through Procurement Policy

Public procurement is promoted by governments and NGOs as a tool to promote sustainable production practices. Few studies examine the effect of public procurement policies on the adoption and expansion of

organic production practices, and those that do focus on procurement policies outside the U.S. However, they may still provide useful insights for designing and implementing procurement policies that alter pesticide use in the U.S.

Altieri and Nicholls (2012) analyze the impact of Brazil's Food Acquisition Program (PAA) on both increasing the number of family farms producing organically and increasing the geographic scope of organic production (i.e., scaling out) across several municipalities in Brazil. The Brazilian federal government established the program with the goal of establishing more localized food systems to promote food security for low-income Brazilians and support family farms. The program established an institutional market for conventional and organic foods produced by peasant and family farms, offered price incentives for organic foods, and made the publicly procured food available to food-insecure individuals located in the same territory in which the food was produced. Results indicate the price incentive did not induce organic transition among small-scale farmers and largely benefited those that were already using sustainable practices. Further, results suggest that many existing organic farmers chose to participate in non-PAA markets. Interviews with farmers illuminate several reasons for this. Many farmers found the market created by the program to be small relative to other nearby accessible markets. Farmers could obtain organic price premiums in these other markets, and these markets were often more stable with less bureaucracy than the PPA market.

Producers with limited access to traditional markets for organic goods may be more inclined to participate in public procurement programs, though these programs and the markets they create must be able to support the scale of organic output they are intended to induce. Analysis of Brazil's School Feeding Program, which is located in a more remote region than the one in which PPA operated and pays a 30% premium for certified agroecological production system, incentivized small farmers to begin transitioning to agroecological practices (Guerra et al., 2017). Absent the program, farmers in the region did not have access to markets for differentiated products and the price premiums they generate. The ability of the program to support increased organic production is limited, however, by the size of the procurement market. The school supported by the program is small, and quotas were imposed on purchases from farmers or groups of farmers, so the market was unable absorb the output of all farms in the region.

The efficacy of PPP as a means of achieving environmental goals depends on market characteristics, and policies may be more successful if the government entity is a relatively large buyer of the good, the supply of the good is elastic, and private demand of the good is fairly inelastic (Marron, 1997; Lundberg, Marklund, and Strömbäck, 2016). Lindström, Lundberg, and Marklund (2020) analyzes the impact of Sweden's Green Public Procurement (GPP) policy on the quantity of organic agricultural land. The policy, established in 2006, directed the public sector to increase the share of organic food procured to 25% by 2010 and 60% by 2030 in order to increase the share of organic farmland in the country to 30%. Results indicate the policy is associated with an increase in organic farmland, though the authors posit that direct cash transfers have a larger effect.

Public procurement programs for local foods are much more common in the US than those for organics or other such sustainable production practices. In 2015, 167,000 farmers sold $8.7 billion in edible food products directly to consumers, retailers, institutions, and intermediary buyers. Of that, $3.4 billion was sold to institutions (e.g., schools, colleges, universities, and hospitals) or local intermediary buyers (e.g., wholesale distributors or processors and $3 billion directly to consumers through farmers markets, CSA, online sales, etc.) (U.S. Department of Agriculture, National Agricultural Statistics Service, 2016).

Two prominent programs are farmers market nutrition incentive (FMNI) and farm to school (F2S) programs. The former is associated with the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and refers to a collection of programs administered by state agencies that provide WIC participants with a check or coupons in excess of their regular benefits to purchase food from farmers markets and roadside stands. In 2020, 15,109 farmers, 2,461 farmers markets and 2,150 roadside stands were authorized to participate in the program (U.S. Department of Agriculture, Food and Nutrition Service, 2011). F2S encompasses buying and serving locally sourced food, establishing and maintaining a school garden, and providing gardening and nutrition education. During the 2018-19 school

year, 65.4% of school food authorities (SFAs) participated in F2S activities, and 88% of those schools participated in at least one procument activity (e.g., serving local foods in school lunches)(of Agriculture, 2021).

Many F2S farmers experience modest increases in revenue at most, with F2S income representing a small share of their total income (Joshi, Azuma, and Feenstra, 2008; Schmidt, Kolodinsky, and Symans, 2006), whereas FMNI farmers selling in low-income areas or to low-income customers consistently reported increased revenues (Cole et al., 2013; Community Science, 2013). Despite the potential for increased revenue and market access, surveyed farmers in Minnesota and adjacent states reported buyers' budget constraints, liability concerns, regulatory burdens, pricing, and seasonality as barriers to participating in such programs (Huff, 2015; Berkenkamp, 2012). Mississippi farmers identified lack of knowledge on how to sell to institutions and crop harvests not aligning with the school year as primary barriers to selling to institutions in addition to low prices paid by schools and institutions, disparities between supply and demand, and insurance costs (Rosenberg et al., 2013). Concerns over pricing, however, may be unwarranted in some instances, as 95% of surveyed farmers in the Minnesota region that participated in F2S activities indicated they received a fair price from their school buyers.

Lehnerd et al. (2018) surveys Mid-Atlantic fruit and vegetable farmers on their perceptions of F2S and FMNI programs as well as reasons for and barriers to participating in the two programs. Of the 155 respondents, 104 participate in FMNI programs, 42 in F2S, and 29 in both. FMNI participants perceived the program as less complex than non-adopters and also perceived the program to be more beneficial relative to traditional markets or sales channels than non-adopters. Reported barriers also differed between the two groups, with most adopters concerned with consumer and market characteristics (e.g., the small size of FMNI markets, lack of customer interest, and customers being unable to afford their high prices) and most non-adopters worried about administrative burdens (e.g., paperwork required to join, availability of program training, timing of payments, etc.). This highlights the need to tailor the content of outreach and efforts to adopters and non-adopters to highlight the concerns of each group. Overall, nearly two-thirds of adopters reported the program increased revenues, providing them with economic incentive to participate.

As with FMNI participants, F2S adopters perceived the program to be more beneficial than non-adopters, though perceptions of complexity were relatively similar across the two groups. Both adopters and non-adopters noted that the most significant barrier to participation is schools lacking the capacity to cook from scratch and serve fresh foods. Both also share concerns about not being able to meet the large volume needs of schools. Over half of participants reported an increase in income due to the program, though most reported the variety of markets accessed to be the same or only slightly higher.

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Appendices

A Sustainable Agriculture and Economic Incentives: Abstracts

Title: Producer Beliefs and Conservation Decisions: The Impact of Perceived Water Security on Irrigation Technology Adoption
Author: Joey Blumberg, Dale Manning, and Chris Goemans
Year of Publication: 2021
Source: AAEA Annual Meeting
Abstract: Agricultural producers make investment decisions based on their beliefs about future returns. This article examines how changes in beliefs about input availability affect conservation decisions. We propose a theoretical model to examine how a producer's beliefs about input shortages influence investment in more efficient technologies. We apply this model to the context of water shortages and irrigation technology investment in Colorado. Then, we use publicly available data on water rights and irrigated cropland to empirically identify the impact of changing beliefs about water availability on water conservation decisions. We leverage a natural experiment in which a period of severe drought and institutional change in the early 2000s led to a plausibly exogenous shock to expectations for some water right holders. Empirical results suggest that producers who experienced an unprecedented increase in the curtailment of their water right converted 11% more land to a more efficient irrigation technology by 2015, with corn predominantly planted on the converted land. This analysis provides useful insight into the role of beliefs in incentivizing adaptation to increasing scarcity.

Title: The Future of Environmental Compliance Incentives in U.S. Agriculture: The Role of Commodity, Conservation, and Crop Insurance Programs
Author: Roger Claassen
Year of Publication: 2012
Source: ERR-94, U.S. Department of Agriculture, Economic Research Service
Abstract: In recent years, direct payments—a type of farm commodity program payment—have made up a large share of Federal agriculture assistance that could be withheld from farmers who fail to comply with highly erodible land conservation (conservation compliance and sod buster) or wetland conservation (swamp buster) provisions, known collectively as environmental compliance requirements. If direct payments are sharply reduced or eliminated to help reduce the Federal budget deficit, compliance incentives would be reduced on many farms, potentially increasing environmental quality problems. Some farmers will still be subject to compliance through existing Federal agricultural programs (e.g., conservation or disaster programs) or programs that may succeed direct payments. Making federally subsidized crop insurance subject to compliance could also make up some of the lost incentive to farmers.

