Shades of green growth scepticism among climate policy researchers

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Abstract

Despite strong promotion of green growth by policymakers and international institutions, there is mounting criticism concerning the compatibility of continued economic growth with sustainability goals. Our survey of climate policy researchers reveals widespread scepticism in high-income countries, supporting the notion that as national income rises, environmental goals prevail over economic growth. This finding underscores the importance of considering alternative post-growth perspectives, including agrowth and degrowth strategies, to cultivate a more comprehensive discourse on sustainable development strategies.

Main text

Proponents of *green growth* believe in the desirability and feasibility of aligning environmental goals with continued economic expansion[1]. At its core, green growth seeks to increase gross domestic product (GDP) while decoupling it from environmental pressures such as greenhouse gas emissions. The concept has become almost ubiquitous among policymakers and international institutions, including the World Bank, the European Union (EU), and the Organization for Economic Co-operation and Development (OECD)[2,3,4]. Nonetheless, a growing body of research within the scientific community is challenging the idea that green growth is fundamentally possible or even desirable[5,6,7].

Scepticism around green growth has led to the emergence of a new economic paradigm, *post-growth*, which emphasises the need to prioritise sustainability, social justice, and human well-being, even if this means a reduction in material consumption and economic activity[8]. Post-growth advocates argue that the pursuit of infinite economic growth is incompatible with planetary boundaries and that alternative economic models are needed to achieve long-term sustainability and well-being[9]. Within the broader post-growth framework, *degrowth* stands as a pronounced stance, critiquing capitalism and advocating for a deliberate and equitable reduction in material consumption and economic activity in high-income countries to achieve more sustainable and socially just societies[10].

A third alternative to the green versus degrowth division has also been proposed, *agrowth*, representing the idea of growth agnosticism[11]. The central stance of agrowth is that progress should not be judged solely through GDP due to its inadequacy in reflecting societal well-being. Instead, policymakers should be neutral about economic growth as it could yield both positive or negative outcomes for the environment or social goals. The focus instead should be on the outcomes themselves. We, therefore, interpret agrowth as a middle-ground position situated between the green growth and degrowth paradigms. Both agrowth and degrowth can be considered as shades of green growth scepticism, falling within the overarching post-growth framework.

Building on these diverse perspectives, our study investigates the prevalence of green growth, agrowth, and degrowth positions among researchers in the field of climate change mitigation policy, while also exploring the relationship between these positions and the researchers' country of origin and disciplinary backgrounds. By examining these

factors, we aim to shed light on the nuances within the growth versus environment debate and encourage a broader discussion on sustainable development strategies.

As part of a global online survey of 789 researchers actively publishing on climate change mitigation policy, we posed three questions aimed at capturing respondents' opinions on the growth versus environment debate. Our sample included participants from 73 countries of residence and 78 of origin, encompassing a broad range of disciplines from social sciences to natural science and engineering. In the survey, we included a concise three-question tool designed to segment respondents based on their growth-versus-environment opinions[12]. The three questions addressed how economic growth relates to life satisfaction, environmental protection, and development space.

Based on the responses, we identified three clusters of views, which we interpret as representing green growth, agrowth, and degrowth positions (see Methods for details). Of the 764 respondents who answered all questions, 207 (27%) were categorised as holding a green growth position, 342 (45%) an agrowth position, and 215 (28%) a degrowth position.

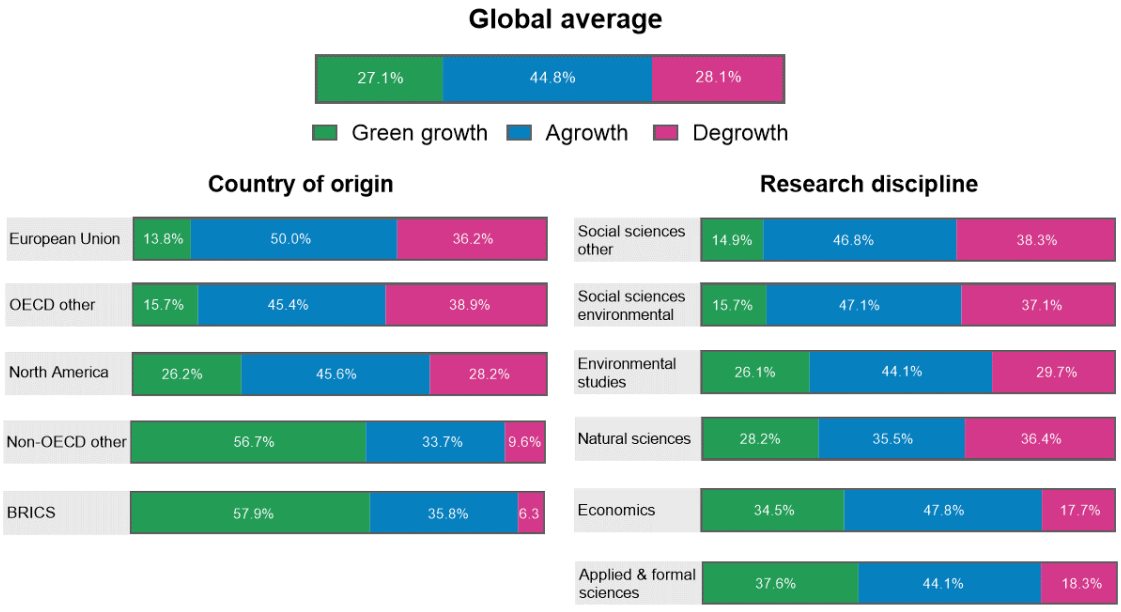


Fig. 1. Respondents' positions on the growth versus environment debate. Distributions by county of residence and detail of group constituents are included in the Supplementary Information.

