1.4. Drivers of the Bioeconomy's Development
Civic Engagement, Affluence, and Environmental Policy Stringency

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1. Introduction

The desire to harness biogenic resources in a bioeconomy is a reflection of the major political and economic challenges that mankind encounters in the twenty-first century (Angenendt et al. 2018). These challenges include climate change, population growth, and growing energy demand in developing and emerging economies, as well as the prosperity gap between the Global South and the Global North and international terrorism (Khan et al. 2021). A sustainable and circular bioeconomy is increasingly turning to a new paradigm, one which is supposed to replace the old industrial society model, and is expected to inaugurate a qualitatively new phase of sustainable development (WGBU 2011; Falcone/Imbert 2018). This new paradigm implies a large-scale biologization of value chains, bio-based industrial processes, materials, and sustainable consumption patterns (von Braun 2014). There is a broad consensus that this will come about through contributions to green growth, competitiveness, and creation of new employment opportunities (Vivien et al. 2019). Hence, the bioeconomy's growth leads to a kind of win-win situation in the context of both economic and environmental sustainability (D'Adamo et al. 2020a; DeBoer et al. 2019).

The European Commission defines bioeconomy more widely as »the production of renewable biological resources and the conversion of these resources and waste streams into value-added products, such as food, feed, bio-based products as well as bioenergy« (European Commission 2012). D'Adamo et al. 2020b) define bioeconomy based on the previous literature about the topic (Hurmekoski et al. 2019; Agovino et al. 2019; Wydra 2020). Their definition is that of a new model for industry, one which comes into its own through a comprehensive socio-economic transition (D'Adamo et al. 2020a). This move is intended to reduce our dependence on fossil-based materials and fuels on the one hand and aims to promote the circular economy through reuse, recycling, and waste-to-energy efforts on the other.

The novel perspective advanced by bioeconomy contemplates two essential elements in terms of economic transformation. These are (1) resource substitution, such as the replacement of fossil-based or energy-inefficient materials and processes with those that have an organic origin; and (2) biotechnology innovation, such as innovations that emanate from biotechnology and that contribute to more sustainable production systems (Birner et al. 2014; D'Amato et al. 2017). The resource substitution perspective has been triggered by the Hubbert peak theory on the one hand, and by the increasing oil prices witnessed during the recent commodity price supercycle on the other (Bardi 2009; Sadik-Zada/Loewenstein 2018; Sadik-Zada/Gatto 2020). Increasing fuel prices have contributed an increase in the comparative advantage of biofuels around the world since 2006. This has served to promote the profitability of substitution (Birner et al. 2014). However, the global economy entered the phase of low oil prices around November 2014 and, hence, the substitution of oil by biofuels is no longer a major driver of the bioeconomy. Furthermore, the adoption of the Paris Agreement and Nationally Determined Contributions (NDCs) to tackle climate change, increasing climate change awareness, and environmental activism have all led to an increased valuation of environmental amenities (Bugge et al. 2016; Sadik-Zada/Ferrari 2020). The bioeconomy's development plays an important role in the achievement of the climate neutrality target by 2050 because of the pivotal role it plays in the transition to more circular and resource-efficient methods, such as in ecologically sustainable technologies (European Bioeconomy Alliance 2021). The substitution of fossil-based materials and energy sources by bio-based sources has been given top priority (Bugge et al. 2016) by two consecutive bioeconomy strategies in the European Union (EU). The Bioeconomy Action Plan, and the circular bioeconomy in particular, are constitutive and essential parts of the European Green Deal's Circular Economy Action Plan (European Commission 2019; Ronzon et al. 2020).

