

Extended Abstract
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Paper/Poster Title	The impact of the regulatory debate on glyphosate in the EU on publicly traded pesticides producers
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Abstract	<i>200 words max</i>
<p>In this article, we analyze the impact of the European glyphosate controversy on publicly listed pesticides producers. We apply an event study approach to identify the effect of five assessments of glyphosate’s risk to human health and three decisions on extension approvals of glyphosate on the daily stock returns of nine of the largest pesticides producers globally for the period 2015-2017. We find that the impact of the eight events is small when compared to both, other events such as mergers and acquisitions announcements as well as other studies on the impact of regulatory decisions on private companies. That is, the glyphosate controversy did not considerably influence future profitability expectations for the sample companies despite the importance of glyphosate as the most widely applied herbicide worldwide. Therefore, our results suggest that policy makers do not necessarily need to show consideration for the competitiveness of agro-chemical companies when deciding on approval and banning of pesticides.</p>	
Keywords	Glyphosate, pesticides producers, agro-chemical industry, event study
JEL Code	G14, L5, L65
Introduction	<i>100 – 250 words</i>
<p>The pesticides industry constitutes an important player in agri-food value chains supplying primary inputs to more than 570 million farmers globally (Lowder, Skoet, and Raney 2016). While pesticides have contributed substantially to yield increases in agriculture during the past decades (Popp, Petö, and Nagy 2013), they also lead to environmental pollution, loss of biodiversity and are harmful for human health (e.g. Larsen, Gaines, and Geschênes 2017; Stehle and Schulz 2015; Tang et al. 2021). Thus, pesticides are subject to high political and societal debates (Finger 2021).</p> <p>One example constitutes glyphosate, the most widely applied herbicide worldwide (Benbrook 2016). The International Agency for Research on Cancer released a report in March 2015 stating that “glyphosate is probably carcinogenic to humans” (IARC 2015), which initiated the European glyphosate controversy. In the subsequent two years, there have been several other organizations assessing the hazardousness of glyphosate for human health along with extension approval decisions by the European Commission.</p> <p>We add to the literature by estimating the effects of assessments of glyphosate’s risk to humans as well as regulatory decisions with respect to the approval extension of glyphosate on the share prices of publicly traded pesticides producers. Thereby, we show how regulatory uncertainty influences the producers of agro-chemicals in terms of future profitability expectations. Second, our findings will provide evidence for the flexibility of pesticides</p>	



producers. In case the regulatory debate does not impact the share prices of pesticides producers, they can be considered as flexible compensating the probable loss of glyphosate sales.

Methodology

100 – 250 words

To identify the impact of the eight events related to the glyphosate discussion (cf. Figure 1) on publicly traded pesticide producers, we follow an event study approach using the companies' daily stock prices.

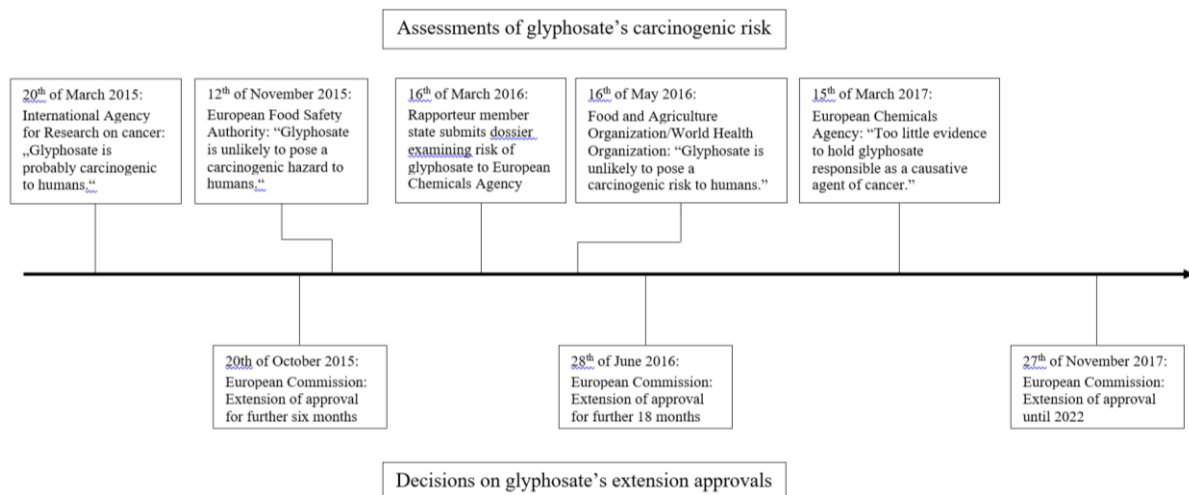


Figure 1. Events during the European glyphosate controversy

In an event study, we start from modelling the counterfactual scenario, i.e. estimating a company's stock return, if the event did not happen, using a market model:

