

## Envisioning Experiments on Regional Science Frontiers

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**ABSTRACT:** Science dynamics has become an established part of scientific research. Over the past years, a broad variety of experimental approaches has been developed to explore the frontiers of the current state of the art—and their shifts—in either separate disciplines or scientific domains, such as expert-opinion consultations, multi-level approaches, living labs, joint decision rooms, scenario methods, imagineering experiments, or interactive envisioning methods. The present chapter will contribute to science dynamics in regional science research by offering findings from an envisioning experiment among some 60 well-known regional scientists, with a view to a critical assessment of past and current performance, so as to initiate an open exploration of promising and challenging research endeavours for the next decades of regional science research. This may range from innovative concept formulation to joint use of open access and big data. This experimental approach serves to pave the road towards proactive strategies and conceptualisations in regional science research and regional policy. The main future concern implicit in the brainstorming experiment appears to be related to spatial justice, next to good governance, and consistency between techniques, methods and theories, as well as an effective interaction with students/scholars and society. This exercise shows that important lessons can also be learned from past scientific mistakes, especially those that were associated with policy failures. New scientific ideas are, of course, pushed by the rise of novel techniques and methods, but also and predominately from evolving new realities, either social or technological. Nevertheless, there are still various doubts concerning the future direction of regional science agenda: Which new thoughts and methods are requested? Which policies must be created and improved? What are the scientific possibilities created by new data? The regional science agenda is full of challenges and promises, but how can

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it be effective? This scoping study does not provide definite answers, but serves to explore uncertain future frontiers.

**JEL Classification:** R10; A13; B40.

**Keywords:** science dynamics; regional science; experts opinion; Q-Method.

**RESUMEN:** La dinámica de la ciencia se ha convertido en una parte importante de la investigación científica. En los últimos años, una amplia variedad de enfoques experimentales se ha desarrollado para explorar las fronteras del estado actual de la técnica —y sus cambios— en una amplia variedad de disciplinas y dominios científicos. Dichos enfoques incluyen consultas de opinión de expertos, enfoques multi-nivel, laboratorios, sesiones de decisiones conjuntas, metodología de análisis de escenarios, experimentos de visualización, o métodos de ideación interactivos. En el presente trabajo contribuye en este ámbito aplicándolo a la investigación en ciencia regional, ofreciendo resultados de un experimento con cerca de 60 científicos reconocidos en el ámbito de esta disciplina, con miras a una evaluación crítica del pasado y de la situación actual. El objetivo además es el de iniciar una exploración de los desafíos para las próximas décadas de la investigación en ciencia regional, incluyendo entornos de formulación de conceptos innovadores o el uso de volúmenes masivos de datos. Este enfoque experimental sirve para facilitar la definición de estrategias proactivas y de conceptualizaciones en la investigación de la ciencia y la política regional.

La principal preocupación futura implícita en el experimento está relacionada con la justicia espacial, junto con el buen gobierno, y la coherencia entre las técnicas, métodos y teorías, así como una interacción efectiva entre los estudiantes / académicos y la sociedad. Este ejercicio muestra que las lecciones importantes también se pueden aprender de los errores pasados, especialmente aquellos que estaban asociados con fallos en las políticas. Las nuevas ideas científicas están, por supuesto, reforzadas por el surgimiento de técnicas y métodos novedosos, pero también a partir de la evolución de las nuevas realidades, ya sea sociales o tecnológicas. Sin embargo, todavía subyacen dudas sobre la dirección futura de la agenda regional de ciencia: ¿Qué nuevos métodos e ideas son necesarios? ¿Qué políticas se deben crear y mejorar? ¿Cuáles son las posibilidades científicas creadas por la aparición de nuevos datos? El programa futuro de la ciencia regional está lleno de retos y promesas, pero ¿cómo puede ser eficaz? Este estudio no proporciona respuestas definitivas, sino que sirve como elemento de reflexión para explorar el incierto futuro y las fronteras de la ciencia regional.

**Clasificación JEL:** R10; A13; B40.

**Palabras clave:** dinámica de la ciencia; ciencia regional; opinión de expertos; método Q.

«Learn from yesterday, live for today, hope for tomorrow.  
The important thing is to not stop questioning»

Albert EINSTEIN

## 1. Setting the Scene: Introduction

The complex evolution of science, including regional science, has—in terms of knowledge acquisition, inspiration sources, unforeseen challenges, new paradigms, unconventional ideas, heterodox perspectives, unanticipated findings, and societal impacts—over the past years become an important focal point of scientific research. Science dynamics has turned into an established part of cognitive exploration and mapping of unknown pathways for research in a knowledge-oriented society. Science in our modern world is often seen as «the discipline of curiosity» (see Groen *et al.*, 1990), inspired by serendipity motives. A need for targeted social science research is built in our understanding of social processes. It helps to recognise answers to critical challenges, and delivers the understanding needed to activate changes in human actions.

Over the past years, a wide variety of experimental and scholarly approaches have come to the fore in order to identify and trace the frontiers of scientific progress—with particular emphasis on shifting boundaries—in either distinct disciplines or in broad scientific—sometimes thematically-oriented—knowledge domains. Examples of such approaches can be found in studies and reports resulting from scientific brainstorm workshops (Kleinstrauer *et al.*, 2016, on Toxicology and Pharmacology), conferences (Sahin *et al.*, 2016, on Neurology), symposia (Cairo and Pinkerton, 2016, on Pediatrics) and scientific societies roundtables (Diener *et al.*, 2014, on Surgical Research). Establishing research priority questions has been particularly fruitful in environmental sciences (Fissel *et al.*, 2012, Feary *et al.*, 2013, Rees *et al.*, 2013, Ingram *et al.*, 2013, Parsons *et al.*, 2014, and Rudd *et al.*, 2014). Each approach differs in the number of scientists surveyed, the way the research questions are identified and how are they weighted. It goes without saying that for a vital science like regional science an exploration of its frontiers is a *sine qua non*.