Title: Conservation Compliance: How Farmer Incentives Are Changing in the Crop Insurance Era
Author: Roger Claassen, Maria Bowman, Vince Breneman, Tara Wade, Ryan Williams, Jacob Fooks, LeRoy Hansen, Rich Iovanna, and Chuck Loesch
Year of Publication: 2017
Source: ERR-234, U.S. Department of Agriculture, Economic Research Service
Abstract: Conservation Compliance ties eligibility for most Federal farm program benefits to soil and wetland conservation. To be eligible for farm program benefits, farmers must apply an approved soil conservation system on highly erodible cropland (Highly Erodible Land Conservation, or HELC) and refrain from draining wetlands (Wetland Conservation, or WC). Conservation Compliance is effective when the incentive—the farm program benefits that could be lost due to noncompliance—exceeds the cost of meeting soil and wetland conservation requirements. HELC significantly reduced soil erosion on highly erodible cropland and may have also encouraged erosion reduction on land not subject to HELC. Compliance incentives (farm program benefits) under the Agricultural Act of 2014 are found to (1) vary

widely across farms with cropland in HEL (highly erodible land) fields, (2) approximate the overall level of incentive that would have been provided under an extension of the 2008 Farm Act (although incentives changed significantly on many farms), and (3) be significantly lower on many farms if crop insurance premium subsidies were not subject to Conservation Compliance. Compliance incentives for WC, although measured only in the Prairie Pothole region of the Northern Plains, are clearly larger than Compliance costs for an estimated 75 percent of wetlands that are already cropped or have characteristics (e.g., productivity, topography) that are favorable to crop production.

Title: Solving the Phosphorus Pollution Puzzle: Synthesis and Directions for Future Research
Author: Cloé Garnache, Scott M. Swinton, Joseph A. Herriges, Frank Lupi, R. Jan Stevenson
Year of Publication: 2016
Journal: American Journal of Agricultural Economics
Abstract: Despite the success of efforts to reduce phosphorus (P) pollution from point sources, P from non-point agricultural sources remains a vexing problem with many U.S. water bodies having impairments. Key to solving the P pollution puzzle is to take stock of progress to date, the puzzle pieces available, and the gaps to be filled. In this paper, we synthesize the state of knowledge on P pollution, discuss the state of existing public programs, and review economists' contributions to informing P pollution policies. We review the water quality valuation literature, identifying limitations in the linkages to policy-relevant environmental quality metrics. We examine how and why P is used agriculturally, along with recent advances in market-based policy design and field testing. We survey new knowledge in biology and engineering, including improved understanding of the fate and transport of P. In light of recent learning and persistent knowledge gaps, we recommend directions for economic research to add needed pieces to the puzzle of how to protect our water bodies. Puzzle gaps meriting attention include mechanisms to target public funds more effectively in voluntary abatement programs, policy design for emerging mitigation technologies, new ways to implement performance-based policies, means to leverage social norms and behavioral cues, changes in the "pay-the-polluter" paradigm, and application of state-of-the-art evaluation methods to conservation programs. Beyond the realm of public policy lies that of private supply chains, where establishment of environmental standards holds additional promise. Rich research opportunities exist for economists in tandem with biologists, engineers, and others.

Title: Experimental Auctions to Evaluate Incentives for Cost-effective Agricultural Phosphorus Abatement in the Great Lakes
Author: Leah M. Harris, Scott M. Swinton, and Robert S. Shupp
Year of Publication: 2014
Source: AAEA Annual Meeting
Abstract: Research on payments for environmental services (PES) largely focuses on two contract types – cost-share and annual stewardship payments. But other types of transactions, such as tax credits, green insurance, and price premiums tied to environmental stewardship certification, can also promote conservation. Using experimental conservation procurement auctions we evaluate farmers' willingness to adopt agricultural best management practices (BMPs) that reduce phosphorus runoff from farm land in the Maumee watershed to help abate damaging algal blooms in western Lake Erie. We determine how bids change depending on the type of transaction offered (e.g. payment, payment with green BMP insurance, tax credit, price premium tied to stewardship certification) to identify cost-effective incentive mechanisms that reduce the most phosphorus runoff per dollar of payment. Two kinds of transactions were found to be less cost-effective: a price premium for product certification and PES with green insurance to protect against yield loss from BMP adoption. The certification price premium cannot spatially target conservation practices to vulnerable locations, so average impact per dollar of payment (and hence cost-effectiveness) is reduced. Green insurance is perceived to have high transaction costs so it elicits demand for higher payments, reducing its cost-effectiveness.

Title: The Influence of Rising Commodity Prices on the Conservation Reserve Program

Author: Daniel Hellerstein and Scott Malcolm
Year of Publication: 2011
Source: ERR-110, U.S. Department of Agriculture, Economic Research Service
Abstract: This report considers how increased commodity prices might influence enrollment in and benefits from the Conservation Reserve Program (CRP) using two complementary models: a likely-to-bid model that uses National Resources Inventory data to simulate offers to the general signup portion of the CRP and an opt-out model that simulates retention of current CRP contracts. Under several higher crop price scenarios, including one that incorporates 15 billion gallons of crop-based biofuels production, maintaining the CRP as currently configured will lead to significant expenditure increases. If constraints are placed on increasing rental rates, it might be possible to meet enrollment goals with moderate increases in CRP rental rates—but this will mean accepting lower average Environmental Benefits Index scores as landowners with profitable but environmentally sensitive lands choose not to enroll.

Title:Optimal Design of Vertical Coordination Strategies for Environmental Conservation under Yield Uncertainty
Author: Megan N. Hughes, Meilin Ma, and Carson J. Reeling
Year of Publication: 2021
Source: AAEA Annual Meeting
Abstract:As consumers and policymakers become increasingly concerned with environmental sustainability, firms in the agricultural supply chain are incentivized to support farmers to conduct sustainable farming such as growing cover crops and reducing tillage. An increasingly popular way of doing this is establishing "vertical coordination" (VC) between downstream firms and farms. VC strategies have focused on increasing farmers' expected net benefits from sustainable practices, but overlooked the associated risks which may be critical to risk-averse farmers. Using unique data of cover cropping (CC) in the U.S. Midwest, we show that adopting CC affects both the mean and variance of corn yield. Specifically, we identify a nonlinear effect of CC on the yield of corn: the yield distribution moves against farmers' favor in the first few years and to their interests in later years. A conceptual model is built to characterize CC adoption decisions of risk-averse farmers under various VC strategies offered by firms, including paying farmers a price premium, lump-sum subsidies, and insurance against yield loss. Among the three strategies, insurance is the one that reduces risks faced by farmers yet has not been implemented by the industry. We conduct simulations to compare the effectiveness and cost efficiency of the three strategies and find that offering a yield-based insurance is the most efficient.

Title: A Regional Bio-economic Model of Nitrogen Use in Cropping
Author: Pierre Mérel, Fujin Yi, Juhwan Lee, and Johan Six
Year of Publication: 2014
Journal: American Journal of Agricultural Economics
Abstract: We develop a programming model of crop production to predict the effects of environmental policies on agriculture and the environment. The model is calibrated against acreages, yields, and exogenous supply elasticities following positive mathematical programming. In addition, crop production functions are calibrated to yield elasticities with respect to nitrogen and irrigation obtained from a biogeochemical model. We study the effects of a nitrogen tax in Yolo County, California, intended to mitigate nitrogen pollution from field crops. The behavioral and environmental responses to the tax are largely due to intensive margin adjustments. Sizable reductions in nitrate leaching are achieved at a low social cost.