Distributions of positions with groupings by country of origin and research discipline are presented in Figure 1. Green growth scepticism is widespread among the research community, with 73% of all respondents having opinions – agrowth or degrowth – that could be considered sceptical, with the more moderate position of agrowth being the most popular overall. However, there are notable differences in the degree of green growth scepticism when comparing both researchers' countries of origin and research discipline.

Despite the OECD being one of the principal proponents of green growth, there is a clear divide between OECD and non-OECD countries in terms of green growth scepticism. Researchers from the European Union (EU) and other OECD countries, excluding North America, expressed very high levels of scepticism about green growth at 86.1% and 84.3%, respectively. North American researchers were more favourable towards green growth and less likely to hold degrowth positions compared to those from other OECD countries.

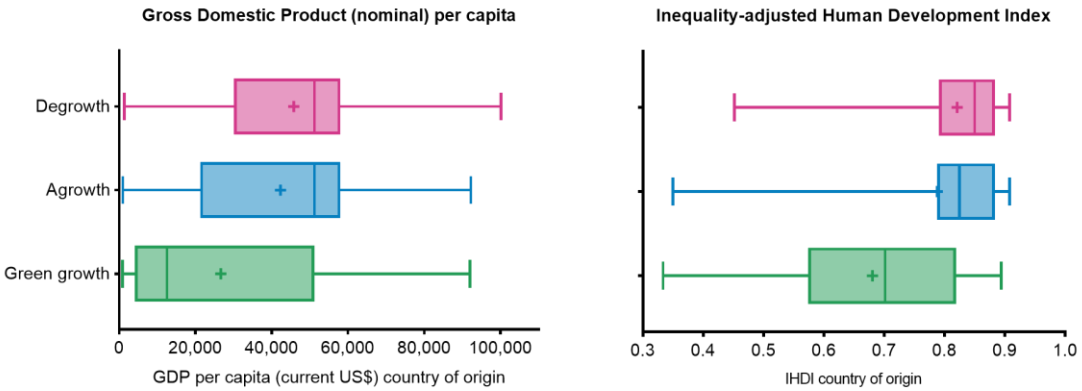
In contrast, more than half of the researchers from non-OECD countries expressed views supporting a green growth position. Researchers from Brazil, Russia, India, China, and South Africa – collectively known as the BRICS – were slightly more in favour of green growth and against degrowth than those from other non-OECD countries. This may be influenced by these countries' self-identified status as emerging economic powerhouses.

A clear divide is also apparent when considering respondents' disciplines. Social scientists, excluding economists, were the most sceptical of green growth, with 84.7% of environmental social scientists and 85.4% of other social scientists (predominantly political scientists) expressing sceptical views. Alongside natural scientists, who displayed a fairly even distribution across the three positions, social scientists were also the most favourable towards degrowth. It should be noted that ecological economists were included in the environmental social science category due to their distinct perspectives compared to more mainstream environmental economists[13].

Environmental and other economists along with applied and formal scientists (predominantly engineers) expressed the strongest preference for green growth. This green growth preference may reflect the optimism within conventional modelling approaches that technological solutions can reconcile economic growth and climate goals, while other social scientists may be more critical of the limitations of current models and their underlying assumptions[9].

Regression analysis was performed on the growth positions against the gross domestic product (GDP) per capita of the respondents' country of origin. A clear and statistically significant relationship was found, showing that respondents' positions move away from green growth and towards degrowth as the GDP per capita of their country of origin increases. Similar but slightly weaker results were also found for respondents' country of residence, which are reported in the Supplementary Information. The relationship between growth preferences and GDP per capita held with even stronger explanatory power when adjusted for purchasing power parity, which is further detailed in the Supplementary Information.

The analysis was repeated for the Inequality-adjusted Human Development Index (IHDI) to capture a broader measure of development. The IHDI is a composite metric of per capita income, life expectancy, and education, with adjustments for the level of inequality in each dimension. Our results suggest an even stronger and significant relationship between growth position and IHDI, implying that welfare measures other than income can also explain views on the growth versus environment debate. Distributions of positions and regression results for nominal GDP per capita and IHDI are shown in Figure 2.