Here we aim to offer a critical assessment of challenges and perhaps paradigmatic changes in regional science research by providing a novel contribution to science dynamics processes in the spatial sciences in a broad sense on the basis of an envisioning experiment, a so-called «brainshaker», among approximately 60 well-known regional scientists from all over the world. This joint experiment was undertaken in the spirit of Doxiades (1963), the founding father of the Ekistics movement of city planning, an endeavour which after a sailing tour with some 70 world-known scientists along various Greek islands led to the world-known Delos Declaration (1963) which offered a path-breaking and influential multidisciplinary perspective on urban science.

The present contribution provides thus a critical assessment of future key research questions identified and evaluated by regional science experts from various countries. In

order to do so we asked first for a critical assessment of past and current achievements in regional science research, which in turn led to an open exploration of promising and challenging research endeavours for the next decades of regional science. This panoramic overview may range from innovative concept formulation to joint use of open access or spatial big data and serves to open up new roads to creative regional research.

This experimental approach outlines pathways towards and frontiers of proactive cognitive strategies and conceptualisations in regional science research and regional policy. This ambitious endeavour appears to call for renewed or intensified interest in spatial justice, urban poverty, sustainable development, human health conditions, science education strategies, and smart governance of cities and regions (see also Nijkamp and Kourtit, 2015; Kourtit *et al.*, 2015). In addition, the achievement of a vital, future-oriented regional science prompts the need for a consistent design of theories, methods and policies, as well as for an informed interaction between theorists and practitioners. Such desiderata have no doubt far-reaching implications for research, training, planning and policy practice, as we have to avoid scientific, educational or planning mistakes that induce policy failures in the spatial domain. Clearly, new scientific ideas and findings are propagated by both technological and societal novel challenges and methodologies.

A prominent question of increasing importance for a future research agenda is: what is a promising and effective regional science agenda in the ever-changing and volatile force field of science dynamics? How can such an agenda complement other research strategies on a high standing in academia? Which program can build sufficiently strong «bonding and bridging» mechanisms for an effective sound relationship and interaction between regional science research, regional policy and regional development?

We follow here a bottom-up approach in a two-step procedure. We firstly issued an open questionnaire, directed to a closed and selected group of researchers involved in a focussed research workshop, which was used to identify a list of 37 themes, statements and priorities of what is the present and specially the future perspective of regional science. In the second step, this list was ranked by some 60 scientists by means of an internet survey. A multivariate analysis was next used to distil meaningful and interpretable statistical results, using the first round as a frame of reference. Our procedure is in line with exercises developed in other disciplines (see Rudd, 2014), but is to our knowledge new in regional science.

Section 2 describes the first step of the procedure, where the research areas are identified, while Section 3 presents the results of the online survey and the multivariate analysis. The chapter concludes with a sketch of long-term oriented lessons and recommendations on frontiers and future research foci in regional science (Section 4).

## 2. Update the Agenda for Regional Science

To update the research agenda for regional science, well-known regional scientists and experts in this field were invited to participate in a so-called «brainshaker»

experiment in two stages, which aimed at generating original ideas and developing strategic perspectives on the future of the spatial sciences from a multifaceted and translational perspective.. To prompt a heterodox discussion among spatial scientists from all over the world, in the first stage of our exploratory science dynamics experiment, a series of unconventional issues was put forward in a self-composed statements questionnaire at a workshop<sup>1</sup> in Amsterdam. Then, this approach provided a record of the main findings from the responses of the first-stage brainshaker experiments, in which several broad questions (see Table 1) on regional science were raised and answered by some 30 well-known experts in the field. These challenging issues serving to generate heterodox perspectives will now successively be addressed.

**Table 1.** Provocative statements on regional science

<i>NR</i>	<i>Statements</i>
1	Regional science exists for more than 60 years already. Mention 2 unanswered questions in regional science that need to be urgently addressed in the next decade(s), and why.
2	Regional science evolution is characterized by shifting paradigms. Mention 2 ideas/concepts/theories in regional science that will change the world by the year 2050, and why.
3	Regional science is sometimes seen as a collection of disconnected studies without an overarching theoretical conceptualization of spatial phenomena. Mention 2 cornerstones of an indigenous regional science theory, and why.
4	If you were able to make a telephone call with the late Walter Isard, the founding father of regional science, which two questions would you like to ask him, and why.

All respondents filled out the above survey questionnaire. The distribution of the respondents who filled out the «brainshaker» questionnaire is as follows (see Table 2). The respondents to these questions were mainly male (75%), with a slight European bias (58%), and falling in the age cohort between 40 and 60 years old (58%). There were 33% Americans and 8% from the Rest of the World. 21% was younger than 40 and 21% older than 60. These figures are close to the demographics of the 2011 ERSA Conference in Barcelona, one of the largest regional science conference ever, described in Royuela (2012): more than 90% of registered people came from developed countries, two thirds were men, and young people (below 30) representing 24% of attendants. These figures though, contrast a modal cohort at 60-69 at WRSA conferences (Franklin *et al.*, 2011). Our sample thus overrepresents middle-age and established scholars, who are the ones with both experience and upcoming research career; consequently, we believe that the selected group of researchers fits rather well to identify key research and frontier questions in regional science.

<sup>1</sup> Tinbergen Institute Jubilee Workshop 2015 on «*The Future of Spatial Equality and Quality: New Contributions to the Analysis of Human, Social, Entrepreneurial, Creative and Environmental Capital*» on May 7-9, 2015 in Amsterdam.

**Table 2.** Profile of experts-respondents

<i>Geographical Distribution</i>	<i>Age Cohorts</i>	<i>Gender</i>
European 58%	> 60 years 21%	Male 75%
American 33%	45-60 years 58%	Female 25%
Rest of the World 8%	> 45 years 21%	

The results of the abovementioned «brainshaker» experiment led to a very exciting and unconventional exchange of views on the future of regional science research among the participants of the international workshop in Amsterdam. The participants in our «brainshaker» experiment engaged later in fundamental thematically organized debates on new and grand challenges in regional science, the care for the next generation, the social and political relevance of regional science research, its broad societal mission, and regional science curriculum development. The main output of this «open questionnaire» is a group of sentences, propositions and questions that we used to identify a list of statements on the regional science agenda that are classified and analysed in Section 3. In order to clarify how we built such a list, we describe next the main elements of every provocative statement.