The prerequisites for a sustainable bioeconomy include comprehensive and cross-cutting scientific knowledge and technological capacities, the enhancement of the congruent managerial instruments, sophisticated and holistic approaches in sectoral policies, and a broad awareness of the sustainable bioeconomy's benefits throughout society (Patermann/Aguilar 2018). The bioeconomy resorts to bio-based innovations and to sustainably produced renewable resources, given that it is a knowledge-based and future-capable economic system (German Bioeconomy Council 2018). Since the adoption of the European Green Deal in 2019, the congruence between NDCs, the implementation of the 8 pilot Emission Trading Schemes (ETS) in China, and the implementation of national bioeconomy strategies in more than 45 countries worldwide have led to the unification of climate and bioeconomy policies and climate policies worldwide (German Bioeconomy Council 2018; Deng/Zhang 2019).

2. Bioeconomy in the EU

The EU's bioeconomy policies date back to 1975 when three scientific officers of the European Commission's Research Directorate, Dreux de Nettancourt, André Goffeau and Fernand van Hoeck proposed taking action with respect to the optimization of exploitation of the European Community's biological resources in their report (Aguilar et al. 2012). This was the first European program on biotechnology and later served as the cornerstone for the European bioeconomy's growth. Based on this note, the European Commission commenced the implementation of the EU Framework Programmes in Biotechnology and Life Sciences and adopted the Biomolecular Engineering Programme (BEP) in 1982. The focus of these programmes was predominantly upon supporting European initiatives in biotechnology research. These initiatives catalyzed biotechnology efforts throughout the European polity and economy. The second factor that essentially shaped the European biotechnology action's emergence emanated from the geopolitical realities of that time. The Cold War and the competition between the West and the Soviet Bloc led to an overt support by the United States of European biotechnology initiatives. The USA established major multilateral treaties and conventions and operating centers and headquarters in Europe in order to capture the best minds within a joint European-U.S.-action. This also simplified the attraction of leading scholars from the opposite side of the Iron Curtain to work within European research institutions (Aguilar et al. 2012). The bioeconomy plays an important role in the EU's economy today and has more than EUR 2.4 trillion turnover, EUR 614 billion value added, and a 9 % share in gross employment (Porc et al. 2020; Ronzon et al. 2017; Ronzon et al. 2020). The bioeconomy is one of most important drivers of the European economy. The average labor productivity in this meta-sector grew from USD 25,000 to USD 33,000 in just one decade, between 2008 and 2017 (Ronzon et al. 2020). Despite the bioeconomy's growing importance across all the sectors of economic activity, today 82 % of bioeconomy turnover is still concentrated in food and beverages, agriculture and forest-based and paper production (Fig. 1).

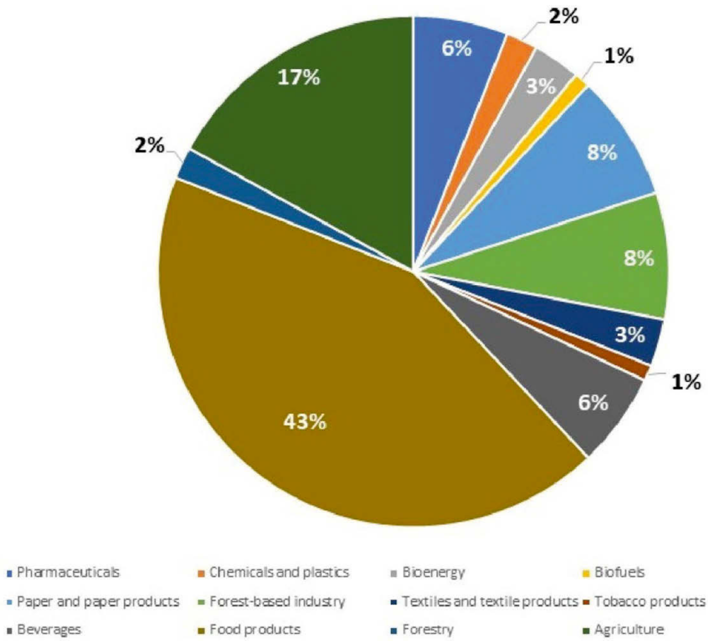
It was clear from the very outset of the biotechnology development programs that the role of the public stance with respect to the new trends would be decisive for the successful development of the sustainable bio-based economic models. This is because of the existing trade-offs between economic and non-economic interests in the context of biotechnology's rising stakes. The following subsection dwells on the issue of incorporation of the broader swaths of the population in the enhancement of bioeconomic production systems.