Title: Participation in Conservation Programs by Targeted Farmers: Beginning, Limited-Resource, and Socially Disadvantaged Operators' Enrollment Trends
Author: Cynthia Nickerson and Michael Hand
Year of Publication: 2009
Source: ERR-62, U.S. Department of Agriculture, Economic Research Service

Abstract: Beginning, limited-resource, and socially disadvantaged farmers make up as much as 40 percent of all U.S. farms. Some Federal conservation programs contain provisions that encourage participation by such "targeted" farmers and the 2008 Farm Act furthered these efforts. This report compares the natural resource characteristics, resource issues, and conservation treatment costs on farms operated by targeted farmers with those of other participants in the largest U.S. working-lands and land retirement conservation programs. Some evidence shows that targeted farmers tend to operate more environmentally sensitive land than other farmers, have different conservation priorities, and receive different levels of payments. Data limitations preclude a definitive analysis of whether efforts to improve participation by targeted farmers hinders or enhances the conservation programs' ability to deliver environmental benefits cost effectively. But the different conservation priorities among types of farmers suggest that if a significantly larger proportion of targeted farmers participates in these programs, the programs' economic and environmental outcomes could change.

Title: Experimental Evidence on Policy Approaches That Link Agricultural Subsidies to Water Quality Outcomes
Author: Leah H. Palm-Forster, Jordan F. Suter, and Kent D. Messer
Year of Publication: 2018
Journal: American Journal of Agricultural Economics
Abstract: Improving water quality in agricultural landscapes is an ongoing challenge, and most agri-environmental programs in the United States rely on voluntary adoption of conservation practices. Conservation-compliance initiatives require producers to meet specific conservation standards to qualify for payments from farm programs. However, these requirements do not require actual improvements in observed water quality. In this study, we introduce policies to reduce nonpoint source pollution that link eligibility for agricultural subsidies to compliance with water quality goals. We then use economic laboratory experiments to provide empirical evidence related to the performance of these policies. In the policy treatments, participants risk losing some or all of their subsidies if the ambient pollution level exceeds an announced target. A novel feature of our experiment is that we test a policy treatment that ensures that no subsidies are lost if a producer implements a verifiable conservation technology that reduces emissions. In these experiments, policies that link the receipt of subsidies to ambient water quality nearly achieve the socially optimal level of pollution. The results suggest that water quality policies that rely on the threat of subsidy reductions are a potentially viable option for reducing aggregate water pollution. Although a policy that allows polluters to avoid potential losses by implementing a verifiable conservation technology could increase political support for ambient-based policies, our results suggest that, depending upon the magnitudes of social damages from emissions and the cost of implementing a conservation technology, such policies may be less cost-effective for a comparable reduction in pollution.

Title: Nitrogen in Agricultural Systems: Implications for Conservation Policy
Author: Marc Ribaudo, Jorge Delgado, LeRoy Hansen, Michael Livingston, Roberto Mosheim, and James Williamson
Year of Publication: 2011
Source: ERR-127, U.S. Department of Agriculture, Economic Research Service
Abstract: Nitrogen is an important agricultural input that is critical for crop production. However, the introduction of large amounts of nitrogen into the environment has a number of undesirable impacts on water, terrestrial, and atmospheric resources. This report explores the use of nitrogen in U.S. agriculture and assesses changes in nutrient management by farmers that may improve nitrogen use efficiency. It also reviews a number of policy approaches for improving nitrogen management and identifies issues affecting their potential performance. Findings reveal that about two-thirds of U.S. cropland is not meeting three criteria for good nitrogen management. Several policy approaches, including financial incentives, nitrogen management as a condition of farm program eligibility, and regulation, could induce farmers to improve their nitrogen management and reduce nitrogen losses to the environment.

Title: An Economic Assessment of Policy Options To Reduce Agricultural Pollutants in the Chesapeake Bay
Author: Marc Ribaudo, Jeffrey Savage, and Marcel Aillery
Year of Publication: 2014
Source: ERR-166, U.S. Department of Agriculture, Economic Research Service
Abstract: In 2010, a Total Maximum Daily Load (TMDL) was established for the Chesapeake Bay, defining the limits on emissions of nitrogen, phosphorus, and sediment necessary to reverse declines in the Bay's quality and associated biological resources. Agriculture is the largest single source of nutrients and sediment in the watershed. We use data on crop and animal agriculture in the watershed to assess the relative effectiveness of alternative policy approaches for achieving the nutrient and sediment reduction goals of the TMDL, ranging from voluntary financial incentives to regulations. The cost of achieving water quality goals depends heavily on which policy choices are selected and how they are implemented. We found that policies that provide incentives for water quality improvements are the most efficient, assuming necessary information on pollutant delivery is available for each field. Policies that directly encourage adoption of management systems that protect water quality (referred to as design-based) are the most practical, given the limited information that is generally available to farmers and resource agencies. Information on field characteristics can be used to target design-based policies to improve efficiency.

Title: The Impact of AD HOC Disaster and Crop Insurance Programs on the Use of Risk-Reducing Conservation Tillage Practices
Author: Karina Schoengold, Ya Ding, and Russell Headlee
Year of Publication: 2015
Journal: American Journal of Agricultural Economics
Abstract: The paper estimates the impacts of risk-reducing government programs on the use of conservation tillage (no-till and other conservation tillage) practices in agriculture. Conservation tillage can be used to reduce production risk from weather shocks. However, subsidized crop insurance and disaster payments also reduce risk through financial assistance. The paper examines the extent to which risk-reducing tillage practices and government programs are substitutes for each other. The economic model shows that a decline in average weather conditions increases the use of conservation tillage. The economic model also shows that the impact of weather risk and risk aversion on risk-reducing practices like conservation tillage are ambiguous. The effect depends on the degree that losses are offset by government payments. The paper uses county-level tillage practice data from the Conservation Tillage Information Center for the three-state region of Iowa, Nebraska, and South Dakota. Results are estimated using instrumental variables and spatial panel data techniques. Instruments for the program participation and payment data include political variables and weather data. The empirical analysis shows that recent disaster and indemnity payments are associated with an increase in the use of no-till and a decrease in the use of other conservation till. Results also show that producers in counties with recent drought and flood events are more likely to use other conservation tillage. The results imply that there may be unintended impacts of changes to agricultural policies like disaster payments and crop insurance on the use of on-farm conservation practices.

Title:Illinois Farmers' Beliefs about the Maximum Return to Nitrogen (MRTN) Recommendation
Author: Sarah C. Sellars, Gary D. Schnitkey, Laura F. Gentry, and Nicholas D. Paulson
Year of Publication: 2021
Source: AAEA Annual Meeting
Abstract: new nitrogen recommendation technology called the Maximum Return to Nitrogen (MRTN) recommendation was introduced in 2005 by Midwest Land Grant Universities after research showed yield-based recommendations were often too high for soils. However, adoption of the MRTN recommendation by Illinois farmers appears low and applying nitrogen at rates above the recommended rate is still prevalent despite the water quality and environmental implications. This analysis uses field-level data from Precision Conservation Management (PCM), a farmer service program led by the Illinois Corn Growers Association and Illinois Soybean Association to identify some factors that influence the use of

the MRTN in Illinois. Within the data, 70% of corn fields receive a nitrogen application above the MRTN profitable range. We find the main factors that increase the probability of MRTN adoption are if the field is enrolled in a NRCS program or if the field is planted in cover crops. We find the main factors that decrease the probability of MRTN adoption are if the field receives a custom application by a retailer or if the field receives a fall nitrogen application.

Title: The Role of Conservation Programs in Drought Risk Adaptation
Author: Steven Wallander, Marcel Aillery, Daniel Hellerstein, and Michael Hand
Year of Publication: 2013
Source: ERR-148, U.S. Department of Agriculture, Economic Research Service
Abstract: This report evaluates the extent to which farms facing higher levels of drought risk are more likely to participate in conservation programs, and finds a strong link between drought risk and program participation. Prior research has shown that climate-related risk exposure influences production decisions such as crop choice; our research shows that adaptation also includes program participation decisions. Programs like the Conservation Reserve Program and Environmental Quality Incentives Program play a role in drought preparedness and climate adaptation even if they do not directly target such behavior. Conservation program outcomes are influenced by regional differences in production risk, so participation choices due to drought risk can be an important consideration in designing such programs.