## 2.1. Unanswered questions in regional science research

Urgent questions, as yet not addressed in regional science research, may relate to various societal and spatial concerns, as well as to various local or regional problem situations and related policies. About 25% of the unanswered issues in regional science research was focussed on spatial policy and governance, while another 25% was concerned with human aspects, such as happiness, social disparities, poverty and socioeconomic development. Some 10% of the urgent but underrepresented issues were related to spatial sustainability and resource problems, while technical-methodological problems (e.g., the Modifiable Areal Unit Problem, the foundations of the gravity model, spatial-temporal aggregation problems, etc.) also received a relatively prominent position in the answers. It is noteworthy that societal relevance of research—in a general sense—received relatively little attention. From the relatively underrepresented issues in regional science research, 4 topics received a lot of attention, viz., spatial justice (i.e., the product generated by space sustains its development; Dentinho, 2012); smart governance; consistency between techniques, methods and theories; the interaction between academic curricula and society. These four themes will now concisely be discussed.

### **2.1.1. Spatial justice**

Societal values and objectives are an object of research in sociology, social psychology, ethics, philosophy, theology and, more generally, the social sciences and humanities. The spatial sciences incorporate elements from both the social sciences and the humanities, and, in particular, zoom in on the spatial differentiation and coherence of relevant social phenomena in a heterogeneous space. Consequently, heterogeneous space-time patterns should be a focal point of future academic and policy concern in regional science. This prompts the need for due future research attention on spatial (in)justice, not only in terms of its genesis, but also in terms of its impacts and policy remedies. In addition to a meso-macro perspective on spatial justice, there is also a clear need to address the micro backgrounds, in particular in relation to disparities in income, wealth, welfare, access to facilities, happiness, health, safety and security. The spatial sciences ought to regard spatial justice in a broad multidisciplinary sense as a prime focal point of research.

### **2.1.2. Smart governance**

The management of any territory (e.g., state, region, city) is fraught with many hurdles, especially in an open-access society linked together through networks of all kinds. Clearly, spatial justice as a policy objective calls for a balanced governance of regions and cities. The use of cognitive, technological and innovative mechanisms to steer the development of regions and cities towards prosperous, balanced and sustainable territories has led to a new policy conceptualisation, nowadays often called smart governance (Scholl and AlAwadhi, 2016). This novel policy *modus operandi* is strongly supported by digital technology (e.g., e-governance) and has to ensure a symbiosis of economic, social, ecological and technological conditions with a view to achieving a sustainable spatial development. Against this background, smart governance induces far-reaching questions on spatial competences of policies, on property rights and commons in a spatially heterogeneous world, on conflicting behaviours in a multi-actor spatial setting, and on fair financial mechanisms to care for the well-being of all citizens in the future.

### **2.1.3. Consistency between research methods and theories**

Theoretically framed models have become en vogue in regional science research. The need for a consistent mapping of such conceptual-theoretical contributions into the pluriform practice in spatial systems has, however, received far less attention. Sometimes it is not even clear at all whether a model or its underlying theory has been tested. For example, does a rejection of a rank size rule imply that the underlying spatial hierarchy theory or the central place theory has to be rejected as well? This prompts the intriguing question of whether space has its own indigenous theoretical conceptualisation or whether spatial theory is an amalgam of various disciplinary contributions.

The methodological issue at the background is the role of space as an abstract spatial resistance concept or as a concrete action platform. The relationship between

human interaction and spatial gradients deserves both theoretically and empirically more profound attention, as is witnessed by our lack of understanding of complex spatial mobility patterns, such as migration or tourism.

The spatial sciences have strong links with economics, geography, planning, sociology, architecture and network science. The spatial merger of these disciplines in regional science is fraught with complex methodological challenges, with heterogeneous paradigms, with different multi-level analytical frameworks, with an intriguing mix of flexibility and inertia (including resilience) and with varying space-time dynamics in geographical space. The interaction between place, space, channels (or filters) and flows is hard to understand, and forms a major concern in the above mentioned issues of spatial justice and smart governance. Clearly, improved data access and use will enhance sophistication and realism of analysis and modelling in regional science, and may be beneficial for all social scientists engaged in spatial research.

## **2.2. Shifting paradigms**

The evolution of regional science shows fascinating pathways, with different research foci and analytical horizons. Regional science is apparently a science in transition, and will always be. The question is, of course, whether new conceptualisations of regional science—novel theoretical framings, unconventional methodologies, heterodox regional or urban policies—will be instrumental in making a difference in the long run. Clearly, realism forces us to recognize that a multitude of concerns calls for permanent adjustments (e.g., health care, climate change, migration). The multidisciplinary nature of regional science calls for an open eye for new developments in many societal domains. Consequently, the evolution of regional science exhibits paradigmatic features.

The answers offered by the respondents demonstrated quite some variety. Several respondents regarded the design and application of novel techniques and methods as a promising research endeavour that matters. Others were of the opinion that rapidly changing social and technological realities in the space-economy would generate a new analysis framework that would make a difference. And finally, another group of respondents highlighted the increasing importance of new classes of actors in the space-economy, such as large urban agglomerations (including mega-cities) or creative classes.

The general view was that new challenges would prompt the development of new analytical techniques (e.g., big data methods, data mining, digital technologies, interdisciplinary modelling approaches), which might also be instrumental in integrative scientific endeavours linking economic, regulatory, social, environmental and infrastructural perspectives to the spatial sciences. Clearly, many respondents shared the view that a more powerful and rigorous analytical apparatus would benefit the scientific knowledge and policy interventions in spatial systems. Such systems are pluriform in nature so that there is no uniform recipe for addressing the regional «problematique» of spatial sustainability and resilience in an open and global network society.



### 2.3. Myths in regional science

Myths are meant to provide a cognitive framework for coming to grips with a confusing reality. They may be true or false. The science world is full of myths, even though it is the task of scholars to demystify scientific thinking, if there is a contradiction with logical or empirical facts. This also holds for the spatial sciences.