3. Transition towards a Bio-based Economy

At the initial stages of development, the concept of the bioeconomy had almost been entirely focused on the supply side, such as biotechnological production processes and on the availability of biological resources (Birner 2018). Until the mid-2010s, broad swaths of the population were not alerted to the sustainable bioeconomy's socioeconomic merits. With the increasing awareness of climate crisis and the degradation of biodiversity, demand side factors also started to play an important role in the growth of the bioeconomy's economic weight (Falcone/Imbert 2018).

The first perceivable step towards undertaking a discussion about biotechnology, the role played by society, and the repercussions on the socioeconomic development of European Communities was undertaken in 1978 with the adoption of the Forecas-

Figure 1: Turnover in the bioeconomy in the EU-28 in 2017



Source: Porc et al. 2020, p. 10.

ting and Assessment in the Field of Science and Technology (FAST) program, especially its subprogram on the topic of ›Biosociety‹. The Biomolecular Engineering Program (BEP) also attracted the attention of relevant stakeholders, such as farmers and local polity units, to its works because of the BEP's focus on genetic engineering and the agro-food industry. The European Biotechnology Strategy (EBS) was launched in 2002, twenty years after the creation of an underlying environment for functional European biotechnological development, cooperation, and its diffusion in industrial production within the framework of BEP (Aguilar et al. 2012). The strategy was supposed to assure development towards a »more innovative, resource efficient and competitive society that reconciles food security with the sustainable use of biotic renewable resources for industrial purposes, while ensuring environmental protection« (European Commission 2012). The strategy puts forward five concrete targets. These include ensuring food security, the sustainable management of natural resources, the reduction of the dependence on fossil fuels, mitigating and adapting to climate change, and creation of good jobs and an increasing in competitiveness (European Commission 2012). The EBS enabled the incorporation of the whole of society, as well as an integration of the formerly uncoordinated and fragmented bioeconomy action, and was based on an efficient platform, predicated on the mechanisms adopted by BEP. The last twenty years has witnessed the establishment of interconnected and European bioeconomy policies. The concept of the Knowledge-Based Bio-Economy (KBBE) became one of the leading approaches within the EBS and the KBBE was proposed by the European Commission. The KBBE was initially the result of an understanding that the bioeconomy, the only exception to which was agriculture, could not compete with the non-bioeconomical models within the EU and beyond without public support (Albrecht et al. 2010).

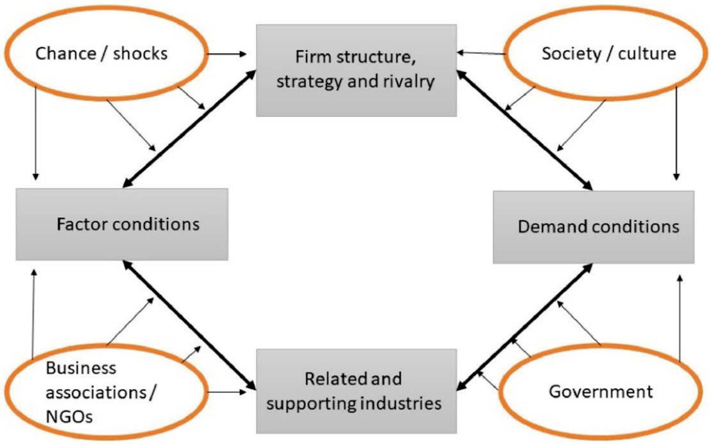
Indeed, the KBBE catalyzed the development of sophisticated managerial, financial, policy, and civic participation. Furthermore, the EBS promotes the empowerment of different stakeholders, such as non-governmental environmental organizations, the private economy, and trade unions to participate in agenda-setting and in the European bioeconomy's implementation. The European Commission redefined its priorities after assessing the EBS‹ intermediary progress in 2007. These priorities imply promotion of biotechnology research and the development of markets for biotechnology-based industries; improvement of market regulations for fostering competitiveness and for the bioeconomy's sustainability, especially in agriculture and food processing; and last, but not least, encouragement of broad, societal participation in the formulation of the bioeconomy's development pathways in the EU.