Title: Working Lands Conservation Contract Modifications: Patterns in Dropped Practices
Author: Steven Wallander, Roger Claassen, Alexandra Hill, and Jacob Fooks
Year of Publication: 2019
Source: ERR-262, U.S. Department of Agriculture, Economic Research Service
Abstract: Since 1996, USDA working lands programs have resulted in hundreds of thousands of conservation contracts—voluntary agreements between USDA and program participants. Within each contract, the participant agrees to install or implement a set of conservation practices, and USDA agrees to provide technical and financial assistance to the participant. The use of contracts is central to the programs because of the complexity of addressing conservation goals—many contracts have multiple practices—and because of the time lags involved in installing and implementing conservation practices. A large majority of practices on these contracts are installed as planned. This study examines data on the 10 to 20 percent of practices that participants who signed contracts in the Environmental Quality Incentives Program in fiscal year 2010 did not implement as planned and dropped from their contracts. We find differences in the frequency with which specific practices are dropped, as well as in the likelihood that some types of contracts have at least one dropped practice. These differences suggest participants earn different levels of private benefits from installing or implementing conservation practices, which results in varying incentives to complete practices. Examining patterns in dropped practices reveals these private benefits, which are generally not known by program managers at the time participants sign conservation contracts. In this report, we discuss the significance of unobserved private incentives in possible policy design options—changes in ranking criteria, restrictions on contract structure, use of bundled practices at varied cost-share rates, and changes to cost share rates.

Title: Sustainable Pest Management Under Uncertainty: A Dynamic Bioeconomic Analysis of Lowbush Blueberry Production
Author: D. Adeline Yeh, Miguel I. Gómez, and C.-Y. Cynthia Lin Lawell
Year of Publication: 2020
Source: AAEA Annual Meeting
Abstract: Spotted Wing Drosophila (SWD) is an invasive pest that infests soft-skinned fruits and has resulted in large pest management costs for growers in the U.S. In this study, we analyze sustainable SWD pest management for lowbush blueberry production in Maine. We develop and apply a novel dynamic bioeconomic analysis framework that combines numerical dynamic optimization and dynamic structural econometric estimation. Our preliminary results suggest that a sustainable pest control alter-

native – early harvesting – can be part of an optimal management strategy, and that spraying insecticide is not optimal in most cases when pest pressure is low. We also find that the actual behavior of growers is rationalized by a very high perceived spray cost and as well as a high perceived yield loss from infestation from medium-high levels of SWD. Furthermore, even after conditioning on growers' beliefs, the preliminary results still show a positive deadweight loss to actual pest management decisions. In particular, preliminary results show that, given growers' beliefs and perceptions, and in contrast to their actual spraying and harvesting decisions, the optimal SWD strategy still tends to include early harvesting and very little if any spraying. The results of this research has the potential to provide timely information to stakeholders regarding optimal management strategies; improve growers' welfare and sustainability; as well as shed light on the field of bioeconomics for pest management.

B Mitigating Risk With Crop Insurance: Abstracts

Title: Creating Incentives to Improve Soil Health Through the Federal Crop Insurance Program
Author: Bryant and O'Connor
Year of Publication: 2017
Source: Progress in Soil Science
Abstract: American farmers are increasingly relying on the subsidized Federal Crop Insurance Program (FCIP) to manage weather-related risks. Unfortunately, the program is structured so that it does not recognize soil security and may actually be putting American soil resources at risk. The FCIP is highly subsidized; on average, 62 % of individual premium costs are paid for by the federal government. As climate change causes more extreme weather and the cost of the FCIP continues to rise, lawmakers will be forced to consider whether the US government can continue to afford the heavy subsidies offered by the FCIP without changes to the program. The FCIP is currently structured using a flawed formula that lets high-risk farmland and management off the hook and ignores soil regenerative practices that would secure the soil. What if the FCIP rewarded good stewardship practices, like cover crops, that could result in lower indemnity payments and also improve carbon sequestration, water quality, and biodiversity? NRDC proposes the development of a pilot crop insurance program offered by the FCIP in select areas of the Mississippi River Basin. The 508(h) pilot program would offer actuarially sound crop insurance discounts to producers whose appropriate use of cover crops puts them at a lower risk for crop loss.

Title: Crop Insurance Subsidies and Environmental Externalities: Evidence from Southern Italy
Author: Capitanio, Adinolfi, and Santeramo
Year of Publication: 2014
Source: Outlook on Agriculture
Abstract: Rapid environmental changes can affect agriculture by introducing additional sources of uncertainty. Conversely, policy interventions to help farmers cope with risks can induce strong impacts on the environment. In this paper, the authors evaluate the effects of public risk management programmes, particularly subsidies on crop insurance, on fertilizer use and land allocation. They implement a mathematical programming model based on data collected from 1,092 farms in the Puglia region of southern Italy. The results show that, under the current crop insurance programmes, input use is expected to increase, while the effect on production is likely to be crop-specific. The policy and environmental implications of subsidies on crop insurance are discussed.

Title: Grassland to Cropland Conversion in the Northern Plains: The Role of Crop Insurance, Commodity, and Disaster Programs
Author: Claassen, Carriazo, Cooper, Hellerstein, and Ueda
Year of Publication: 2011
Source: ERR-120, U.S. Department of Agriculture, Economic Research Service
Abstract: Native grasslands in the U.S. Northern Plains, particularly those located in the Prairie Pothole Region, are excellent breeding habitat for migratory birds. The conversion of grassland to crop production could damage this habitat and affect bird populations. We focus on three questions: How fast are grasslands being converted to cropland in the United States and especially in the Northern Plains? Can a temporary (5-year) ban on crop insurance purchase for converted grassland slow grassland to cropland conversion? More broadly, what has been the role of crop insurance and other farm programs in grassland to cropland conversion? We find that: (1) roughly 770,000 acres (1 percent) of 1997 rangeland acreage in the Northern Plains were converted to cultivated crops by 2007; (2) a 5-year ban on crop insurance purchase for converted grassland could slow but is unlikely to stop grassland to cropland conversion; and (3) the benefits of crop insurance, disaster assistance, and marketing loans increased cropland acreage by about 2.9 percent between 1998 and 2007.

Title: Impacts of Federal Crop Insurance on Land Use and Environmental Quality
Author: Claassen, Langpap, and Wu
Year of Publication: 2016

Source: American Journal of Agricultural Economics
Abstract: This article integrates economic and biophysical models to assess how federal crop revenue insurance programs affect land use, cropping systems, and environmental quality in the U.S. Corn Belt region. The empirical framework includes econometric models that predict land conversion and crop choices at the parcel level based on expectation and variance of crop revenues, land quality, climate conditions, and physical characteristics at each site. The predictions are then combined with site-specific environmental production functions to determine the effect of revenue insurance on nitrate runoff and leaching, soil water and wind erosion, and carbon sequestration. Results suggest that federal crop insurance has, on average, a small effect on conversions of non-cropland to cropland, and somewhat more significant impacts on crop choice and crop rotation. These changes in cropping systems have, on average, small impacts on agricultural pollution.

Title: Crop Insurance Participation and Cover Crop Use: Evidence From Indiana County-Level Data
Author: Connor, Rejesus, Yasar
Year of Publication: 2021
Source: Applied Economic Perspectives and Policy
Abstract: This study examines whether crop insurance participation reduces incentives to use cover crops in corn and soybean production. To achieve this objective, we utilize 2006–2015 county-level longitudinal data with information on cover crop adoption and crop insurance participation for the State of Indiana. Cover crop adoption information is collected from a remote sensing (satellite-based) data set of soil health practices. Linear fixed effect (FE) models and instrumental variable FE models are used in the empirical analysis to take advantage of the panel nature of the data and address potential endogeneity issues. Our results suggest that while crop insurance coverage may play a role in "disincentivizing" cover crop use, it is likely not a major driver in the cover crop adoption decision (i.e., the magnitude of the effect is small). Therefore, further research and policy attention toward other potential mechanisms that can likely have a larger impact on cover crop uptake may be a better approach (e.g., enhanced outreach programs and/or additional targeted conservation payments).