Regional science addresses real-world issues, such as migration, sustainability, urban dysfunctions, poverty traps, and so on, from a multidisciplinary perspective. Some respondents argued that this interdisciplinary orientation is already a myth, as in the absence of a unifying conceptual framework any translational science must fail. Most respondents, however, resorted to the identification of real-world issues as a source of myths. In the view of many participants, a popular but wrong belief in current regional science myths is the proposition of the «flat world» (Friedman, 2007). Instead, barriers in space (either abstract or concrete) may lead to a «spiky world» (McCann, 2007, 2008).

Similarly, the notion of spatial equilibrium as a desirable and end-state of the space-economy was questioned as a serious flaw, based on a myth. Equilibrium is often seen as a mathematical construct, not as a real-world phenomenon.

Indeed, heterogeneity in geographical and socioeconomic spaces constitutes regional science problematic. The challenge is, of course, to design or use a coherent analytical framework for studying such spatial barriers. The real challenge then is whether the belief in new economic geography, cyber geography, spatial econometrics or evolutionary economics/geography would lead to a new myth or to a better understanding of the space-time evolution of our world. Clearly, if scientific results are based on shared and accepted myths, we will no doubt face alarming policy failures. De-mystification is therefore, an important methodological task in future regional science.

### 2.4. Lessons from the past: What would you ask the late Walter Isard?

Studying the scientific inheritance of one of the prominent founding fathers of regional science, the late Walter Isard, is rewarding and illuminating. It is sometimes shocking to realize that over a timespan of more than half a century, the «real» issues have not drastically changed. Various methodological and policy issues from the past are still with us and bother us. Examples are:

- Is regional science concerned with regions (including cities), or with the spatial behaviour of people, or perhaps with the solution of human or policy problems?
- Is a region a connected spatial entity with some common homogeneity, or is a region an action platform for competition, conflict or even war?
- Are we sure that a painstaking effort to understand the complex space-economy through an interdisciplinary lens provides more and better insights than a rigorous monodisciplinary approach?
- Is an interdisciplinary *modus operandi* a fixed methodological bastion, or is this methodological approach itself also evolving over time and space as a response to emerging challenges?

- Does regional science aim to test spatial models and methods, or to test the validity of propositions on human spatial behaviour or policies?

The findings briefly outlined in Subsections 2.1-2.4 formed the basis for an intensive group discussion and a vivid exchange of views among the respondents in the brainshaker experiment. This cognitive process is further highlighted in the next sections.

The subsequent step of our envisioning experiment was to undertake a multivariate analysis of the responses of the participating respondents. These results —and their interpretation— are presented in Section 3. The final part of our study on the future of regional science addresses ways forward and frontiers to be faced; various suggestions on unconventional roadmaps can be found in a concluding Section 4.

### **3. Statements on Regional Science**

#### **3.1. Selection of statements**

In the light of the inferences from the «brainshaker» experiment, we have selected a list of ideas and findings that were proposed by the participants. In our second-round experiment, we have used this large set of challenging statements on the future of regional science, and we have asked a larger group of researchers to evaluate these.

A prominent concern in the exchange of views among respondents was the lack of a clear role articulation of regional science. Serendipity-oriented research appears to be accompanied by practical policy-oriented research without a clear connection between these approaches. It was recognized that blue-sky research in regional science is needed but, that such fundamental cognitive exercises would have to be geared toward the resolution of real-world problems. Think-tank activities would need to find a pragmatic balance between different research orientations. This new institution should be a «breaker» and promoter of ideas. The attention in such a think-tank setting might be focussed, *inter alia*, on the following elements of our knowledge horizon:

- A better understanding of the backgrounds, characteristics and impacts of human goals and values in the context of space and time.
- An improvement of the consistency between the theoretical framework of regional science and the available research toolkit.
- An enhancement of our insights into the spatial-functional role of cities, regions and nations as a spatially connected network of actors, places and spaces.
- A more thorough examination of the functionalities of space (including its barriers) in relation to connected places and actors in a given territorial system.

In this spirit of such fundamental issues in regional science, 37 phrases were selected; most of the thoughts were taken into consideration while avoiding redundancies (see Table 3).

**Table 3.** Statements on regional science

<i>NR</i>	<i>Statements</i>
1	What really matters in the spatial sciences is economic growth, happiness, quality of life and well-being.
2	We need to look more at territorial disparities and conflicting behaviours.
3	It is important to study the reasons why culture influences welfare distribution.
4	The kind of regional policy, where and for whom, deserves more attention.
5	The question on how effective policy is in reducing regional inequities is important.
6	We need to analyse the differential spatial-economic impacts of megatrends, such as ageing and climatic change.
7	The role of cities, regions, nations and unions, and how to invent the best governance for the world, is a prominent research issue.
8	The role and functions of the common in the city of the 21st century is relevant.
9	It is important to address the question on how to plan housing and suburban growth in the context of unstable and informal economic relations.
10	There should be a general theory of human interaction that goes beyond what we have learnt so far.
11	Reconciliation of the rank-size rule with the theory of the urban economy is an important research challenge.
12	It is important to find out what we can learn from industrial districts to promote creative and innovative districts.
13	It is relevant to know what the relation is between investments in global financial markets and the location of activities.
14	What will be the impact of free migration becomes an important issue.
15	It is important to know how we can trace the path / timing / dynamics of adjustments to exogenous shocks in a regional economic system.
16	How perceptions and cognition impact the development trajectory of regional economies is an important question.
17	How people behave and respond to new spatial (physical and non-physical) connectivity structures needs more attention.
18	Improved data availability and reporting will enhance sophistication and realism of analysis and modelling.
19	When the constraint of telecommunication is overcome, the main constraint will be communication between humans.
20	All studies of new technologies will pass.
21	Regional science paradigms have always been challenged by analytical techniques.
22	We need the integration of the analysis of global economic, social and demographic dynamics into spatial, localized decisions.
23	We should look at space as a theoretical object of research.