4. Analytical Framework and the Role of Civic Society

Birner et al. (2014) and Birner (2018) employ the »diamond model« of comparative advantage for a theoretical analysis of a hypothetical bioeconomy strategy, an idea which was originally proposed by Porter (1990). Figure 2 graphically illustrates the bioeconomy's comparative advantage in terms of the modified diamond model. There are four fundamental factors that explain the bioeconomy's successful development, and these include: (1) factor conditions; (2) demand for bio-based products and services; (3) firm structure, strategy, and rivalry; and (4) related and supporting industries. Factor conditions relate to the availability of biomass-based natural resources (materials), human capital, and to infrastructure (Porter 1991; Birner et al. 2014). This explains why countries with high levels of human capital and technological progress have preconditions that are more conducive to the bioeconomy's development.

According to Porter (1991), domestic demand plays an important role in the generation of comparative advantages for international markets. In the case of bio-based processes and products, the bioeconomy advances faster in countries with a large domestic demand for bio-based and biotechnology products (Birner et al. 2014). Clusters of biotechnology companies, i.e., the concentration and interaction of these enterprises in the same regions, also play a decisive role in the development of national biotechnology companies and informs their international competitiveness (Engel et al. 2011; Lecocq et al. 2021; Angenendt et al. 2018). There are additional factors that shape the bioeconomy's competitiveness. These include external shocks, business associations and NGOs, public governance, and society and culture. External shocks, at least in the context of the EU, are confined to the global fuel markets' volatility (Cavalcanti et al. 2014). With the exception of oil price volatility, other secondary factors are rather predictable and play an important role in the bioeconomy's development. All of these factors are related directly to the human factor and, hence, this is decisive in terms of the management of the bioeconomy's transition pathways. These factors are interrelated and also help to shape the primary determinants (Fig. 2). Business associations and NGOs play a central role in bioeconomy's development by increasing the bioeconomy's competitiveness. These organisations support industrial standardization for bio-based products and organize the industry-specific competitions (Champenois et al. 2009; Engel et al. 2011). Lobbying of the traditional (not bio-based or not sustainable producers) might limit the sustainable bio-based economy's growth, however (Stigler 1971).

Figure 2: The diamond model of comparative advantage.



Source: Birner et al. 2014, p. 30.

In addition to the bioeconomy's contextualization within the framework of Porter's diamond model, there is also another framework that was proposed by van Leeuwen et al. (2013; 2015) and which was slightly augmented by Jander et al. (2020). The difference between these two theoretical frameworks is that the diamond model is more focused on the essential drivers of the sustainable bioeconomy's competitiveness and development and that the model provided by van Leeuwen et al. (2015) is more comprehensive. This is why the authors refer to their framework as a »Systems Analysis Framework for the EU Bioeconomy« (van Leeuwen et al. 2013, 2015). Furthermore, the diamond model of the bioeconomy focuses more explicitly on society and culture as the drivers of the demand side of the bioeconomy's development. This is the central difference and one clear advantage of the approach proposed by van Leeuwen et al. (2013, 2015). In the further elaboration of these aspects, Jander et al. (2020) refer explicitly to society and culture. Aguilar et al. (2012: 22) phrases it in the following way:

> »European competition and collaboration moves with an engine, which cannot be fuelled with just the right dose of excellence, competence or other resources. Rather, the engine is fuelled by common human values reflecting the European utopia«.