Title: Crowding Out or Crowding In? The Influence of Subsidized Crop Insurance on Climate Change Adaptation
Author: Doidge
Year of Publication: 2020
Source: Agricultural and Applied Economics Association
Abstract: Climate change is expected to impact agricultural production in the eastern corn belt region of the American Midwest, bringing higher temperatures, longer growing seasons, increased frequency and severity of high-volume rain events, and more weather variability. While some of these changes may increase crop yields and thus be viewed positively by farmers, a changing climate will introduce additional sources of risk for farmers. It is important to understand how farmers manage these risks. Federally subsidized crop insurance is an important risk management strategy for the majority of row crop producers in the eastern corn belt, reducing risk from both price and yield fluctuations. However, researchers have posited that subsidized crop insurance reduces farmers' incentives to undertake other adaptations to mitigate climate change risk. In this work, we examine how crop insurance influences the other on-farm adaptations that farmers employ in response to climate change. Using survey data from over 900 farmers in 5 states, we investigate how crop insurance and the features of crop insurance products influence other adaptations farmers make on their farms. We find that farmers who have crop insurance are more likely to make adaptations that reduce climate change risk, including purchasing time saving planting and harvesting equipment and hiring outside labor, and less likely to rent out their land or sell their farms. Our results suggest that crop insurance reduces the risk that farmers face, allowing them to invest in other, more costly adaptations that may make farming more viable. Further, crop insurance may allow farmers to implement ecological adaptations on their farms. We conclude this paper by discussing the financial and ecological implications the federally subsidized crop insurance in the United States.

Title: How Do Time and Money Affect Agricultural Insurance Uptake? A New Approach to Farm Risk

Management Analysis
Author: Farrin, Miranda, and O'Donoghue
Year of Publication: 2016
Source: USDA Economic Research Report 120
Abstract: Growth in the Federal crop insurance program, as well as in the use of crop insurance in developing countries, highlights the policy importance of insurance as a risk-management tool for farmers. This report presents a new approach to the analysis of demand for crop insurance, which can better explain observed insurance coverage decisions among U.S. farmers and inform future discussion about crop insurance provisions in the Farm Bill. The findings indicate that when farmers have access to other financial mechanisms—primarily savings—their insurance decisions change. In addition, when researchers consider the element of time—for example, a farmer's consideration of many crop seasons when making production and risk management decisions—predictions about farm-level demand for crop insurance will also change. Specifically, the authors find that, with savings, relatively wealthier farmers appear to spend less on insurance and self-insure through savings, while limited-resource farmers with low farm income use savings to increase insurance coverage. The more time a farmer factors into the decision making process when comparing insurance versus savings for risk management, the less important insurance becomes.

Title: Design Principles for Agricultural Risk Management Policies
Author: Glauber, Baldwin, and Anton
Year of Publication: 2021
Source: OECD Food, Agriculture and Fisheries
Abstract: Government support for agricultural risk management tools has grown substantially over the past two decades. While these tools can play a role in strengthening farm-level resilience by helping farmers to cope with the financial impact of adverse events, they also modify farmers' incentives to invest in risk-reducing measures and market tools. Policy design is critical to maximise effectiveness while minimising unintended consequences. This report reviews the accumulated experience on four types of publicly-supported agricultural risk management tools (ex post disaster aid, agricultural insurance, income stabilisation schemes and tax and savings measures). It suggests some basic principles on how countries can improve the design of their agricultural risk management policies, using a holistic approach and focusing on market failures. The report also highlights the need for more transparency on basic programme data, and for periodic public evaluation of existing programmes.

Title: An Ex Post Evaluation of the Conservation Reserve, Federal Crop Insurance, and Other Government Programs: Program Participation and Soil Erosion
Author: Goodwin and Smith
Year of Publication: 2003
Source: Journal of Agricultural and Resource Economics
Abstract: Recent research has questioned the extent to which government policies, including conservation and risk management programs, have influenced environmental indicators. The impacts of income-supporting and risk management programs on soil erosion are considered. An econometric model of the determinants of soil erosion, program participation, conservation effort, and input usage is estimated. While the Conservation Reserve Program has reduced erosion an average of 1.02 tons per acre from 1982 to 1992, approximately half of this reduction has been offset by increased erosion resulting from government programs other than federally subsidized crop insurance.

Title: Federal Crop Insurance Options for Upland Cotton Farmers and Their Revenue Effects
Author: Hungerford and O'Donoghue
Year of Publication: 2016
Source: ERR-218, U.S. Department of Agriculture, Economic Research Service
Abstract: The Agricultural Act of 2014 introduced two new crop insurance programs for upland cotton: the Supplemental Coverage Option (SCO) and the Stacked Income Protection Plan (STAX). SCO and STAX are known as "shallow loss" programs because they typically have lower deductibles and do not compensate for the bigger losses that other Federal crop insurance programs cover. This report

examines the structures of SCO and STAX and how these programs interact with Revenue Protection, a preexisting crop insurance policy. It provides estimates of the contribution of SCO and STAX to revenue and downside risk reduction for upland cotton producers in various counties, revealing how risk reduction differs across counties with different inherent revenue risk caused by regional variations in yield. The report describes 2015 enrollment in STAX and SCO and finds that STAX enrollment is tied to the market share of cotton in a given county.

Title: Crop Insurance, Land Productivity and the Environment: A Way forward to a Better Understanding
Author: Kurdyś-Kujawska, Sompolska-Rzechuła, Pawłowska-Tyszko, and Soliwoda
Year of Publication: 2021
Source: Agriculture
Abstract: Providing farmers with effective risk management tools and increasing the productivity of factors of production, while limiting negative effects on the environment, is an important challenge for the current EU agricultural policy. The aim of this research is to identify and evaluate the relationship between crop insurance and land productivity in the context of environmental effects. The study covered farms with crop insurance participating in the Polish FADN system. The article uses the TOPSIS method of organizing objects. We classify farms in terms of land productivity and examine the relationship between these results and the value of insurance coverage. In our conceptual and empirical framework, we recognize that there is a mutual relationship between crop insurance, land productivity and the environment. Our empirical results show that the level of insurance coverage may support the increase in land productivity, indirectly affecting the environment. Farms with the highest productivity level were characterized by an average value of insurance that was double that compared to farms with the lowest productivity level.

Title: Implications of Commodity Programs and Crop Insurance Policies for Wheat Producers
Author: Luckstead and Devadoss
Year of Publication: 2019
Source: Journal of Agricultural and Applied Economics
Abstract: We analyze the effects of Price Loss Coverage (PLC), Agriculture Risk Coverage (ARC), individual revenue protection insurance (RP), and Supplemental Coverage Option (SCO) on the RP coverage level, certainty equivalent, and program payments. The model is calibrated to a representative wheat farm in Mitchell County in Kansas to analyze the effects of various policies. The result highlights that when insurance is framed as an investment, cumulative prospect theory predicts farmers' coverage decisions accurately at 70%. ARC or PLC program increases the RP coverage level to 75%, but PLC and SCO jointly decrease the RP coverage level to 70%.

Title: The Evolving Distribution of Payments from Commodity, Conservation, and Federal Crop Insurance Programs
Author: McFadden and Hoppe
Year of Publication: 2017
Source: ERR-184, U.S. Department of Agriculture, Economic Research Service
Abstract: Agricultural policies—through Federal commodity, conservation, and crop insurance programs—aim to mitigate the financial risks faced by farmers and the environmental risks posed by agricultural production. The programs also provide support to farmers through direct financial assistance, in the case of commodity and conservation programs, and through premium subsidies in the case of crop insurance. Changes in the structure of agriculture have changed the distribution of income support over time. Specifically, commodity program payments, some conservation program payments, and Federal crop insurance indemnities have shifted to larger farms as U.S. agricultural production continues to consolidate. Since the operators of larger farms have higher household incomes than those of smaller farms, commodity program payments and support through Federal crop insurance have also shifted to higher income households. This study details the extent of that shift over 25 years from 1991 through 2015.