**Table 3.** (continue)

24	Christaller's and Lösch's work represent the cornerstones of an indigenous regional science theory.
25	Celso Furtado with Raúl Prebisch argue rightly that underdevelopment tends to self-perpetuate under changing forms.
26	What unifies regional science is the object, not the theory (Medicine, as a discipline, does not have a paradigm and does not need one).
27	Regional science is an interdisciplinary group of people who usually do not mix and talk to each other.
28	Walter Isard moved towards peace science; was it to address the question: why are most wars and conflicts territorial?
29	We need to promote teaching workshops recognized by universities.
30	We need to certify courses that are provided by universities.
31	Regional science main courses are: regional economics; urban economics.
32	Regional science main courses are: geographical information systems; territorial planning.
33	Regional science main courses are: research methods; econometrics.
34	Regional science main courses are: input-output analysis, spatial interaction and CGE models.
35	Regional science main courses are: decision support systems and planning models.
36	Regional science main courses are: transport and network economics.
37	The main task of regional science is to become a recognized discipline.

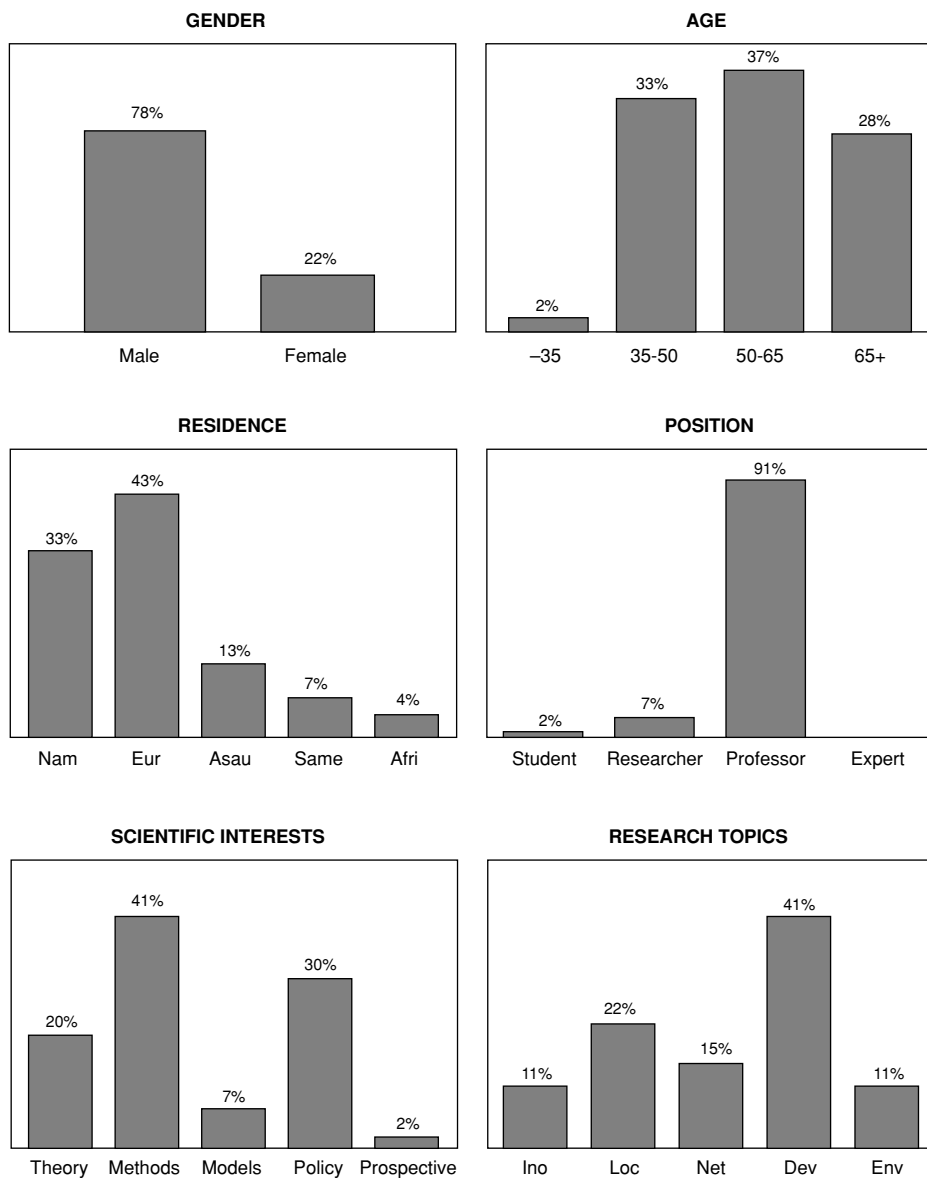
### 3.2. Ranking of statements on Regional Science

Those phrases were sent to a group of regional scientists that were asked to classify them according to the level of agreement. The surveyed group was intentionally formed mostly by established scholars. We tried to work with a representative group of people and at the same time be diverse in terms of several variables. The respondents, with some overlap with the first group, were identified by gender (male, female), age (< 35, 35-50, 50-65, > 65), residence (Europe, North America, South America, Asia-Oceania and Africa), position (PhD Student, Researcher, Professor and Expert), scientific interest (Theory, Methods, Models, Policy, Prospective Analysis) and research topic (Location, Development, Innovation, Networks and Environment).

Most of the 46 participants<sup>2</sup> in the questionnaire were male, senior, coming from Europe or North America, Academics, more interested in Methods and Policies than theory of policy, and mainly focused on Development issues (see Figure 1). Again,

<sup>2</sup> This sample size is more than enough for the Q method analysis that is undertaken (Robbins and Krueger, 2000).

**Figure 1.** Characteristics of the respondents



some of these demographics are similar to the figures of regional science attendees to international conferences<sup>3</sup>.

<sup>3</sup> In a revision of the main trends of regional science by analyzing the 51st ERSA conference in Barcelona, Royuela (2012) found that 63% of attendants were men, being such proportion higher (79%) for Full professors.

Crossing some of these data, academics interested in *Innovation* and *Location* are more keen on theory; those more focused on *networks* are more attracted towards *methods*; the ones who prefer *development* issues are also more inclined to favour *policy evaluation*; finally, *environmental issues* are mainly related to *prospective analysis*.