	Position	Green growth	Agrowth	Degrowth
Constant	1.668*** (0.049)	8.857×10^{-2} (0.146)	-0.602*** (0.141)	-1.598*** (0.169)
GDP (nominal) per capita	8.767×10^{-6}*** (1.054×10^{-6})	-3.078×10^{-5}*** (3.752×10^{-6})	9.934×10^{-6} ** (3.023×10^{-6})	1.608×10^{-5}*** (3.427×10^{-6})
R^2 / Pseudo R^2	0.084	0.137	0.02	0.04

	Position	Green growth	Agrowth	Degrowth
Constant	0.581*** (0.138)	3.088*** (0.447)	-1.562*** (0.425)	-4.775*** (0.677)
IHDI	1.868*** (0.177)	-5.480*** (0.592)	1.777** (0.540)	4.860*** (0.827)
R^2 / Pseudo R^2	0.130	0.174	0.02	0.09

Fig. 2. Growth position and relationships to GDP per capita and IHDI in the country of origin. Boxes show the interquartile range and median values, whiskers show the 1–99 percentiles, and "+" symbols indicate the means. Position is a variable taking the value 1 for green growth, 2 for agrowth, and 3 for degrowth. Each growth position is also regressed as a binary variable, the results of which are shown in the tables below the graphs. Standard deviations are provided in parentheses. Asterisks ***, **, and * indicate 0.1%, 1%, and 5% significance, respectively.

Our findings suggest that as national income rises, scepticism regarding the compatibility of continued economic growth and sustainability goals increases. This relationship implies that as income rises there might be growing belief among experts in the post-growth notion that beyond a certain point, prioritising GDP increase is misguided as the social and environmental costs of pursuing further growth may exceed the benefits[8]. Additionally, this could also imply that there is strong support from experts for prioritising efforts to stay within planetary boundaries once society's basic needs are met[14].

The more pronounced relationship with IHDI suggests that factors beyond income, including inequality and other development goals, contribute to prioritising environmental objectives over economic growth. Future research could explore additional factors influencing patterns of green growth scepticism, such as specific cultural or geopolitical aspects of countries. This may help further clarify, for example, why the USA shows greater support for green growth compared to the EU and other OECD countries despite its higher GDP per capita. Examining the perspectives of researchers focusing on environmental issues other than climate change could also be valuable.

In conclusion, green growth scepticism is more prevalent among researchers in high-income countries than might be expected from its extensive institutional and political support. Greater consideration should be given to alternative post-growth perspectives, including agrowth and degrowth strategies. The survey results also have implications for climate policy: in terms of policy instruments, supporters of green growth favour innovation subsidies while degrowth proponents prefer direct regulation (see Table S6 in Supplementary Information). Our findings underscore the importance of fostering a more inclusive and diverse dialogue on sustainable development that goes beyond the green growth paradigm.

Methods

Our analysis is based on a sample of 789 researchers who published at least one article between 1 January 2016 and 22 June 2021, indexed in the Web of Science database with the following terms in its title: "carbon pric*" OR "carbon tax*" OR "cap-and-trade" OR "climate polic*" OR "mitigation of climate change" OR "climate change mitigation". This search resulted in 10,822 documents and 15,070 unique email addresses, which were contacted between mid-September to the end of December 2021. At the beginning of the survey questionnaire we obtained informed consent from all participants.

The sample covers 73 countries of residence and 78 of origin, demonstrating considerable global representation, with participants from various disciplines including environmental economics (21%), natural science (14%), political science (11%), engineering (11%), and sustainability transition (10%). The average number of years after PhD completion is 18.5, indicating considerable research experience. Detail of the groupings used in Figure 1 can be found in the Supplementary Information, along with comprehensive distributions of respondents by research discipline and country of origin and residence in Tables S1 and S2.

The survey included three statements from the short "Growth-vs-Environment" Module (GEM)[12] to categorise respondents based on their growth-versus-environment opinions. Respondents had to indicate their level of agreement using a Likert scale from 1 (strongly disagree) to 7 (strongly agree): (i) "Continued economic growth is essential for improving people's life satisfaction" (Life satisfaction), (ii) "Economic growth is necessary to finance environmental protection" (Environmental protection), and (iii) "In view of limited natural resources, rich countries may have to give up their economic growth to assure that all poor people in the world can reach a fair standard of living" (Development space).

Subsequently, we used Latent Class Analysis to segment our sample in three clusters (Figure S4 in Supplementary Information indicates three clusters as optimal), which correspond to *green growth*, *agrowth*, and *degrowth* perspectives[15]. As one can see from Figure S5, proponents of green growth and degrowth take opposite views on the three statements while agrowth is in-between the two. Since participants had the option not to answer these questions, we lost 20 participants due to missing observations.

For the regression results in Figure 2 of the main text as well as Figures S6–7 and Tables S3–6 of the supplementary materials, we employed Ordinary Least Squares to regress the growth position variable on GDP per capita and IHDI, sourced from the World Economic Outlook Database[16] and the UNDP Human Development Data[17], respectively. All data are for the year 2021. When testing each position separately as a binary variable, logistic regression was used. Pseudo R^2 was calculated with the Nagelkerke option from DescTools package in R software.

Additional information

Correspondence and requests for materials should be addressed to L.C.K.

Acknowledgements

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Author contributions statement

L.C.K. and I.S. jointly conceived the research and drafted the paper. I.S. and S.D gathered the data. I.S. performed the regression analysis.

Competing interest statement

The authors declare that they have no competing interests.

Data availability statement

The data will be provided on request.

Code availability statement

The computer code will be provided on request.

Inclusion & Ethics

The research project was approved by the Committee on Ethics in Animal and Human Experiments of the Autonomous University of Barcelona (reference number of the case: 5758). Informed consent was obtained from all participants.