Title: The Effects of Premium Subsidies on Demand for Crop Insurance

Author: O'Donoghue
Year of Publication: 2014
Source: ERR-169, U.S. Department of Agriculture, Economic Research Service
Abstract: The first 50 years of the Federal crop insurance program were marked by low enrollment levels. To boost program participation, legislation in 1994 and 2000 increased premium subsidies. In the years since, the jump in enrollment coupled with high commodity prices caused significant increases in program costs. This report examines the effects of premium subsidies on the demand for crop insurance across major crops and production regions. Findings show that while increases in subsidies can induce farmers to enroll more land, they primarily encourage them to adopt higher levels of coverage on land already enrolled. Midwestern and wheat producers are more responsive to changes in subsidies relative to other regions and crops. Findings suggest that changes to current premium subsidies have the potential to alter producers' reliance on crop insurance to help mitigate farm risk

Title: Moral Hazard – The Effect of Insurance on Risk and Efficiency
Author: Roll
Year of Publication: 2019
Source: Agricultural Economics
Abstract: While there is a large body of literature investigating the effect of crop and livestock insurance on input and yield, limited attention has been paid to the effect of insurance on efficiency. This article investigates how insurance affects technical efficiency and whether insurance alters the utilized input quantity to a riskier bundle using the Norwegian salmon farming industry as a case. The results illustrate that insurance has an enhancing effect on production and efficiency and changes the utilized input mix – a well-insured farmer uses more feed and less capital and labor than a less-insured farmer. When linking this to each input's risk profile, the results indicate that insurance will induce the use of the risk-increasing factor (feed) and reduce the use of the risk-decreasing factors (labor and capital) – thereby increasing production risk and indicating moral hazard.

Title: Crop Insurance Decision under Expected Revenue
Author: Zhao, Skevas, Chai and Tack
Year of Publication: 2020
Source: Agricultural and Applied Economics Association
Abstract: The Federal Crop Insurance Program is the safety net for U.S. farmers that protect them from natural disasters and market instability. To understand potential subjective determinants that affect producers' crop insurance decisions over time, this study explores a revenue-based theoretical framework on crop insurance decisions that incorporates behavioral concepts of reference-dependent and loss aversion. Empirical results using individual-level panel data provide supportive evidence that producers' experience in indemnity and revenue fluctuation affects their choices of crop insurance coverage. This study evaluates producer responses to crop insurance policies over time, which offers timely policy implications under the recent debates on a potential significant cut of crop insurance subsidy.

C Altering Purchase Choices Through Attribute-Based Taxes: Abstracts

Title: Should We Tax Sugar-Sweetened Beverages? An Overview of Theory and Evidence
Author: Allcott, Lockwood, and Taubinsky
Year of Publication: 2019
Source: Journal of Economic Perspective
Abstract: "Sin taxes" are imposed to discourage individual behaviors, such as smoking or drinking alcohol, that are thought to harm the individual and possibly others in society. This article provides an economic framework for evaluating an increasingly popular class of sin taxes: those on sugar-sweetened beverages. As of mid-2019, seven US cities and thirty-nine countries around the world have implemented sugar-sweetened beverage taxes, mostly in the past few years (Global Food Research Program

2019).Proponents of these taxes point to a range of policy goals, including improving public health and raising revenues that can be used to reduce budget deficits or to fund social programs. Opponents often express concerns about paternalistic government intervention in individual decisions and point out that sugar-sweetened beverages are consumed most heavily by the poor, which could make taxes regressive. How do economists evaluate these arguments? Should we tax sugar-sweetened beverages? If so, how high should the tax be?

Title: Impact of SSB Taxes on Sales
Author: Castelló and Casasnovas
Year of Publication: 2020
Source: Economics & Human Biology
Abstract: In this paper, we analyze a tax on sugar-sweetened beverages (SSB) that was introduced in Catalonia on May 1, 2017. The Bill established the requirement of a 100% pass-through of the tax to the final consumer and two levels of the tax: 0.08 euro/liter for products with 5-less than 8 g of sugar and 0.12 euro/liter for products with 8 g of sugar or more. Previous literature focusing on the impact of SSB taxes finds that pass-though is only complete in the long-term. Our paper provides new evidence that, when the tax increases prices substantially and immediately, the sales response is also significant. In particular, we estimate that the new SSB tax in Catalonia reduced SSB purchases by 7.7%. We document that part of this reduction is substituted by an increase in sales of zero/light drinks (substitution effect). Importantly, the reduction in purchases is stronger in areas with a higher incidence of obesity, in areas with higher household incomes and for products with higher sugar content.

Title: Oakland's Sugar-sweetened Beverage Tax: Impacts on Prices, Purchases, and Consumption by Adults and Children
Author: Cawley, Frisvold, Hill, and Jones
Year of Publication: 2020
Source: Economics & Human Biology
Abstract: Several cities in the U.S. have implemented taxes on sugar-sweetened beverages (SSBs) in an attempt to improve public health and raise revenue. On July 1, 2017, Oakland introduced a tax of one cent per ounce on SSBs. In this paper, we estimate the impact of the tax on retail prices, product availability, purchases, and child and adult consumption of taxed beverages in Oakland, as well as of potential substitute beverages. We collected data from Oakland stores and their customers and a matched group of stores in surrounding counties and their customers. We collected information in the months prior to the implementation of the tax and again a year later on: (1) prices, (2) purchase information from customers exiting the stores, and (3) a follow-up household survey of adults and child beverage purchases and consumption. We use a difference-in-differences identification strategy to estimate the impact of the tax on prices, purchases, and consumption of taxed beverages. We find that roughly 60 percent of the tax was passed on to consumers in the form of higher prices. There was a slight decrease in the volume of SSBs purchased per shopping trip in Oakland and a small increase in purchases at stores outside of the city, resulting in a decrease in purchases of 11.33 ounces per shopping trip that is not statistically significant. We find some evidence of increased shopping by Oakland residents at stores outside of the city. We do not find evidence of substantial changes in the overall consumption of SSBs or of added sugars consumed through beverages for either adults or children after the tax.

Title: In Mexico, Evidence Of Sustained Consumer Response Two Years After Implementing A Sugar-Sweetened Beverage Tax
Author: Colchero, Rivera-Dommarco, Popkin, and Ng
Year of Publication: 2017
Source: Health Affairs
Abstract: Mexico implemented a 1 peso per liter excise tax on sugar-sweetened beverages on January 1, 2014, and a previous study found a 6 percent reduction in purchases of taxed beverages in 2014. In this study we estimated changes in beverage purchases for 2014 and 2015. We used store purchase data for 6,645 households from January 2012 to December 2015. Changes in purchases of taxed and untaxed beverages in the study period were estimated using two models, which compared 2014 and 2015

purchases with predicted (counterfactual) purchases based on trends in 2012–13. Purchases of taxed beverages decreased 5.5 percent in 2014 and 9.7 percent in 2015, yielding an average reduction of 7.6 percent over the study period. Households at the lowest socioeconomic level had the largest decreases in purchases of taxed beverages in both years. Purchases of untaxed beverage increased 2.1 percent in the study period. Findings from Mexico may encourage other countries to use fiscal policies to reduce consumption of unhealthy beverages along with other interventions to reduce the burden of chronic disease.

Title: Partial versus General Equilibrium Calorie and Revenue Effects Associated with a Sugar-Sweetened Beverage Tax
Author: Dharmasena, Davis, and Capp
Year of Publication: 2014
Source: Journal of Agricultural and Resource Economics
Abstract: Taxes on sugar-sweetened beverages have been widely proposed to combat the U.S. obesity crisis. Most previous work has found the effects of a SSB tax to be small to moderate. We address three limitations. First, we incorporate the supply side via a stochastic equilibrium displacement model. Second, we account for uncertainty in the underlying elasticities using probability distributions associated with elasticities. Third, we address industry revenue effects. We find that assumptions about the supply side are more important than assumptions about substitution. Ignoring supply side severely overestimates quantity and calorie effects and slightly underestimates revenue effects.