5. Measuring Sustainable Bioeconomy

Despite some indirect indications about the European bioeconomy's successes, the measurement of the bioeconomy in terms of sustainability has proven to be a serious challenge for both policy-makers and scholars working in this field. The statistics that are publicly available do not differentiate between bioeconomic and non-bioeconomic production processes and do not include the share of bioeconomic materials used in the production of the intermediary and end products. No reliable statistics exist with regards to the bioeconomy's effect on job creation. It is also impossible to assess sustainability and circularity throughout the entire bioeconomy supply chains, including the extraction of the biomass to consumption and possible recycling, end use, or energy transformation (Jander et al. 2020; BMEL 2014). In the context of the bioeconomy, biomass encompass materials that have a biological origin; fossils-based materials are excluded, however, despite their biological origin (Kaltschmitt 2019). A growing share of the biological feedstock does not automatically correspond with more circular and/or energy-efficient production systems. In order to address these challenges, the EC launched the Knowledge Centre for Bioeconomy (KCB) hosted by the Joint Research Centre of the European Commission. KCB is supposed to serve as the knowledge base for policymaking by designing a monitoring system for the sustainable development of the European bioeconomy.

Jander et al. (2020) consider the quantification of ecological, economic, and social aspects of the bioeconomy to be a »Herculean task« because of the bioeconomy's cross-sectoral character and due to lack of a comprehensive and harmonized statistical assessment of the bio-based products throughout the individual countries' production value chains. The bioeconomy is not an individual economic sector or even the sum of several sectors; instead, the bioeconomy is epitomized in individual activities that involve every sector of the economy and multi-scalar relations of stakeholders that operate at different domains throughout society (Essletzbichler 2012; D'Adamo et al. 2020b).

Bioeconomic elements can be present, essential even, in most sectors of the economy, whereas these activities are more or less pronounced in particular value chains (National Academies of Sciences, Engineering, and Medicine 2020). This also complicates an assessment of the drivers of a successful (sustainable) bioeconomic development more generally. Thus, as indicated by the Germany Bioeconomy Council's framework paper, it is also impossible to promote bioeconomy development over public subsidization of the individual economic sectors. This is because of the omnipresence of bioeconomic elements in different sectors of economy. The German Bioeconomy Council defines bioeconomy-oriented industrial policy formulation as the central contemporary problem, in terms of economic policies, because of the close intersection patterns between bioeconomic activities and the rest of the economy.

The industrial policy shifts might account for the prioritization of a sustainable bioeconomy, at least at this rather nascent phase of its development, and must be predicated on a comprehensive approach. This accounts both for micro- and macro-level drivers of innovation activity in the field of bioeconomy (Birner et al. 2014).

This fact facilitates the need to make greater use of the alternative sources of information about the bioeconomy that are available, particularly the case studies, expert interviews, company-specific accounting reports, ecological auditing data, and additional sources that might be put in the service of advancing the theoretical framework for the development of the sustainable bioeconomy and for practical decision-making support systems.

6. Data and Methodology

This survey takes the first step towards assessing the relationship between civic engagement, in the form of active or passive participation in environmental organizations, and sustainable bioeconomic development. These estimates are predicated on the basis of data about 17 economies. The list of countries examined is presented in Tab. 1. The study makes use of a socio-economic indicator for the bioeconomy (SEIB), as proposed in D'Adamo et al. (2020) as a dependent variable. Regression estimations have been confined to just one year, 2017, because of the lack of data about the socio-economic indicator for the bioeconomy (SEIB). Methodologically, SEIB is predicated on the methodology suggested in Ronzon et al. (2020) and encompasses turnover, value-added, and the bioeconomy sectors' employment linkages. Hence, the SEIB is an appropriate indicator for socioeconomic sustainability, but not for environmental sustainability by any means. The authors justify this limitation by the lack of data about circularity and the biomass-based activities' environmental degradation data. Thus, the estimations with SEIB as a dependent variable should be interpreted with caution.