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Supplementary Information

Contents

Supplementary Methods

Country groupings

Our survey had two separate questions at the end, "What is your country of residence?" and "What is your country of origin?", both with a drop-down list of countries. Out of the 789 total respondents, 586 gave the same answer to both questions. Figures S1 and S2 display heatmaps illustrating the numbers of respondents based on country of residence and origin, respectively. Table S1 presents the categorisations of respondents into the groupings used for Figure 1 in the main text. Countries were classified according to their membership in the Organisation for Economic Co-operation and Development (OECD). This division was made as the majority of the OECD members are high-income economies with a very high Human Development Index (HDI) relative to non-OECD members. The OECD is also an organisation that is one of the leading proponents of green growth.

Further distinctions were made to differentiate between the EU27, North America (the USA and Canada), and other OECD countries to examine potential differences in growth positions that exist within various segments of the OECD countries. Similarly, non-OECD members were divided into the BRICS – Brazil, Russia, India, China, and South Africa – and other non-OECD countries. This classification was made as the BRICS are large, fast-growing economies with substantial regional and global influence.

Consequently, they may exhibit a distinct profile to other non-OECD members concerning economic growth and sustainable development.

Discipline groupings

Respondents were asked to report their research field from one of 12 predefined fields (e.g. environmental economics, political science). However, about 140 respondents chose "other" instead, providing their own description of their research field. This led to a vast number of fields. Using respondents' self-defined fields and research topics, we reduced this number by categorising fields as follows. First, some respondents were moved to the predefined categories when appropriate. For example, several researchers indicated "public policy" as their field, which is typically considered a subfield of political science. Those indicating environmental science or ecology were added to the natural sciences category. For other respondents, we created several new categories. The largest is what we call "other environmental social science" (n=43), which includes researchers who did not clearly identify themselves with a predefined social science discipline and instead stated another field (e.g., "philosophy"). Two additional categories formed on the basis of these responses were "industrial ecology" and "agriculture/forestry".

For Figure 1 of the main text, we grouped the 15 research fields into six broader categories. Constituents of these groupings along with the numbers of respondents are shown in Table S2. It is worth noting that the research field of "ecological economics" was placed in the "environmental social science" group rather than the "economics" group, which contains environmental economists and other economists. This decision was made because ecological economists and environmental economists considerably differ in their core principles, assumptions, and approaches[13]. It is perhaps not unsurprising, given these differences, that these two disciplines showed one of the largest disparities in the results, with ecological economists showing some of the greatest green growth scepticism while environment economists were some of the most favourable towards green growth.

Policy instrument preferences

Our survey also contained a set of questions regarding support of climate policy instruments. Specifically, we asked about six types of instruments classified by prior

research: direct regulation (e.g., technical standards, quotas), carbon taxation, cap-and-trade, adoption subsidies, innovation support (e.g., R&D subsidies), and information provision (e.g., education or ecolabels) [18]. Researchers were asked to rate the importance of each of these instruments in a climate-policy mix of a country (on a 5-point scale of importance). In Table S6, we provide results of regressing these responses with ordered logit regression on the three clusters of growth position: green growth, agrowth and degrowth.

We find that climate policy researchers with a degrowth position tend to support direct regulation (standards, quotas, bans) significantly more than researchers with green growth perspectives. They also support cap-and-trade and innovation support much less than those with a green growth perspective. Researchers with an agrowth position are also favourable towards innovation support but less so towards adoption subsidies than the green growth cluster. This result may be considered intuitive since adoption and innovation subsidies are meant to stimulate technological diffusion, consumption, and economic growth in the long term, which are most compatible with a green growth perspective.

