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Comment on Soregaroli and Wesseler: Minimum distance requirements and liability: implications for co-existence

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The future institutional environment for the co-existence of GM crops, conventional and organic crops in Europe is likely to combine measures of *ex ante* regulation and *ex post* liability rules. Recognizing Europe's heterogeneity in farm structures, crop patterns and legal environments, the European Commission decided to follow the principle of subsidiarity and states that "measures for coexistence should be developed and implemented by the Member States" (European Commission 2003). It could be expected that the Member States will develop a variety of different measures that will have a profound impact on the adoption rate of GM crops.

Against this background the paper by Soregaroli and Wesseler deals with an interesting question. How do *ex ante* regulation and *ex post* liability affect the adoption of transgenetic crops on different farm or plot sizes? The paper focuses its attention more specifically on the effect of different minimum distance requirements on the minimum field size of adoption. This question is without any doubt very relevant given the variance in size among Europe's farms. In Italy, Portugal and Greece, more that 70 % of all farms cultivate less than 5 hectares, compared to Denmark, Ireland and Sweden where the share of these small farms does not exceed 10 %. If the *ex ante* regulation and *ex post* liability for using GM crops induce additional costs, these costs may not be scale-neutral. It may be argued that minimum distance requirements in particular will disadvantage smaller farms compared to liability rules. This trade-off is the main theme of the paper.

Soregaroli and Wesseler push forward the modelling approaches to capture this trade-off and to my knowledge this is the fist paper that deals with these issues more systematically. The trade-off is modelled in a classical way using the approach by Kolstad, Ulen and Johnson (1990) and in a more advanced way considering irreversibility and uncertainty. With both models they arrive at the conclusion that it "… is not possible, *a priori*, to conclude what is the effect on the minimum adoption size of the *ex ante* regulation" (p. 176). Although I would not disagree, I would like to point out that some crucial assumption on the cost function may have an important impact on the results. I would like to elaborate on this point.

Soregaroli and Wesseler introduce some assumptions of the cost functions that may be very important and driving the results. The costs of regulations are defined as $C(s,d)$ with s as the size of the field and d as the minimum distance between the GM crop and the field's external limits. It is further assumed that the costs increase with distance and size but in both cases at a diminishing rate, $\partial C(s,d)/\partial s > 0$, $\partial^2 C(s,d)/\partial s^2 \leq 0$ and $\partial C(s,d)/\partial d > 0$, $\partial^2 C(s,d)/\partial d^2 \leq 0$. The costs of liability are defined as $\mu(s,d)$ with the assumption that $\mu(s,d)$ increases in s at a diminishing rate

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but decreases in d at an increasing rate, $\partial\mu(s,d)/\partial s > 0$, $\partial^2\mu(s,d)/\partial s^2 \leq 0$ and $\partial\mu(s,d)/\partial d < 0$, $\partial^2\mu(s,d)/\partial d^2 \geq 0$. Let us think about the field as a square. In this case we can define $s = a^2$ with a as the side length. The field size that is needed to keep the minimum distance d and, thus the costs C can be calculated as $C = a^2 - (a - 2d)^2 = 4ad - 4d^2$ or alternatively as $C = 4\sqrt{s}d - 4d^2$. Now consider a different situation, where the farmer negotiates with his neighbours. In this case the cost function can be described as $C = (a + 2d)^2 - a^2 = 4\sqrt{s}d + 4d^2$. This function has the following partial derivatives: $\partial C(s,d)/\partial s > 0$, $\partial^2 C(s,d)/\partial s^2 \geq 0$ and $\partial C(s,d)/\partial d > 0$, $\partial^2 C(s,d)/\partial d^2 > 0$. Thus, the costs steadily increase with the field size and constantly increase with the minimum distance requirements.

However, most important is that the minimum distance regulation creates some fixed costs since $\lim_{s\to 0} C = 4d^2$. This clearly would disadvantage very small farms. This disadvantage to small farms by minimum distance regulations is reinforced by a more realistic damage function. The damage function is not continuous, since damage is related to the threshold of food and feed being labelled as GM. In Europe economic damage will only appear if the fraction of GM products in non-GM crops exceeds the 1% threshold (see also Beckmann 2003). Suppose f_G defines the fraction of GM crops in non-GM crops and T defines the threshold. The damage function, then, could be redefined as

$\mu(s,d) = \begin{cases} 0 & f_G < T \\ > 0 & f_G \geq T \end{cases}$. If s is small compared to the size of the surrounding fields, the probability of being liable is zero perhaps over a larger range of s. If this holds true then minimum distance regulations will disadvantage and liability rules will advantage small farms. However, as the size of the field increases the effects are not that clear. This is what Soregaroli and Wesseler found. I would encourage them to calculate the model with different specifications of the cost function.

However, the Soregaroli and Wesseler paper offers a good starting point for further analysis of different minimum-distance regulations and liability rules on the adoption of GM crops in Europe. There is much more work to come along this line of research and it will be a rich field for empirical studies in the future.

References

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