Table 1: List of countries in the cross-country analysis of the determinants of the SEIB

Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Slovak Republic, Spain, Sweden, UK

Furthermore, the study employs a panel dataset for 26 economies, spanning from 1990 to 2015, for the assessment of the role played by civic engagement in the development of the bioeconomy, while the number of patents in the field of biotechnology serves as an indicator for the bioeconomy's development. The list of these countries has been presented in Tab. 2. The study makes use of the same indicator provided by the World Values Survey as an indicator for civic engagement; specifically, the share of active or inactive members in environmental organizations. The estimation also controls for additional variables and includes environmental policy stringency, per capita income, and recycling rate. The data series employed in both cross-country and panel estimations are described in Tab. All of the variables have been transformed to their natural logarithms in order to allow for a meaningful interpretation of regression coefficients. This allows for the coefficients to be interpreted as a percentage. The study employs the conventional fixed- or random-effects estimators, rather than the dynamic fixed effects (Blackbourne/Frank 2007), in order to account for the data's time series character within the framework of panel analysis.

Table 2: List of countries in the cross-country panel analysis about the determinants of biotechnology patents

Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, UK, USA

Table 3: Description of data

Variable	Description	Source
Ln_SEIB	Natural logarithm of the socio-economic indicator of bioeconomy.	D'Adamo et al. (2020a, b)
Ln_Patents	Natural logarithm of the number of patents in biotechnology. The variable encompasses all of the patents in accordance with the methodology of the International Patent Classification (IPC).	OECD (2022)
Ln_EPS	The OECD Environmental Policy Stringency Index (EPS) is a country-specific and internationally comparable measure of environmental policy's stringency. Stringency is defined as the degree to which environmental policies put an explicit or implicit price on polluting or environmentally harmful behaviour.	OECD (2022)
Ln_PCI	Natural logarithm of the average income in constant 2010 USD.	World Bank (2021)
Ln,Greens	Natural logarithm of the share of the green parties in national parliaments.	--
Ln_BVA	Natural logarithm of the shape of the bioeconomy's added value in gross GDP.	World Bank (2021).
Ln_Recycling	Natural logarithm of the share of recycled municipal waste. This dataset shows data that has been provided by member countries' authorities through a questionnaire about the state of the environment (OECD/Eurostat). They were updated or revised on the basis of data from other national and international sources available to the OECD Secretariat, and on the basis of comments received from national delegates.	OECD 2022

7. Empirical Findings and Conclusions

7.1. Drivers of Socioeconomic Effects of Bioeconomy

The cross-country OLS-estimators indicate that the level of affluence and the share of bio-economy in the gross value added has a statistically significant positive impact on the SEIB.

Table 4: Ordinary Least Squares Estimator, 2017

VARIABLES	(1) lnSEIB	(2) lnSEIB	(3) lnSEIB
lnPCI	0.293*	0.436**	0.381**
	(0.159)	(0.150)	(0.141)
lnBVA		0.562**	0.578*
		(0.239)	(0.268)
lnGreens			0.0447
			(0.0823)
Constant	-4.434**	-4.701***	-4.167***
	(1.652)	(1.493)	(1.372)
Observations	18	18	17
R-squared	0.221	0.351	0.367

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Interestingly, countries with a greater average income and a larger share of bioeconomy in gross value added have benefited more from the existence, and increasing growth, of bio-based economic activities. The green parties' importance in the parliaments of the respective countries have no statistically significant impact on SEIB. There is no statistically significant impact of civic engagement on the socioeconomic effects of bioeconomy sectors in this cross-country estimation. The results of this subsection must be interpreted with caution due to the fact that the study has employed a dataset with the timeframe of just one year. Hence, further research is required to verify these results.

7.2 Determinants of Patent Activity in Biotechnology

In this subsection, I will present the preliminary results of the estimation on the determinants of patent activity in the field of biotechnology. The estimates are based on data of 26 advanced and emerging economies for the time interval spanning between 1990 and 2015. The reason for the confinement of the analysis to this time interval is because of this time frame's limitation in terms of the Environmental Policy Stringency Index (EPS). The study employed a pooled OLS-Discroll-Kraay estimator. The choice of estimator was predicated on the preliminary estimations' post-estimation test statistics. The study employed pooled OLS-Discroll-Kraay estimators due to the detection of heteroscedasticity and cross-sectional dependence. A further bivariate regression, one based in the dynamic fixed effects estimator, confirms the results with regards to the civic engagement variable.