Supplementary figures

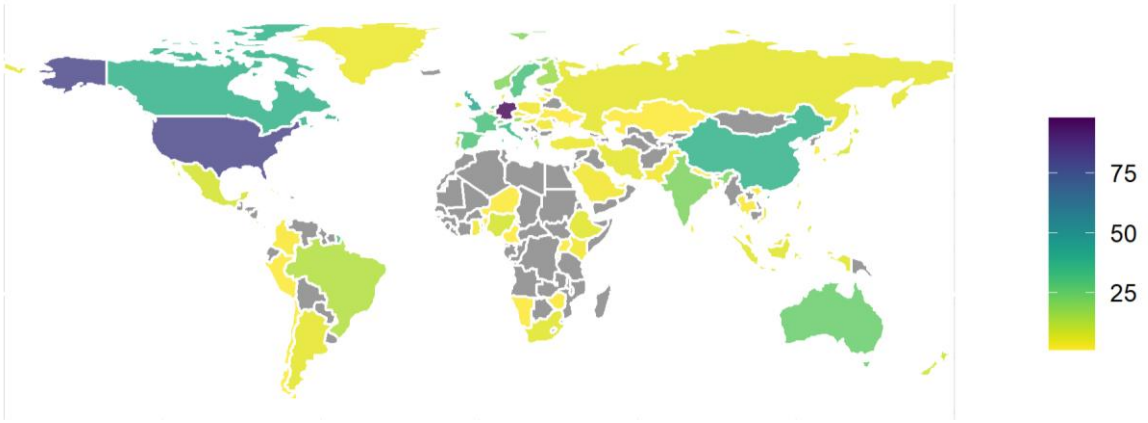

Fig. S1. Number of respondents by country of residence

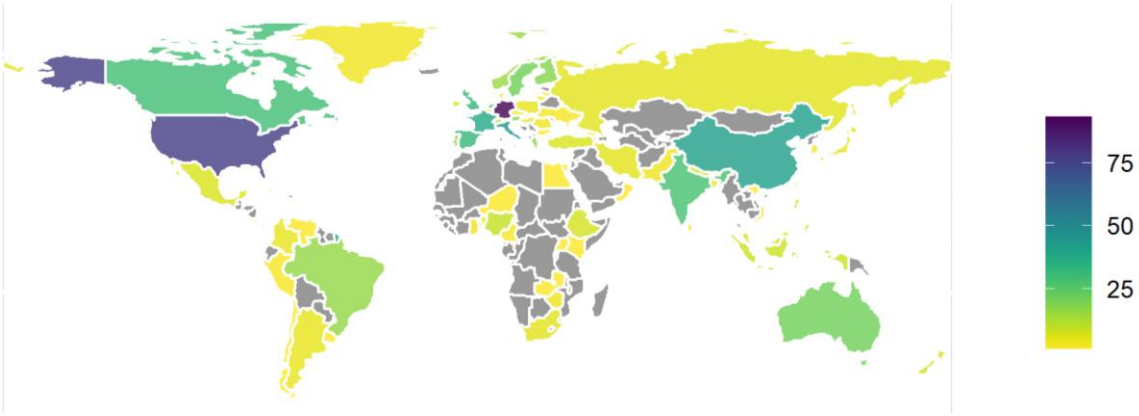

Fig. S2. Number of respondents by country of origin

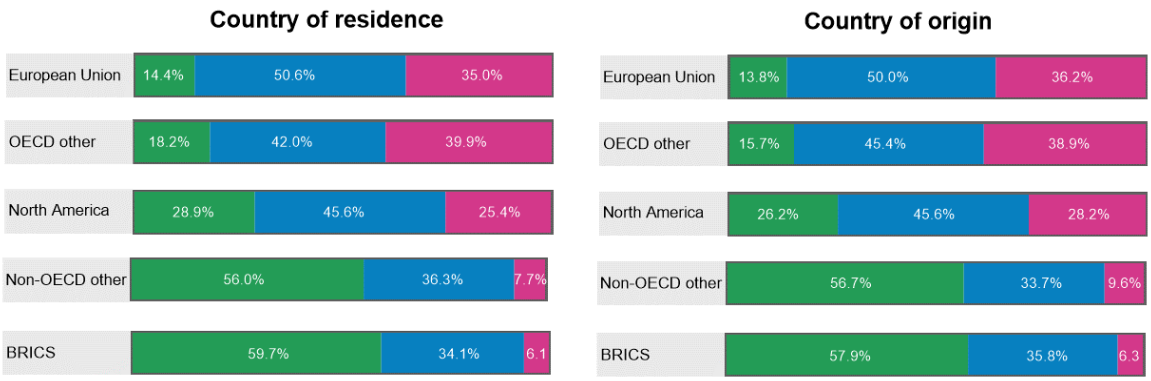

Fig. S3. Comparison of growth positions by country of residence versus origin

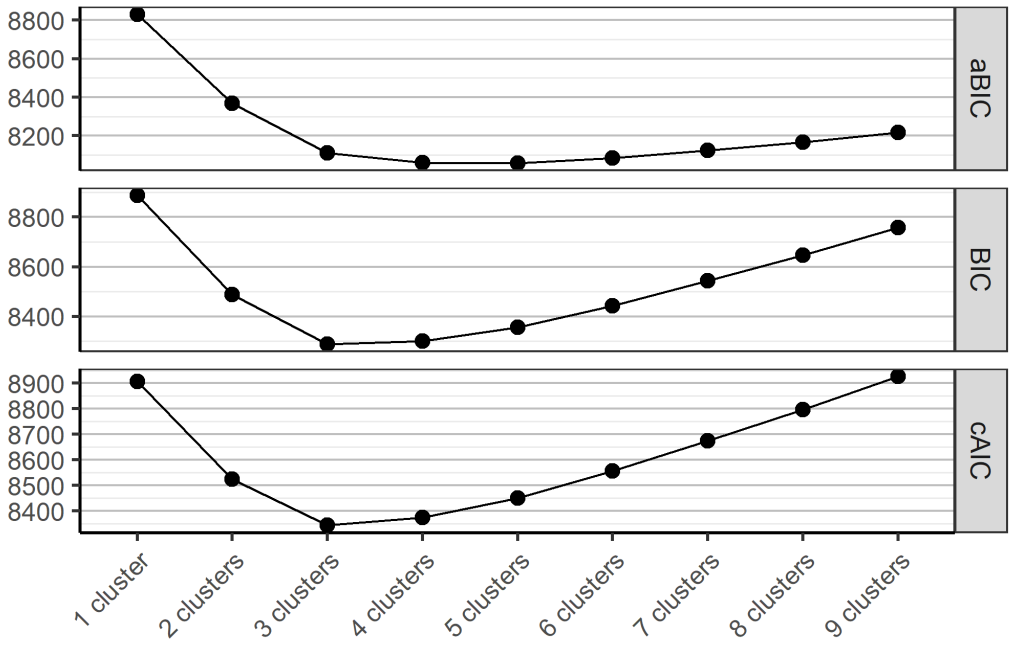

Fig. S4. Plot of information criteria for 1- to 9-cluster solutions for the growth-vs-environment debate.