Title: Feebates, Rebates and Gas-Guzzler Taxes: A Study of Incentives for Increased Fuel Economy
Author: Greene, Patterson, Singh, and Li
Year of Publication: 2005
Source: Energy Policy
Abstract: US fuel economy standards have not been changed significantly in 20 years. Feebates are a market-based alternative in which vehicles with fuel consumption rates above a 'pivot point' are charged fees while vehicles below receive rebates. By choice of pivot points, feebate systems can be made revenue neutral. Feebates have been analyzed before. This study re-examines feebates using recent data, assesses how the undervaluing of fuel economy by consumers might affect their efficacy, tests sensitivity to the cost of fuel economy technology and price elasticities of vehicle demand, and adds assessments of gas-guzzler taxes or rebates alone. A feebate rate of $500 per 0.01 gallon per mile (GPM) produces a 16 percent increase in fuel economy, while a $1000 per 0.01 GPM results in a 29 percent increase, even if consumers count only the first 3 years of fuel savings. Unit sales decline by about 0.5 percent but sales revenues increase because the added value o f fuel economy technologies outweighs the decrease in sales. In all cases, the vast majority of fuel economy increase is due to adoption of fuel economy technologies rather than shifts in sales.

Title: Price Impact of Taxes on Sugary Drinks in Brazil
Author: Pereda and Garcia
Year of Publication: 2020
Source: Economics & Human Biology
Abstract: Sugary drink consumption is an important contributor to the current global epidemic of obesity. In recent years, 50 countries or jurisdictions have implemented taxes on sugary drinks as an instrument to discourage consumption. Against the tide, Brazil reduced taxes on these beverages in 2017 and 2018. However, a recent debate - raised by the federal government - has started over taxation of sugary and alcoholic beverages (sin taxes). The effectiveness of this policy will depend on how the taxes are transferred to prices. In this sense, this paper we aim to quantify the impacts of the tax reduction on prices of sugary drinks in Brazil, and therefore to contribute to the debate by calculating the pass-through of taxes to prices of these products in the Brazilian context. We analyze the Brazilian market using a panel data of products, by brand, collected by Euromonitor from 2013 to 2018. Our results suggest that the transfer of taxes to prices depends on the firm size and the type of product, with pass-through rates ranging from 15% to 124%.

Title: The Impact of Seattle's Sweetened Beverage Tax on Beverage Prices and Volume Sold

Author: Powell
Year of Publication: 2020
Source: Economics & Human Biology
Abstract: On January 1, 2018 the city of Seattle, WA, implemented a 1.75-cent per ounce (oz) Sweetened Beverage Tax (SBT) on sugar-sweetened beverages with at least 40 calories per 12 oz. This study drew on universal product code-level store scanner data and used a pre-post intervention-comparison site difference-in-differences (DID) study design to assess the impact of the SBT on taxed beverage prices in Seattle, the volume sold of taxed beverages in Seattle and in its 2-mile border area (cross-border shopping), and the volume sold of untaxed beverages (substitution) relative to changes in its comparison site of Portland, OR. The DID results showed that, on average, in the first year post-tax implementation, prices of taxed beverages rose by 1.03 cents per oz (p ¡ 0.001) corresponding to a 59% tax pass-through rate. Volume sold of taxed beverages fell, on average, by 22% (p ¡ 0.001) in the first year following the implementation of the tax. Volume sold of taxed beverages fell to a greater extent for family- versus individual-size beverages (31% versus 10%) and fell to a greater extent for soda (29%) compared to all other beverage types. Moderate substitution to untaxed beverages was found – volume sold of untaxed beverages increased by 4% (p ¡ 0.05). The results revealed no significant increases in the overall volume sold of taxed beverages in the 2-mile border area of Seattle relative to its comparison site suggesting that tax avoidance in the form of cross-border shopping did not dampen the impact of the tax.

Title: By Ounce or by Calorie: The Differential Effects of Alternative Sugar-Sweetened Beverage Tax Strategies
Author: Zhen, Brissette, and Ruff
Year of Publication: 2014
Source: American Journal of Agricultural Economics
Abstract: The obesity epidemic and excessive consumption of sugar-sweetened beverages have led to proposals of economics-based interventions to promote healthy eating in the United States. Targeted food and beverage taxes and subsidies are prominent examples of such potential intervention strategies. This paper examines the differential effects that taxing sugar-sweetened beverages by calories and by ounces have on beverage demand. To properly measure the extent of substitution and complementarity between beverage products, we developed a fully modified distance metric model of differentiated product demand that endogenizes the cross-price effects. We illustrated the proposed methodology in a linear approximate almost ideal demand system, although other flexible demand systems can also be used. In the empirical application using supermarket scanner data, the product-level demand model consists of 178 beverage products with a combined market share of over 90%. The novel demand model outperformed the conventional distance metric model in non-nested model comparison tests, and in terms of the economic significance of model predictions. In the fully modified model, a calorie-based beverage tax was estimated to cost $1.40 less in compensating variation than an ounce-based tax per 3,500 beverage calories reduced. This difference in welfare cost estimates between two tax strategies is more than three times the difference estimated by the conventional distance metric model. If applied to products purchased from all sources, a 0.04 cent per kcal tax on sugar-sweetened beverages is predicted to reduce annual per capita beverage intake by 5,800 kcal.

D Altering Production Choices through Procurement Policy: Abstracts

Title: Grower Perspectives on Farm to School: A Survey of Interested Farmers, Ranchers and Other Producers
Author: Berkenkamp, JoAnne
Year of Publication: 2012
Source: Institute for Agriculture and Trade Policy
Summary: As part of our work on Farm to School, the Institute for Agriculture and Trade Policy

(IATP) conducted an electronic survey of growers interested in Farm to School in Spring 2011. The survey was designed to assess growers' perceptions of Farm to School, interest levels, challenges, aspirations and strategies that could enable growers to benefit more fully from this growing market. A request to participate in the survey was issued through a variety of channels, including newsletters, emails and blogs from selected farm membership organizations in Minnesota, the Sustag Listserv and by email to a list of farmers that Minnesota school districts have identified as suppliers. This survey complements a similar survey that IATP conducts annually with Minnesota school foodservice leaders (Available at www.iatp.org/localfoods). Our most recent foodservice survey found that the number of Minnesota public school districts engaged in Farm to School programs has grown from 10 in 2006 to 123 in 2010. Sixty-seven individuals responded to the grower survey. Of these, 63 identified themselves as producers (e.g., farmers, ranchers, orchardists) while four represent multi-farm collaboratives or farmers markets. Nearly all respondents live in Minnesota. Approximately 80 percent report annual agriculture-related revenues of less than $100,000 per year, with a majority under $25,000. Respondents produce a wide range of farm products, with vegetables being the most common. The vast majority of respondents sell through multiple sales channels, with direct marketing being the most common.

Title: Public Procurement as Strategy to Foster Organic Transition: Insights From the Brazilian Experience
Author: Borsatto, Ricardo Serra and Altieri, Miguel A. and Duval, Henrique Carmona and Perez-Cassarino, Julian
Year of Publication: 2020
Source: Renewable Agriculture and Food Systems
Abstract: Initiatives to foster a transition toward organic agriculture have drawn policy-makers' interest worldwide. However, research studies evaluating the effectiveness of policies intended to promote 'scaling-out' organic production systems to more farms and larger production areas are still rare. To better understand the role that public procurement and price incentive policies have in scaling-out organic transitions, we assessed the effects of the Brazilian Food Acquisition Program (PAA) in a group of municipalities. PAA offers both markets for family farmers and price incentives for certified organic products. However, our findings suggest that farmers who establish organic production systems and become certified also gain access to other markets; ones that they find more attractive than those created by the PAA. Thus, we find that the PAA offers insufficient incentives for adopting organic practices among peasant and family farmers and supports the argument that scaling-out organic production is a multilevel process that depends on different, but interrelated drivers.

