Introduction Special Issue "The Political Economy of the Bioeconomy"

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Understanding the responses by different societal groups including private sector companies, governmental agencies, media and NGOs towards new technologies for the bioeconomy is of importance considering the economic relevance of the sector. The importance of these responses has been highlighted recently within the Transatlantic Trade and Investment Partnership (TTIP) negotiations, by the debate on GMO labelling within the US and on the environmental sustainability standards for biofuels in the EU and US, and by the research allocation choices of research intensive private sector companies such as Bayer, BASF, and Novozyme.

As WESSELER and ZILBERMAN (2015) and WESSELER (2015) have pointed out, there are six major reasons why the bioeconomy is a sector of growing significance: (i) the recent advances in biological sciences (ii)) the increase in horizontal and vertical integration in agricultural supply chains, (iii) the increase in inter- and intra-industry trade, (iv) the advances in information and communication technologies, that power the industry, (v) the increase in globalization, and (vi) the challenges caused by climate change. These changes lead to a greater interdependence within and between the different sectors of the economy, so that changes such as new technologies or policy reforms in one segment of a supply chain have stronger horizontal and vertical implications than two or three decades ago. The growing interdependence between sectors is illustrated by the financial crisis of 2008, the introduction of indirect land-use considerations in bioeconomy policies and the recognition of global effects of local greenhouse gas emissions in policy design.

These developments require new methodological approaches for assessing the social implications of policies and institutions. These methodologies must consider the vertical and horizontal transmission of policy impacts within value chains, the dynamics and the spatial implications of various changes and the challenges of implementation and governance associated with policy and institutional changes.

Furthermore, the bioeconomy is set to address major challenges. To quote the European Commission: "With the world population set to approach an estimated 9 billion by 2050, against a background of finite natural resources, Europe needs renewable biological resources – not just for securing healthy food and animal feedstuffs but also for materials and other bio-based products such as bio-fuels. A strong bioeconomy will help Europe to live within its limits. The sustainable production and exploitation of biological resources will allow the production of more from less, including from waste, while limiting negative impacts on the environment and reducing the heavy dependency on fossil resources, mitigating climate change and moving Europe towards a post-petroleum society." (EUROPEAN COMMISSION 2012: 4). Accordingly, this includes contributions to food security, sustainable management of natural resources, reducing dependence on non-renewable resources, mitigating and adapting to climate change, and creating jobs and maintaining competitiveness. Similar reasoning's can be found in the national bioeconomy strategies of Finland, France, Germany, Norway, the United States and other countries (PATERMANN, 2015).

The growing integration between different sectors of the economy also suggests broadening the range of concerns of different players in the economy which will affect their strategic interactions, attitudes towards polices and efforts to affect policy formations affecting the bioeconomy. In other world, recent economic and environmental changes increase the value of understanding the political economy of the bioeconomy, and it will be addressed in this special issue of the German Journal of Agricultural Economics.

Much of the political economy literature on the introduction of a new technology applies static models

to analyse the introduction of regulations. However, a dynamic political-economy framework seems to be more appropriate to capture the evolution of regulations on contested technologies (e.g. ZILBERMAN et al., 2015; PANNICKE et al., 2015) to advance our understanding about the driving forces of regulations (e.g. SMART et al., 2015), the incentives of different stakeholder groups (e.g. PUTTKAMMER and GRETHE, 2015), and the related benefits and costs and their distribution over time and space (JUNKER et al., 2015).

The paper by ZILBERMAN, HOCHMAN, GRAFF and KAPLAN provides a general framework for investigating the political economy of the bioeconomy. They illustrate the relevance of the political economy approach by referring to lessons learned from the introduction of genetically engineered (GE) plants into agriculture. There are three regulatory aspects that need to be considered: regulation of approval, cultivation (coexistence), and have identity preservation (labelling). Different interest groups influence each aspect, and the interest groups are not homogeneous. For example, some of the lobbyists for organic agriculture may support GE while others object to the technology. ZILBERMAN et al. stresses the relevance of behavioural economics, characterised by three major elements: loss aversion, probability weighing, and framing. The theory of loss aversion provides an explanation for strong resistance of the chemical industry towards GE technology, while consumer behaviour can be explained by differences in probability weighing where, and framing, e.g. "Frankenfoods", has been an effective scare tactics used by used by opponents of GE. Adding behavioural economics to the political economy provides refreshing insights.

The contribution by PANNICKE, GAWEL, HAGEMANN, PURKUS und STRUNZ illustrates that behavioural considerations are also relevant for understanding pathways towards a bioeconomy. They discuss opportunities and threats of increasing the use of woody biomass by looking at the lock-in concerns that prevent an increase in the use of woody biomass and lockout options for overcoming such hurdles and apply their framework to assess German policies. Interestingly, they identify a number of policies supporting woody biomass use, but find that they are not sufficient and recommend policies that more strongly internalize social benefits and costs of fossil fuel use and woody biomass alternatives.

The paper by SMART, BLUM and WESSELER provides a political economic lance to look at the voting behaviour of member states of the European Union for the approval of GE crops. This is the first paper describing and analysing this issue. The authors assessed the extent to which expected economic agricultural or environmental impacts of specific varieties, crops or technologies, affect the countries attitudes toward their regulations. Interestingly, differences in agricultural and environmental impacts of the different traits do not seem to have substantial impacts or relevance on country voting on regulations. Country specific issues dominate these choices. In particular, France, Germany, and Italy voting behaviour is not affected much by differences between traits and their impacts. This has important implications for future decisions. As the authors point out, the results of their analysis do not support that the "Opt-Out" proposal for cultivation of GE crops in the EU will change voting outcomes.

The paper by PUTTKAMMER and GRETHE investigates the framing strategy used by lobby groups within the debate on the sustainability of biofuel production in Germany. In particular they asked why biofuels received strong political support, while scientists early on stressed the limitations of biofuels to achieve desired policy objectives. The authors look at the framing of biofuels by different groups by analysing publications in the five major daily newspapers in Germany. They identify a coalition of biofuel advocates that was able to dominate the debate and frame biofuels produced in Germany as greenhouse gas emission saving, a claim that strongly disputed by scientists. Similar to the debate about GE crops, policy decisions are made ignoring the scientific opinion and recommendations of scientific advisory boards.

The contribution by JUNKER, GOCHT, MARQUARDT, OSTERBURG and STICHNOTHE to a certain extend confirms this observation. The authors assess the implications of greenhouse gas emissions and subsidies of biodiesel produced from oilseed rape. Biodiesel has a major share of the biofuels market but production will be threatened by the increase in the greenhouse gas emission savings requirements for subsidies under EU regulations. The authors show that those higher standards can hardly be met and as a result biodiesel production from oilseed rape will cease to exist and assess the implications for the allocation as well trade of oilseed rape and derived products. The study confirms the concerns that many economists have raised: the production of bio-diesel requires subsidies, but greenhouse gas emission savings cannot justify those.

In summary, the papers of this special issue address the two important aspects of the political economy of the bioeconomy: dynamics and governance, from both a theoretical and empirical perspective. We hope this special issue will encourage colleagues to follow this line of research. As the contributions in this special issue of the GJAE show, we are just at the beginning of getting a better understanding of bioeconomy economics and policies and certainly the political economy that will affect it.

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