$$R_{it} = \alpha_i + \beta_i R_{it}^M + \varepsilon_{it} . \quad (1)$$

R_{it} is the return of company i 's stock price on day t and R_{it}^M is the return of the market index of company i 's country of operation on day t . α and β are parameters to estimate and ε is a random error component. To investigate the impact of an event on the sample firms, we examine the share of variation in R_{it} not explained by the market, i.e., the cumulative average abnormal return (CAAR), across the N firms:

$$CAAR = \frac{1}{N} \sum_{i=1}^N \sum_{T^{EV}-j}^{T^{EV}+k} R_{it} - \hat{R}_{it} . \quad (2)$$

\hat{R}_{it} is the predicted value from (1). T^{EV} is the event date while k and j define the event window length which we set equal to three days. Thereby, we obtain a measure of the average impact for each event across all companies. Our sample includes Bayer, BASF, Dow Chemical, Du Pont, FMC, Monsanto, Nufarm, Syngenta and UPL as they are publicly listed and generate at least a share of 10% of their agribusiness sales in Europe. Thereby, we avoid including firms that are not affected by the events because of the geographical scope of their operations.

Results	<i>100 – 250 words</i>
<p>The <i>CAAR</i> range from -1.028% (European Chemicals Agency report) to 1.262% (European Food Safety Authority report), i.e. on average the share price of the sample companies declined by approximately 1% due to the glyphosate risk assessment published by the European Chemicals Agency on the 15th of March 2017, whereas the pesticides producers' share price, on average, increased by approximately 1.3% because of the risk assessment released by the European Food Safety Authority (12th of November 2015). With respect to the category “assessments of the carcinogenic risk of glyphosate for humans”, we identify two events with a positive <i>CAAR</i> (1.262% and 0.668%): the report of the European Food Safety Authority (12th of November 2015) and the submission of the dossier compiled by the rapporteur member state to the European Chemicals Agency (16th of March 2016). For the remaining three events, we identify negative <i>CAAR</i> of -0.591% (report of the International Agency for Research on Cancer), -0.110% (risk assessment of the Food and Agriculture Organization/World Health Organization) and -1.028% (report of the European Chemicals Agency).</p> <p>For “decisions by regulatory bodies on glyphosate’s extension approval”, two <i>CAAR</i> are negative and one is positive. For the first extension of six months (20th of October 2015) the <i>CAAR</i> amounts to -0.585% and for the second extension of 18 months (28th of June 2016) the <i>CAAR</i> is -0.970%, whereas we observe a <i>CAAR</i> of 0.368% for the third extension lasting for five years until 2022 (27th of November 2017).</p>	
Discussion and Conclusion	<i>100 – 250 words</i>
<p>The <i>CAAR</i> obtained for the glyphosate controversy must be considered small when comparing them to other event types. For instance, on the 12th of December 2015 rumor about a merger between Dow chemical and Du Pont led Dow’s share price to increase by 11% on the same day, which is in line with earlier studies on mergers and acquisitions announcements (see e.g. Lamprinakos and Fulton 2011; Liargovas and Repousis 2011; Yoo, Lee, and Heo 2013).</p> <p>Even when comparing our study to research on the impact of other political events on private companies, our estimates are comparatively small. Analyzing the effect of carbon price regulation in the EU, Bushnell, Chong, and Mansur (2013) yield <i>CAAR</i> of -1.11% to -3.2% for energy intensive industries for a carbon price reduction and <i>CAAR</i> -5.6% to 9.6% for a price rise of carbon emission allowances. Johannesen and Larsen (2016) investigate the impact of the political decision process on a country-by-country tax payment disclosure for firms in extractive industries in Europe (oil, gas, mining), and estimate <i>CAAR</i> between -6% and 1.1%.</p> <p>Hence, the controversy has not influenced future profitability of the agro-chemical sector considerably despite the importance of glyphosate as it represents the most widely applied herbicide worldwide. Therefore, future public discourses on bans of specific pesticides will probably not lead to different outcomes for pesticides producers such that policy makers do not necessarily need to show consideration for the competitiveness of agro-chemical companies when deciding on approval and banning of other pesticides.</p>	

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