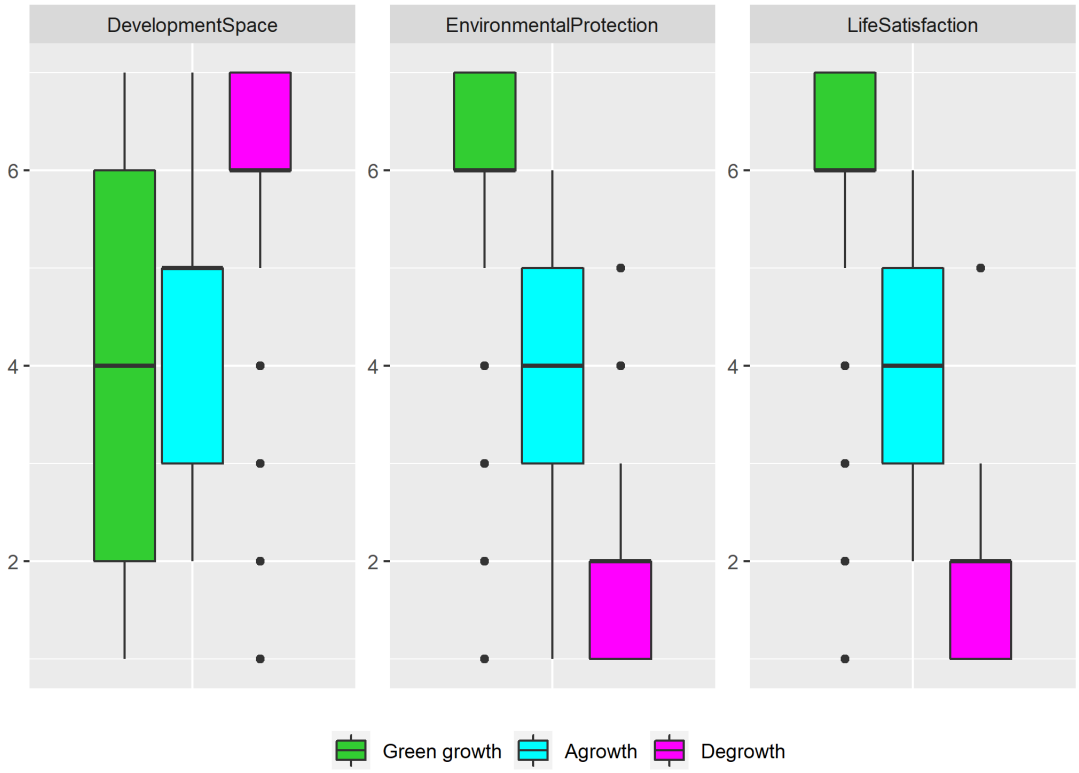

Fig. S5. Distribution of responses for the three resulting clusters on the three statements from the GEM survey tool.

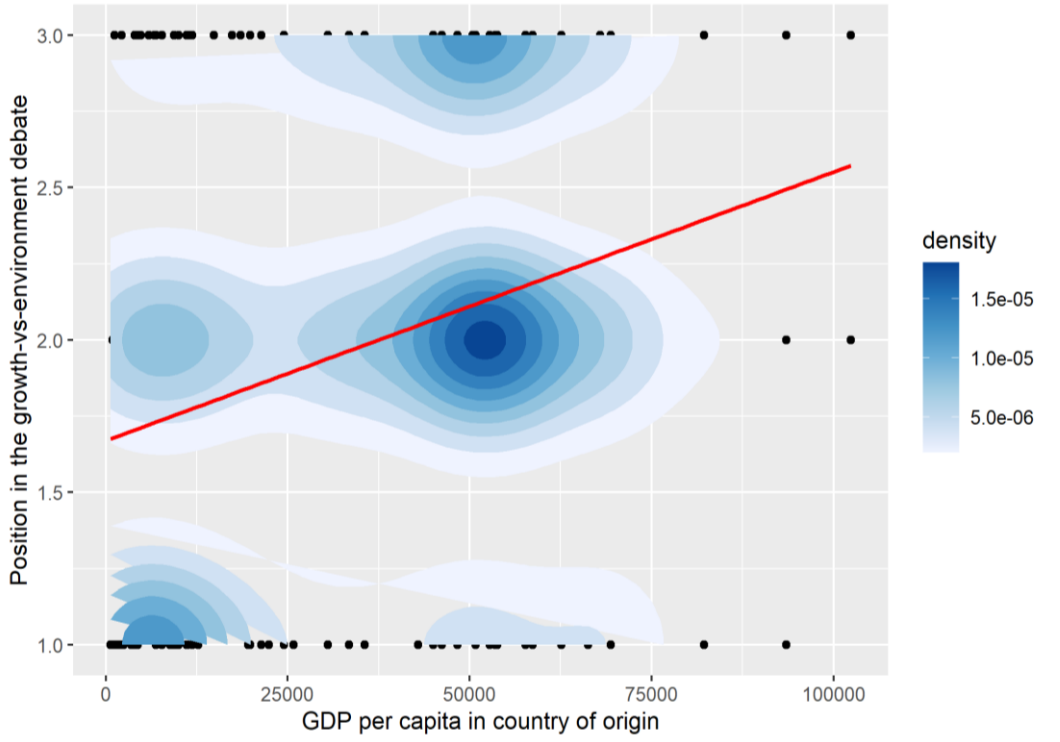

Fig. S6. 2D-density plot of growth position versus GDP (nominal) per capita. Growth position is a variable taking values 1 for green growth, 2 for agrowth, and 3 for degrowth. The red line indicates a fitted linear model.