Out of the 37 statements, some received a higher level of agreement while some others were less supported by all participants. Three phrases received a negative total grade: «All studies of new technologies will pass» (20), showing that regional scientists take seriously their interest in innovation issues. This is further reaffirmed when they deny that «Regional science is an interdisciplinary group of people who usually do not mix and talk to each other» (27). Finally, they hope that development can reach all, rejecting «Celso Furtado's and Raúl Prebisch's argument that underdevelopment tends to self-perpetuate under changing forms» (25). On the other hand, the three winning and preferred phrases show that there is a clear interest in spatial justice by inquiring «How effective is policy in reducing regional inequities?» (5). This can change, for better or worse, due to uncontrolled scenarios, expressed in the question: «What are the differential spatial-economic impacts of megatrends, such as ageing and climatic change (6)?», while the following statement is clearly liked: «Improved data availability and reporting will enhance sophistication and realism of analysis and modelling» (18). Table 4 summarises the support for each individual statement.

**Table 4.** Statements on future regional science ordered by the support received

<i>NR</i>	<i>Statements</i>	<i>Wheighted Support</i>
18	Improved data availability and reporting will enhance sophistication and realism of analysis and modelling.	122
6	We need to analyse the differential spatial-economic impacts of megatrends, such as ageing and climatic change.	118
2	We need to look more at territorial disparities and conflicting behaviours.	112
5	The question how effective policy is in reducing regional inequities is important.	112
1	What really matters in the spatial sciences is economic growth, happiness, quality of life and well-being.	111
7	The role of cities, regions, nations and unions, and how to invent the best governance for the world, is a prominent research issue.	110
4	The kind of regional policy, where and for whom, deserves more attention.	95
22	We need the Integration of the analysis of global economic, social and demographic dynamics into spatial, localized decisions.	89
13	It is relevant to know what the relation is between investments in global financial markets and the location of activities.	82
10	There should be a general theory of human interaction that goes beyond what we have learnt so far.	74
3	It is important to study the reasons why culture influences welfare distribution.	73

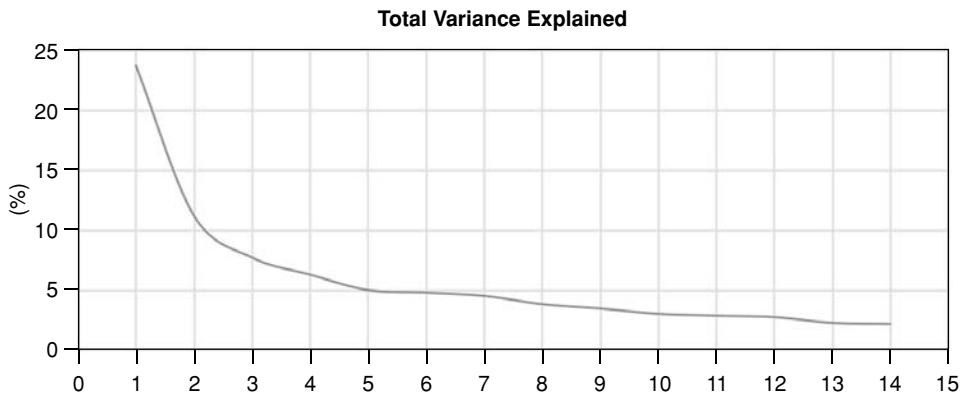
**Table 4.** (continue)

29	We need to promote teaching workshops recognized by universities.	70
31	Regional science main courses are: regional economics; urban economics.	67
12	It is important to find out what we can learn from industrial districts to promote creative and innovative districts.	65
8	The role and functions of the Common in the city of the 21st century is relevant.	63
33	Regional science main courses are: research methods; econometrics.	54
9	It is important to address the question how to plan housing and suburban growth in the context of unstable and informal economic relations.	53
23	We should look at space as a theoretical object of research.	51
30	We need to certify courses that are provided by universities.	48
16	How perceptions and cognition impact the development trajectory of regional economies is an important question.	46
19	When the constraint of telecommunication is overcome, the main constraint will be communication between humans.	44
32	Regional science main courses are: geographical information systems; territorial planning.	40
36	Regional science main courses are: transport and network economics.	40
34	Regional science main courses are: input-output analysis, spatial interaction and CGE Models.	39
24	Christaller's and Lösch's work represent the cornerstones of an indigenous regional science theory.	31
37	The main task of regional science is to become a recognized discipline.	30
26	What unifies regional science is the object, not the theory (Medicine, as a discipline, does not have a paradigm and does not need one).	27
35	Regional science main courses are: decision support systems and planning models.	24
21	Regional science paradigms have always been challenged by analytical techniques.	23
11	Reconciliation of the rank-size rule with the theory of the urban economy is an important research challenge.	14
28	Walter Isard moved towards peace science; was it to address the question: why are most wars and conflicts territorial?	13
25	Celso Furtado with Raúl Prebisch argue rightly that underdevelopment tends to self-perpetuate under changing forms.	-17
27	Regional science is an interdisciplinary group of people who usually do not mix and talk to each other.	-25
20	All studies of new technologies will pass.	-35

### 3.3. Regional science perspectives

Clearly, our sample to explore the relative preference of each phrase is limited. Nevertheless, the sample is more than enough to identify the main perspectives on regional science. To get this, the valuations provided by the respondents were standardized and a principal component (PC) analysis taking the respondents as variables was undertaken. This Q Method approach identified 14 factors with eigen-values higher than 1, that explain 84% of the total variance of the respondents' valuations. Even though this first result does not express a strong consistency among regional scientists, such a diversity is quite common when interviewees are not really stakeholders defending their interests, but independent academics who care about a scientific approach to human interaction in space. We also interpret these results as a sign of diversity in the 37 selected statements resulting from the first experiment explained in point 2 of this chapter. Clearly, the large number of identified factors is a consequence of both the diversity in the perspectives that regional science has to cover but also the outcome of the different points of view of scientists. Next, we describe the main factors resulting from our PC analysis, including the characteristics of the people supporting the main arguments.

