

A Novel and Effective Tax Design of Danish Pesticide Tax of Ex-Post Evaluation

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Abstract

Externality taxes are seen as a crucial instrument in the environmental and climate policy toolbox. However, due to poor design and inadequate tax rates, externality taxes don't always live up to their potential. These issues are addressed by the Danish pesticide tax, which was revised in 2013 and differentiates tax rates based on how dangerous a product is and dramatically raises prices for the most harmful pesticides. Using a panel data set containing pesticide use on 1900 medium-sized and large farms two years before and four years after the tax adjustment, this article assesses the redesigned tax. We discover that the fee was successful in encouraging consumers to switch from more harmful items to less harmful ones, which led to a 16 percent decrease in pesticide burden. Retaliation for the pesticide tax changes from farm to farm depending on the types of crops planted. The work offers empirical proof that a correct tax design may overcome the low price sensitivity reported with earlier pesticide levies in Denmark and elsewhere, making it highly relevant for governments looking to reduce pesticide load. Additionally, this study provides a unique illustration of an ex-post evaluation that is based on comprehensive farm-level data and compares registered pesticide use before and after the tax revision, allowing for a more accurate estimation of the tax's effects.

Keywords: Environmental tax; Pesticide tax; Tax design; Tax effectiveness; Policy evaluation; Ex-post evaluation

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Introduction

Externality taxes are thought to be a viable tool for environmental and climate policy [1]. In order to transform production, consumption, and technology development in order to meet the goals of the Paris Agreement, carbon taxes are therefore a crucial driver in the discussion of climate policy Partnership for Market Readiness and the World Bank Group, Danish Council on Climate Change, Similar to this, a small number of nations have adopted environmental taxes, levies, or charges to reduce diffuse pollution from the use of fertilisers and pesticides Danish Competition Authority Bocker and IEEP and Partners [2]. Through pricing that encourage production or consumption of goods and services that are more resource and environmentally friendly, externality taxes can effectively control behaviour [3]. Strong theoretical justifications exist for environmental taxes, and ex-

ante Models have suggested that properly crafted taxes can help achieve environmental policy goals, for instance in agro-environmental evaluations [4]. These ex-ante models, however, frequently rely on assumptions regarding the economically optimal behavioural responses among policy target groups, and the ex-ante assessments' predictions are rarely confirmed by the ex-post analyses. In actuality, it is more difficult to find ex-post assessments of environmental levies that examine how they actually affect behaviour [5]. Ex post reviews of regulations are now the weakest part of the regulatory cycle, according to Withana, and in some ways they are more difficult and convoluted than ex ante assessments [6]. Lack of thorough and trustworthy data on the reaction of targeted actors to the instrument may be a contributing factor in the lack of ex-post reviews. or various monitoring data kinds [7]. Taxes are frequently implemented alongside other policy instruments, and other developments may

attenuate their influence, making it challenging to isolate and evaluate the effectiveness of the tax itself [8].

Discussion

These factors together make evaluation challenging [9]. A counterfactual scenario, ideally a randomised controlled trial, is required to account for all confounding circumstances; however, such evaluation designs are often the ex-post evaluations of environmental taxes research vacuum is filled in part by this work [10]. It examines ex post the revised Danish levy on agricultural pesticides to determine how it affected farmers' pesticide use [11]. The study makes use of panel data to track the application of pesticides at the farm level on 1900 farms two years prior to and four years following the change in the fee on pesticides [12]. The panel format enables us to account for unobserved farmer heterogeneity, which could otherwise skew the results, even if this still only constitutes a before-and-after assessment and does not allow us to exclude all confounders [13]. As a result, farmers function as their own controls, removing elements at the individual level that remain constant throughout time [14]. Moreover, using sources of agricultural knowledge we take into account the effects of various confounders like the weather, pests, or changes in legislation [15]. Although these are excluded from our statistical models, we qualitatively determine that the pesticide tax modification was the most important adjustment that would have had an impact on pesticide use during the time period examined based on information from the sources indicated above. The Danish Environmental Protection Agency's indicator for environmental load, which is calculated at the farm level based on the individual products and amounts used, is used to track changes in pesticide usage. You can get this information in open registers. Thus, using before-and-after data at the individual level from official registries enables us to overcome some of the data flaws that have traditionally limited ex-post judgements. The Danish pesticide tax has a significant impact on policy. The EU Commission declared in its 2020 Farm to Fork Strategy that it would take steps to reduce the risk of chemical pesticides and more hazardous pesticides by 50% in 2030 and added that "EU tax systems should also aim to ensure that the price of different foods reflects their real costs in terms of use of finite natural resources, pollution, GHG emissions, and other environmental externalities." The Danish pesticide tax is also particularly pertinent to policy because it was created to solve common flaws in many existing environmental tax schemes. First, environmental taxes frequently tax production input amounts as an imprecise proxy for their environmental impact due to a lack of adequate indicators or data. The Danish tax, though is intended to focus on the environmental effects of pesticides by constructing a pesticide load indicator that differentiates tax rates based on the product's effects on the environment and human health. As a result, the OECD regards the Danish tax as the most sophisticated pesticide tax in effect right now. Second, political acceptance of tax rates tends to be lower than what is necessary to offer effective economic incentives, which has been a criticism of environmental taxation. Andersen, In contrast, the tax rates for

the revised Danish pesticide tax were raised on average at a rate that would have more than doubled the prior tax level, assuming no change in pesticide use.

Conclusion

An increase in tax rates by twofold is notable because the prior rates were already fairly high. We debate, consequently, a reasonably substantial incentive to switch from more hazardous pesticides to ecologically friendly goods is provided by the Danish pesticide tax's design. As a result, we anticipate that Denmark's overall pesticide burden will decrease as a result of the pesticide tax, signalling a shift away from higher-taxed, more dangerous items and toward lower-taxed, less harmful ones. According to our data, the tariff had a real impact on pesticide use because it reduced the average amount of pesticides used between 2012 and 2017 by 16%. The philosophy of environmental taxation is outlined in the next part, which also examines the most recent assessments of green taxes. The structure of the pesticide tax and Danish pesticide policy in general is then briefly described in Section 3. The approach and the data are described in Section 4. Sections 5 and 6 we address these findings after presenting the analysis' findings. Only a small number of OECD nations have implemented environmental taxes on agricultural production inputs like pesticides and fertilisers, therefore there is comparatively little experience with this sort of taxation. Additionally, the low tax rates in several of these nations suggest that it is unlikely that the taxes will influence behaviour. Studies on the Norwegian tax, which has fairly high tax rates, however, indicate a possible behavioural response. The total amount of pesticide sales in Norway increased between 1996 and 2011, according to figures supported by survey data on actual use and qualitative interviews with importers and producers, but the overall health and environmental dangers of these products increased as well. Have slightly dropped during the period, which suggests that consumers are switching to products with lower risks and, thus, lower taxes. These improvements in pesticide usage have happened despite Norway seeing higher precipitation, increased use of lower tillage, and more pesticide resistance issues within the same time period. Producers and importers have been encouraged by the fee to market products with lower levels of toxicity and remove pesticides with high levels of toxicity. However, the study does not statistically quantify the tax impact while controlling for other factors; instead, it employs a straightforward before-and-after difference in the Pesticide Load Indicator as an aggregated measure of impact. Additionally, sales figures are a poor indicator of the short-term effects of a tax because substantial stockpiling was prompted by public awareness of the tax, which led to extremely high sales in the year before the tax and rather low sales in the years immediately after its adoption.

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Conflict of Interest

None

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