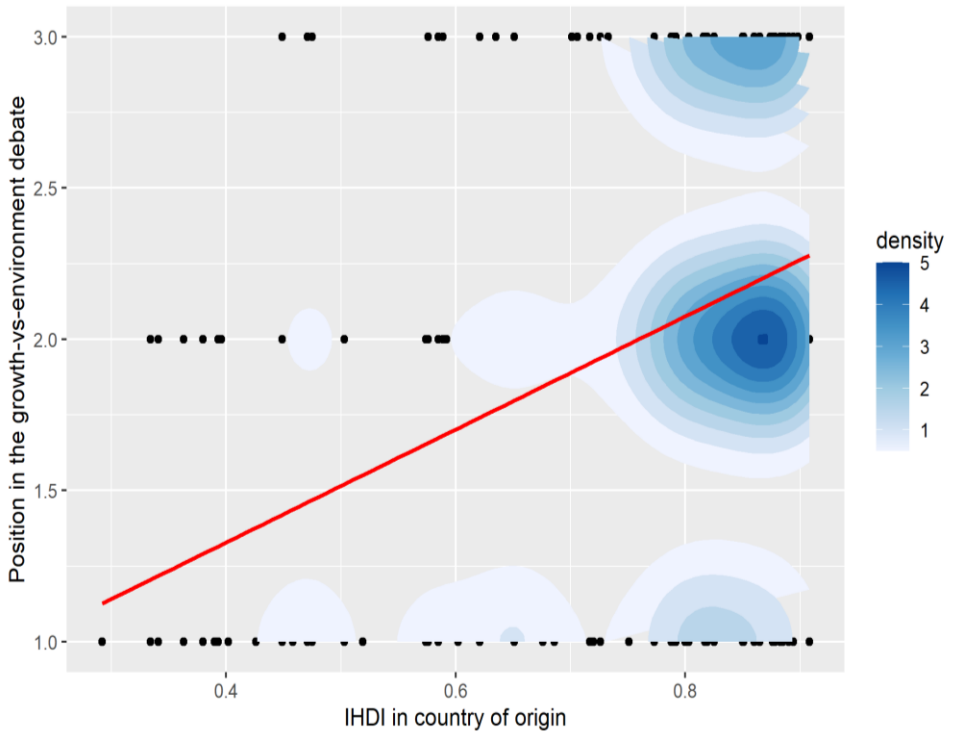

Fig. S7. 2D-density plot of growth position versus IHDI. Growth position is a variable taking values 1 for green growth, 2 for agrowth, and 3 for degrowth. The red line indicates a fitted linear model.

Supplementary tables

Table S1. Numbers of survey respondents categorised by country of origin and residence

Grouping	Country	Number (residence)	Number (origin)
North America		**114**	**103**
	USA	76	74
	Canada	38	29
European Union		**334**	**354**
	Austria	17	17
	Belgium	4	2
	Bulgaria	0	1
	Croatia	2	1
	Czech Republic	3	2
	Denmark	3	3
	Finland	16	18
	France	31	37
	Germany	93	98
	Greece	13	17
	Hungary	3	3
	Ireland	3	5
	Italy	35	45
	Latvia	1	1
	Lithuania	1	2
	Luxembourg	1	0
	Netherlands	29	33
	Poland	3	4
	Portugal	14	15
	Romania	3	3
	Slovakia	2	2
	Slovenia	0	2
	Spain	27	32
	Sweden	30	20
OECD other		**143**	**108**
	Australia	25	20
	Chile	1	1
	Colombia	2	4
	Costa Rica	1	1
	Japan	7	4

	Mexico	8	6
	New Zealand	9	7
	Norway	19	14
	South Korea	1	2
	Switzerland	24	11
	Turkey	4	6
	United Kingdom	42	32
BRICS		**82**	**95**
	Brazil	12	15
	China	38	42
	India	21	28
	Russia	5	5
	South Africa	6	5
Non-OECD other		**91**	**104**
	Argentina	5	4
	Bangladesh	4	4
	Benin	1	2
	Bhutan	0	1
	Cameroon	1	2
	Cuba	1	2
	Egypt	0	1
	Eswatini	0	1
	Ethiopia	6	7
	Georgia	0	1
	Ghana	3	3
	Indonesia	6	8
	Iran	5	5
	Kazakhstan	1	0
	Kenya	3	1
	Lebanon	1	2
	Malaysia	5	6
	Namibia	1	0
	Nepal	2	7
	Niger	1	1
	Nigeria	7	8
	North Macedonia	1	1
	Oman	0	1
	Pakistan	3	3
	Peru	1	2