**Figure 2.** Variance Explained by the Factors of the Principal Component Analysis

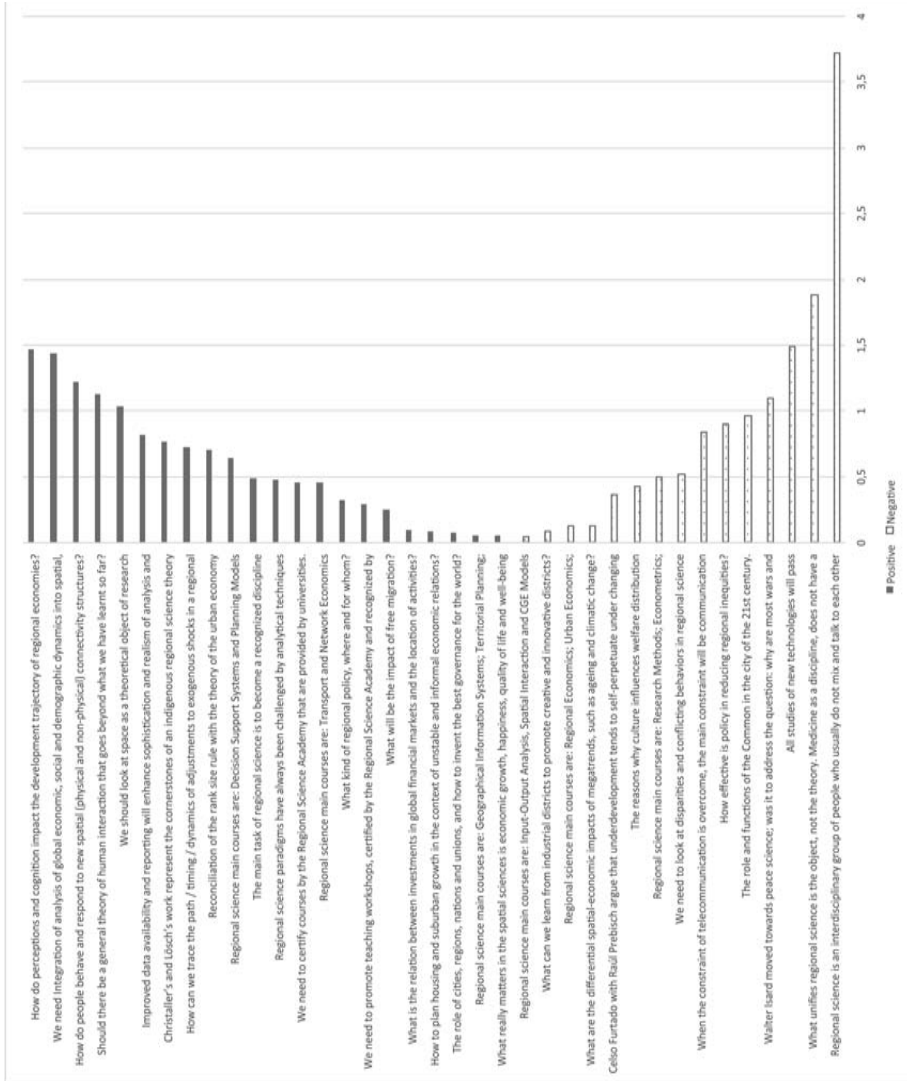


#### • **Factor 1: Human Interaction in Space**

The first factor from a Principal Component Analysis is united in denying that «Regional science is an interdisciplinary group of people who usually do not mix and talk to each other». This general denial of a provocative statement is compensated by a clear focus on object of study: *Regional Science tries to understand Human Interaction in Space and with Space*. This is a perspective shared by most of the regional scientists interviewed. Nevertheless, those who are more identified with it are young, female, coming from all continents, mostly interested in *methods* and *policy*, and very much focused on *networks and development*.



Figure 3. Factor 1: Human Interaction in Space



• **Factor 2. Spatial Interdisciplinarity for a General Theory of Human Interaction**

The second common factor can be found in the denial of the need for regional science to become a recognised discipline. It is noteworthy that this factor supports complementing different disciplines around a *General Theory of Human Interaction in Space and with Space*, while refusing that any discipline or method can be more important than any other one. Spatial data seems to be the major concern of this perspective. The respondents that favour this point of view are mostly middle aged, male, coming from all continents, with diversified scientific interests but relatively more interested in development and environmental issues than their colleagues who identified more with other perspectives.

• **Factor 3: Advanced Training for Territorial Competence**

The third factor can be named *Advanced Training for Territorial Competence*, since it favours addressing territorial issues (development, conflicts, etc.) supported by advanced training. The representatives of this position are: relatively young, mixed, coming from various parts of the world, focused on policy and methods, but with diversified topics to be addressed.

• **Factor 4: Regional Science - Science of Cities. Methods and Training for Better Spatial Regulation**

Principal component 4 values most statements stressing the role to be played by cities in the 21st century. It can be also interpreted as supporting *Methods and Training for Better Spatial Regulation*. It is somehow similar to Factor 5, but more focused on improving regional policies. The defendants of this attitude are: relatively young, strongly mixed, coming from remote places of all continents, mostly interested in methods, and very much focused on location topics.

• **Factor 5: Regional Policy: Regional Science for a Better World**

Perspective 5 puts a high value on the role to be played by regional policy. Regional and urban analysis has to look into the behaviour of people, institutions and organizations in space. Scientists associated with this perspective are: relatively young, mixed, coming from Europe and North America, interested in theory, and aiming at addressing development topics.

• **Factor 6: Scientific Response to Emerging Challenges**

Perspective 6 refuses that space be the object of study and that regional science should be a territorial discipline, but defends that regional science should become a