Title: Increasing Access to Farmers Markets for Beneficiaries of Nutrition Assistance: Evaluation of the Farmers Market Access Project
Author: Cole, Kate and McNees, Molly and Kinney, Karen and Fisher, Kari and Krieger, James W.
Year of Publication: 2013
Source: Preventing Chronic Disease
Abstract: Introduction Increased acceptance of nutrition benefits at farmers markets could improve access to nutritious foods for low-income shoppers. The objective of this study was to evaluate a pilot project to increase participation by farmers markets and their vendors in the Supplemental Nutrition Assistance Program (SNAP) and Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Methods The intervention targeted 9 markets in lower-income regions of King County, Washington. Markets and vendors were offered subsidized electronic benefits transfer (EBT) terminals for processing SNAP, and vendors could apply to accept WIC cash value vouchers. WIC staff received information on using SNAP and vouchers at farmers markets. We used mixed methods post-implementation to measure participation, describe factors in acceptance of benefits, and assess information needs for WIC staff to conduct effective outreach. Results Of approximately 88 WIC-eligible vendors, 38 agreed to accept vouchers. Ten of 125 vendors installed an EBT terminal, and 6 markets installed a central market terminal. The number of market stalls accepting SNAP increased from 80 to 143, an increase of 79%. Participating vendors wanted to provide access to SNAP and WIC shoppers, although redemption rates were low. Some WIC staff members were unfamiliar with markets, which hindered outreach. Conclusion Vendors and markets value low-income shoppers and, when offered sup-

port, will take on some inconvenience to serve them. To improve participation and sustainability, we recommend ongoing subsidies and streamlined procedures better suited to meet markets' capabilities. Low EBT redemption rates at farmers markets suggest a need for more outreach to low-income shoppers and relationship building with WIC staff.

Title: SNAP Healthy Food Incentives Cluster Evaluation 2013 Final Report
Author: Community Science
Year of Publication: 2013
Source: Community Science
Abstract: NA

Title: Pathways to Agroecological Management Through Mediated Markets in Santa Catarina, Brazil
Author: Guerra, Jill and Blesh, Jennifer and Schmitt Filho, Abdon Luiz and Wittman, Hannah
Year of Publication: 2017
Source: Elementa
Abstract: Agroecology, as a social movement and scientific discipline, applies ecological principles to the design and management of agricultural systems to improve environmental outcomes and livelihoods for farmers and rural communities. However, little research to date has assessed the policy mechanisms that could facilitate increased adoption of agroecological management practices. We investigated if and how public food procurement programs that provide financial incentives for organic and agroecological production can mitigate key constraints to agroecological transition. We explored the experience of participants in Brazil's National School Feeding Program (PNAE) in Santa Catarina, which offers both a structured market for small-scale family farmers and a price premium for certified agroecological production systems. We found that the PNAE provides an economic incentive for small-scale farmers to begin an agroecological transition by creating a price-differentiated market that is otherwise absent in the regional context. However, without external network linkages – such as participation in farmers' associations, cooperatives, and non-governmental agricultural extension programs that support agroecological practices – the influence of PNAE is limited in stimulating a broader scaling up of agroecological production.

Title: Building Minnesota's Farm to Institution Markets: A Producer Survey
Author: Huff, Pete
Year of Publication: 2015
Source: Institute for Agriculture & Trade Policy
Overview: As part of our shared work on farm to institution in Minnesota and the Upper Midwest, the Institute for Agriculture and Trade Policy (IATP), the Sustainable Farming Association (SFA) and Renewing the Countryside (RTC) conducted an online survey of Minnesota growers interested in farm to institution markets in fall 2014. The goal of the survey was to determine the resources Minnesota growers—specifically specialty crop growers—need to engage with institutional markets in a consistent and economically viable manner.

Title: Do Farm-to-School Programs Make a Difference? Findings and Future Research
Author: Joshi, Anupama and Azuma, Andrea Misako and Feenstra, Gail
Year of Publication: 2008
Source: Journal of Hunger and Environmental Nutrition
Abstract: Farm-to-school programs are increasing in number across the United States, yet research and evaluation of programs is limited, with only a few studies published in refereed journals. For this article we reviewed 38 studies and report on 15 studies that met the inclusion criteria. These preliminary findings are related to the impacts of farm-to-school programs on behavior of students, school teachers and administrators, food service, farmers and producers, and parents, as well as knowledge gains and attitudinal changes. Further evaluation and research are needed to improve practice and assist programs in meeting their goals.

Title: Farmers' Perspectives on the Adoption and Impacts of Nutrition Incentive and Farm to School Programs
Author: Lehnerd, Megan and Sacheck, Jennifer and Griffin, Timothy and Goldberg, Jeanne and Cash,

Sean
Year of Publication: 2018
Journal: Journal of Agriculture, Food Systems, and Community Development
Abstract: Recent increases in consumer demand for local food have resulted in more opportunities for food to be purchased in close proximity to where it is produced. However, local markets can be challenging retail outlets for farmers and not uniformly affordable and accessible to all consumers. Farmers market nutrition incentive (FMNI) and farm to school (F2S) programs are two community-based initiatives that support farmers while simultaneously lessening the burden of local food access for lower income populations. In this study, we explore farmer perceptions, barriers to adoption, and impacts of FMNI and F2S programs. A survey was developed based on the Diffusion of Innovations theory to assess (1) the key factors that influence adoption of FMNI and F2S programs; (2) farmer perceptions of the most significant barriers to program adoption; and (3) the influence of non-economic impacts on farmers' motivation to participate in those programs. A total of 155 Mid-Atlantic fruit and vegetable farmers completed the survey. Participating farmers perceived FMNI and F2S as providing advantageous social impact and various economic opportunities. However, participants and non-participants had differing perspectives on program complexity, compatibility with their business model, and the degree to which others have succeeded when participating. The most significant barriers relate to issues with product pricing, customer engagement, and logistics. Three-quarters of farmers ranked social/community impacts as most important to them. A deeper understanding of farmers' involvement in FMNI and F2S programs will help address barriers and modify program components to increase economic, social/community, and environmental impacts.

Title: Is Environmental Policy by Public Procurement Effective
Author: Lundberg, Sofia and Marklund, Per Olov and Strömbäck, Elon
Year of Publication: 2016
Source: Public Finance Review
Abstract: Advocates of green public procurement (GPP) argue that the public sector can use its purchasing power to influence producers and consumers to reduce their negative impact on the environment. Our aim is to assess GPP as an environmental policy instrument and its ability to lead to the achievement of environmental objectives. Central to our analysis is the extent to which polluting firms choose to adapt to the public sector's environmental requirements and to invest in greener technologies. Our theoretical finding is that the potential of GPP to function as an objective effective instrument of environmental policy is limited and can actually be counterproductive. From an environmental policy point of view, it is crucial that the GPP aims for an environmental standard beyond the technology of the polluting firms and is designed with reference to defined environmental objectives.

Title: Buying Green: Government Procurement as an Instrument of Environmental Policy
Author: Marron, Donald B
Year of Publication: 1997
Source: Public Finance Review
Abstract: NA

Title: Farmers' Perceptions of Local Food Procurement, Mississippi, 2013
Author: Rosenberg, Nathan and Truong, Nhan L. and Russell, Tyler and Abdul-Haqq, Deja and Gipson, June A. and Hickson, De Marc A.
Year of Publication: 2014
Journal: Preventing Chronic Disease
Abstract: We sought to understand the experiences and perceptions of food producers regarding food procurement programs for local institutions. A total of 72 (45%) Mississippi fruit and vegetable growers completed a mailed survey, and of those that reported selling to local businesses and institutions (54%), few were selling to schools (13%). The primary motivations to sell to institutions were to increase profits (67%) and to improve nutrition within theircommunities (57%), while the most commonly reported barrier was alack of knowledge about how to sell to institutions (39%). Farm to institution programs must develop evidence-based practices designed to address barriers to producers' participation in local

institutional food procurement programs.

Title: The Burlington School Food Project: Final Evaluation Report
Author: Schmidt, M. C. and Kolodinsky, J. and Symans, C.
Year of Publication: 2006
Source: Center for Rural Studies, University of Vermont
Abstract: NA