Philippines	6	8
Rwanda	0	1
Saudi Arabia	3	0
Serbia	2	3
Singapore	6	1
Sri Lanka	1	2
Taiwan	6	6
Thailand	2	0
Uganda	1	1
Ukraine	1	2
United Arab Emirates	1	0
Uruguay	0	1
Venezuela	0	1
Vietnam	2	1
Zambia	0	1
Zimbabwe	2	3

Table S2. Distribution of survey respondents categorised by their research discipline and groupings

Grouping	Discipline	Number
Applied and formal sciences		**93**
	Engineering	82
	Mathematics & computer science	11
Economics		**226**
	Environmental economics	160
	Economics other	66
Environmental studies		**111**
	Agriculture/forestry	23
	Industrial Ecology	12
	Sustainability transition	76
Natural sciences		**110**
	Natural sciences	110
Social science environmental		**70**
	Ecological economics	27
	Environmental social science other	43
Social science other		**154**
	Geography	41
	Law	10
	Political science	79
	Psychology	11
	Sociology	13

Table S3. Regression results with GDP (nominal) per capita. Standard deviations are provided in parentheses. Asterisks ***, **, and * indicate 0.1%, 1%, and 5% significance, respectively.

		Position	Green growth	Agrowth	Degrowth
Country of origin	Constant	1.668*** (0.049)	8.857×10^{-2} (0.146)	-0.602*** (0.141)	-1.598*** (0.169)
	GDP (nominal) per capita	8.767×10^{-6} *** (1.054×10^{-6})	-3.078×10^{-5} *** (3.752×10^{-6})	9.934×10^{-6} ** (3.023×10^{-6})	1.608×10^{-5} *** (3.427×10^{-6})
	R^2 / Pseudo R^2	0.084	0.137	0.02	0.04
Country of residence	Constant	1.666*** (0.052)	4.339×10^{-2} (0.155)	-0.517*** (0.148)	-1.657*** (0.180)
	GDP (nominal) per capita	8.047×10^{-6} *** (1.047×10^{-6})	-2.620×10^{-5} *** (3.578×10^{-6})	6.983×10^{-6} ** (2.963×10^{-6})	1.614×10^{-5} *** (3.405×10^{-6})
	R^2 / Pseudo R^2	0.084	0.106	0.01	0.04

Table S4. Regression results with GDP (PPP) per capita. Standard deviations are provided in parentheses. Asterisks ***, **, and * indicate 0.1%, 1%, and 5% significance, respectively.

		Position	Green growth	Agrowth	Degrowth
Country of origin	Constant	1.524*** (0.059)	0.479** (0.179)	-0.708*** (0.173)	-1.964*** (0.219)
	GDP (PPP) per capita	1.091×10^{-5} *** (1.190×10^{-6})	-3.567×10^{-5} *** (4.089×10^{-6})	1.108×10^{-5} ** (3.468×10^{-6})	2.197×10^{-5} *** (4.158×10^{-6})
	R^2 / Pseudo R^2	0.100	0.151	0.02	0.06
Country of residence	Constant	1.549*** (0.063)	0.389* (0.192)	-0.616*** (0.182)	-1.933*** (0.228)
	GDP (PPP) per capita	9.688×10^{-6} *** (1.2094×10^{-6})	-3.073×10^{-5} *** (4.051×10^{-6})	8.346×10^{-6} * (3.454×10^{-6})	2.016×10^{-5} *** (4.4120×10^{-6})
	R^2 / Pseudo R^2	0.077	0.112	0.01	0.05

Table S5. Regression results with IHDI. Standard deviations are provided in parentheses. Asterisks ***, **, and * indicate 0.1%, 1%, and 5% significance, respectively.

		Position	Green growth	Agrowth	Degrowth
Country of origin	Constant	0.581***	3.088***	-1.562***	-4.775***
		(0.138)	(0.447)	(0.425)	(0.677)
	IHDI	1.868***	-5.480***	1.777**	4.860***
		(0.177)	(0.592)	(0.540)	(0.827)
	R^2 / Pseudo R^2	0.130	0.174	0.02	0.09
Country of residence	Constant	0.552***	3.016***	-1.412**	-5.198***
		(0.152)	(0.482)	(0.460)	(0.779)
	IHDI	1.864***	-5.223***	1.530**	5.300***
		(0.191)	(0.620)	(0.573)	(0.938)
	R^2 / Pseudo R^2	0.113	0.144	0.01	0.08

Table S6. Regressing support of policy instruments in a policy mix on different growth positions. Results obtained with ordered logistic regression indicate odds ratios with 2.5–97.5% confidence intervals within brackets. Asterisks ***, **, and * indicate 0.1%, 1%, and 5% significance, respectively. Agrowth and degrowth are categorical variables with Green Growth as the reference group.

	Direct regulation	Carbon tax	Cap-and-trade	Adoption subsidies	Innovation support	Information provision
Agrowth	0.99	1.06	0.77	0.71*	0.62*	0.79
	(0.72-1.36)	(0.77-1.45)	(0.56-1.05)	(0.51-0.97)	(0.45-0.85)	(0.58-1.08)
Degrowth	2.02***	1.07	0.35***	0.80	0.46***	0.79
	(1.41-2.92)	(0.75-1.52)	(0.24-0.50)	(0.56-1.14)	(0.32-0.66)	(0.56-1.12)
Pseudo R^2	0.03	0.01	0.05	0.01	0.03	0.01