Author’s response to reviews

Title: The USA Lags Behind Other Agricultural Nations in Banning Harmful Pesticides

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Reviewer #11. You need to define/address risk trading more formally, in specific comments below I suggest one place. Yes, very good suggestion. I thought about adding this in the place you recommended in the background section below, but thought that it disrupted the flow of the intro – and seemed a bit out of place. Since it’s basically discussing a potential drawback of pesticide bans, I decided to add this to the discussion section where I think it contributes very nicely to the discussion of the limits of the analysis. Lines 410-419 on tracked changes document2. There is not 1 word re resistance, yet resistance is a major driver of registrant decisions to voluntarily cancel products. Plus, cancellations can have adverse resistance management repercussions, a reality that at least deserves mention. I agree that pest resistance does play a role in the decision to voluntarily cancel products. This was what I had in mind when stating that obsolete pesticides no longer justified the cost of maintaining registration in the US in the discussion. But I realize that’s not very clear. I took out the word “obsolete” and replaced with “pesticides that are no longer effective due to pest resistance issues” to make that point more clear. Lines 321-322 on tracked changes document2. With regards to cancellations having adverse resistance management repercussions, I believe that the impact this will have will be very minor compared to many of the lesser-used management practices for delaying pesticide resistance. But I did add a section on this in the Discussion section. Lines 420-425 on tracked changes document2. Author should add a para discussing the possible impact of the unprecedented concentration in the industry, after the 3 huge deals. The newly merged companies have all announced product line reviews to identify "redundancies." What this really means is they will drop lower profit margin a.i.s when they think they can replace acre-treatments with more profitable, and even better, proprietary products. I agree that recent consolidation in the industry may result in an increase in the rate of voluntary cancellations for the reasons you mentioned, however I am unsure of the extent this will be the case. The number of new AIs being developed and granted new approvals has been declining for some years now (a trend that will likely continue with these mergers). The trend in the industry has been to combine older AIs into single proprietary products, this is particularly the case for herbicides. For example, proprietary products like Enlist Duo will still require registration of glyphosate and 2,4-D. These newly formed conglomerates will now have many products in their portfolios, some of which may be in direct competition with each other, however dropping an AI completely would preclude its use in a future proprietary product. The cancelling of many individual products will certainly increase, but I’m unsure the extent this will translate to AI cancellations (which is really the focus of the paper). After all, it’s much cheaper to keep an existing AI registered than develop a new AI. Admittedly this is not an area I have spent much time researching, but I did include a sentence about this in the discussion. Lines 327-329 on
4. Author definitely needs to discuss the inclination of registrants to allow voluntarily accept cancellations of products that recently have or will soon lose patent protection, when they have a "new/improved" proprietary replacement with either patent protection or data comp protection or both. E.g. alachlor>acetochlor; metolachlor>metalochlor-s. This is a very good suggestion and one that I had not thought much about. This is not an area that I have much knowledge or expertise in, however I added a sentence to this effect when talking about the economic factors involved in voluntary cancellation in the discussion section. Lines 323-327 on tracked changes document Editing: there are many long sentences, and long paras. Suggest breaking more sentences into 2; adding new commas, etc. Some specific places noted below. There are ~1 dozen awkward sentences that will benefit from rewriting; some examples below.

Specific Comments: Line 75: make clear FQPA applies to tolerance setting in food crops, and has not changed FIFRA standard re cancellation. Yes, good distinction. I made that clearer. Lines 79-83 on tracked changes document Line 92: "has" should be "have"; run-on sentence could be clearer. Changed the sentence structure. Lines 100-104 on tracked changes document Lines 98-102: Fine to make case for bans, but must add discussion of risk trading. Bans that move acres-treated from one hazardous a.i. to another accomplish little. See response to #1 above Line 112: need comma after "factors." Line 124 on tracked changes document Lines 127-128: revise. Break into 2? Lines 139-141 on tracked changes document Line 142: Hope u can find a better descriptor than "(not approved)" How about (voluntarily phase-out)? I agree this term leaves much to be desired, however the “not approved” designation can mean multiple things, not just a voluntary cancellation. It also includes instances where no pesticide company has ever applied for registration in that nation and also in cases where a time-limited approval expired. In order to encompass all of these possibilities, I feel like I need to keep it vague. Line 170: EPA formed in 1970 or 1972? Check. EPA's website states the official date of formation was December 2, 1970. https://www.epa.gov/history#timeline. Line 240: Add comma after "former." Line 252 on tracked changes document Line 249: replace "and" with "that one" I replaced with “that are” because “that one” did not make sense to me. Line 262 on tracked changes document Lines 256-260: In fairness, should at least mention % paraquat poisonings from attempted/successful suicides. Yes, very good thought. The results actually surprised me a bit. By far the majority of reported cases in the USA were unintentional. Lines 271-273 on tracked changes document Line 291: add comma after "years.". Line 306 on tracked changes document Line 292: would be better to say something like "the US EPA has not taken steps to meaningfully reduce use of and risks from the hazardous..." Yes, that is a better way of laying it out. That sentence is supposed to sum up conclusions from the previous three paragraphs, but it’s not quite right for concluding the paragraph that it’s a part of. Lines 307-309 on tracked changes document Line 300: add comma after "requirements"; maybe break into 2 sentences. Line 321 on tracked changes document Line 317-19: Awkward, not a good reference for this point. Plus, I am not sure overall OP use has declined in a "major" way. Should be more specific re decline. This is a direct quote from the Hertz-Picciotto et al. paper I cited: “After passage of the FQPA, OP pesticide use across all market sectors declined by over 70%, from 70 million pounds per year (lbs/yr) in 2000 to about 20 million lbs/yr in 2012 (the most recent available data) [6]. By 2002, most nonagricultural uses were phased out by agreements between the EPA and the pesticide manufacturers, based on results of EPA risk assessments for chlorpyrifos and diazinon showing unacceptably high risks to residents, particularly children, from residential pest control [42,43]. The volume of OP pesticides used on foods commonly consumed by children, such as fruits, decreased by 57% between 1994 and 2004, from 28 to 12 million pounds (12,701 to 5,443 metric tonnes) of active ingredient applied annually.