Table 5: Pooled OLS-Discroll-Kraay Estimators, 1990-2015.

	Pooled OLS-Discroll-Kraay	Pooled OLS-Discroll-Kraay	Pooled OLS-Discroll-Kraay	Pooled OLS-Discroll-Kraay	Pooled OLS-Discroll-Kraay
VARIABLES	(1) ln_Patents	(2) ln_Patents	(3) ln_Patents	(4) ln_Patents	(5) ln_Patents
ln_PCI	0.203***	0.132	0.131***	0.143***	0.146***
	(0.0312)	(0.0799)	(0.0195)	(0.0256)	(0.0482)
ln_Participation		0.991***	0.455***	0.485***	0.403***
		(0.208)	(0.0982)	(0.0929)	(0.0955)
ln_Bioeconomy			-1.898***	-1.941***	-2.054***
			(0.143)	(0.143)	(0.203)
ln_Stringency				-0.0997	0.107
				(0.0930)	(0.243)
ln_Recycling					0.343*
					(0.185)
Constant	1.765***	1.451	3.781***	3.694***	2.514***
	(0.303)	(1.204)	(0.378)	(0.442)	(0.540)
Observations	639	174	174	162	129
R-squared	0.035	0.258	0.666	0.682	0.551
Number of groups	26	18	18	18	17

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

The study found that average income level (*ln_PCI*), civic engagement (*ln_Participation*), and recycling rate (*ln_Recycling*) had a statistically significant positive impact on patent activity in the field of biotechnology. A one percent increase of average income leads to a 0.131-0.203 percent increase of patent activity, measured in the quantity of patents registered. A one percent increase in the recycling rate led to a 0.343 percent increase of patent activities. An increase in the share of the population, which is actively or inactively engaged in environmental organizations, caused a 0.403-0.991 percent increase in patent registrations. The bivariate dynamic fixed effects estimator yielded an even more pronounced long-term effect on civic engagement in terms of patent activity: In the long run and according to DFE-estimator, a one percent increase of the share of members involved in environmental organizations can lead to a 0.567 percent increase in biotechnological patent activity (see Appendix). Interestingly, the share of the value added to the bioeconomy, in both gross GDP and environmental policy stringency, have no statistically significant impact on patent activity.

These central finding of this study is that civic engagement determines development of the central driver of successful bioeconomy rollout, which is epitomized in patent activity in biotechnology more than any other factor. Based on the estimations in Table 2, the effect of the increasing civic engagement is 3-5 times greater than the effect of increasing level of average income. This result answers the question on the significance of public participation in the development of bioeconomy, but in the same time raises questions on the causes of causation. Hence, these findings necessitate further qualitative research on the patterns of interaction between civic engagement and technological advancements in biotechnology.

Appendix: Pooled Mean Group Estimator, 1990-2015.

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. xtpmg d.ln_Patents d.ln_Participation , lr(l.ln_Patents ln_Participation ) ec(ec) replace

Iteration 0:   log likelihood =  150.47764  (not concave)
Iteration 1:   log likelihood =  154.98585  (not concave)
Iteration 2:   log likelihood =  155.45466
Iteration 3:   log likelihood =  155.48437
Iteration 4:   log likelihood =  155.48437

Pooled Mean Group Regression
(Estimate results saved as pmg)

Panel Variable (i): ID                          Number of obs      =       153
Time Variable (t): Year                         Number of groups   =        18
                                                Obs per group: min =         4
                                                               avg =       8.5
                                                               max =        25

                                                Log Likelihood     =  155.4844
```

D.ln_Patents	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
ln_Participation	.565786	.0903219	6.26	0.000	.3887584	.7428137
SR						
ec	-.5150845	.1018533	-5.06	0.000	-.7147133	-.3154557
ln_Participation						
D1.	-.0457463	.0838219	-0.55	0.585	-.2100342	.1185417
_cons	1.920345	.398861	4.81	0.000	1.138591	2.702098

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