**Figure 4.** Factor 2: Spatial Interdisciplinarity for a General Theory of Human Interaction

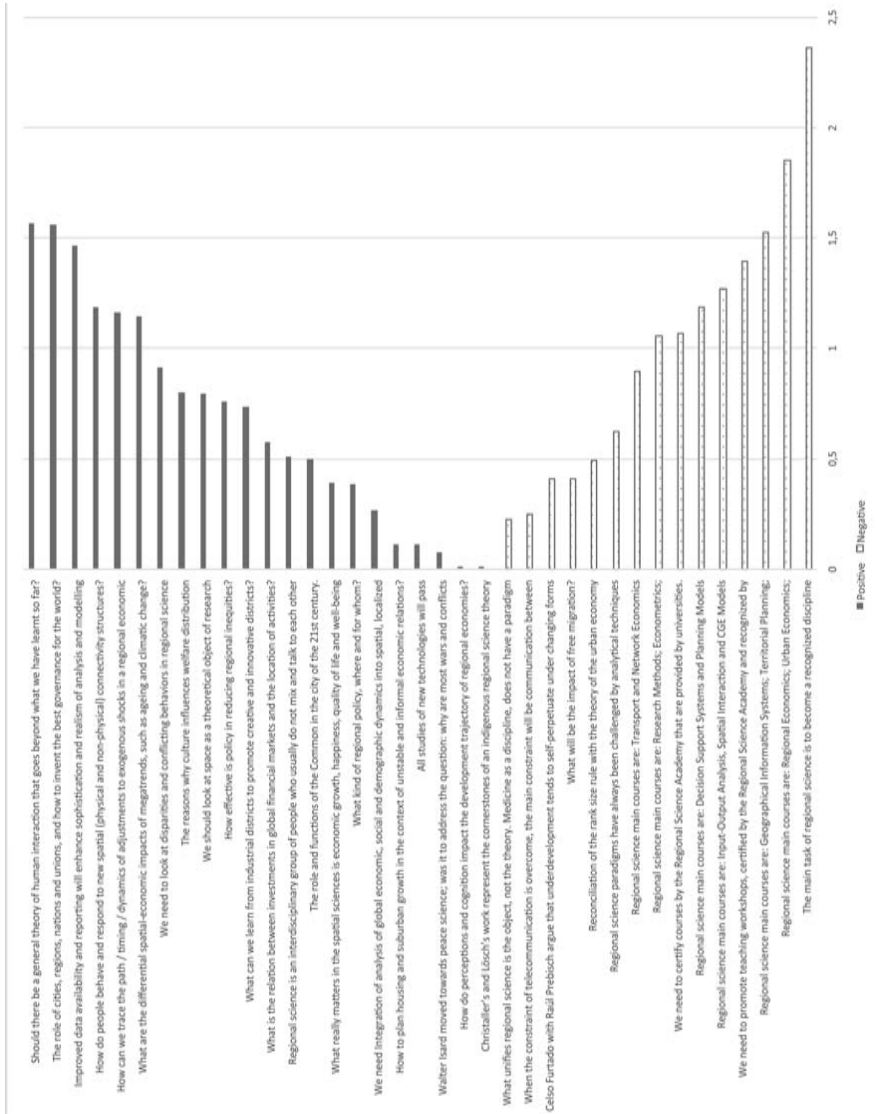


Figure 5. Factor 3. Advanced Training for Territorial Competence

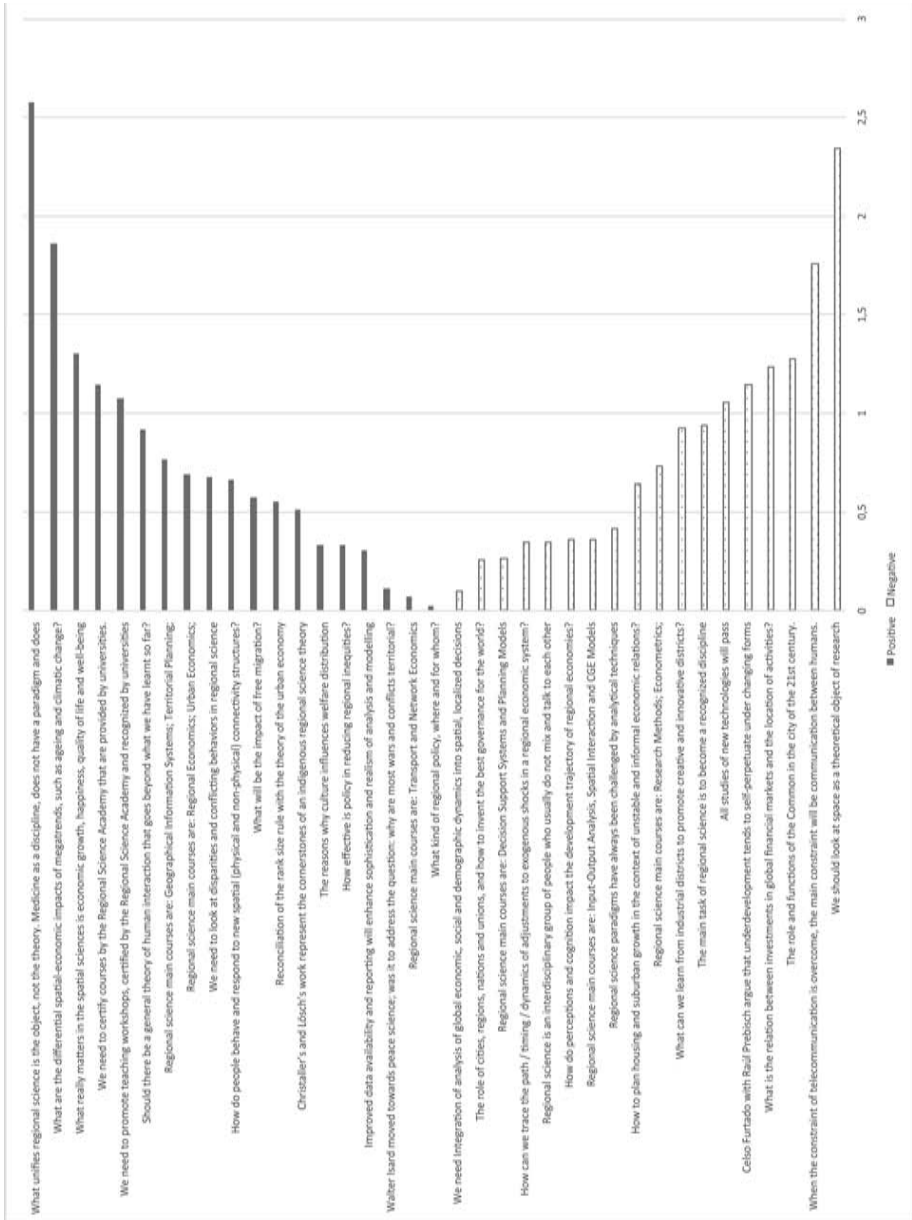


Figure 6. Factor 4. Methods and Training for Better Spatial Regulation

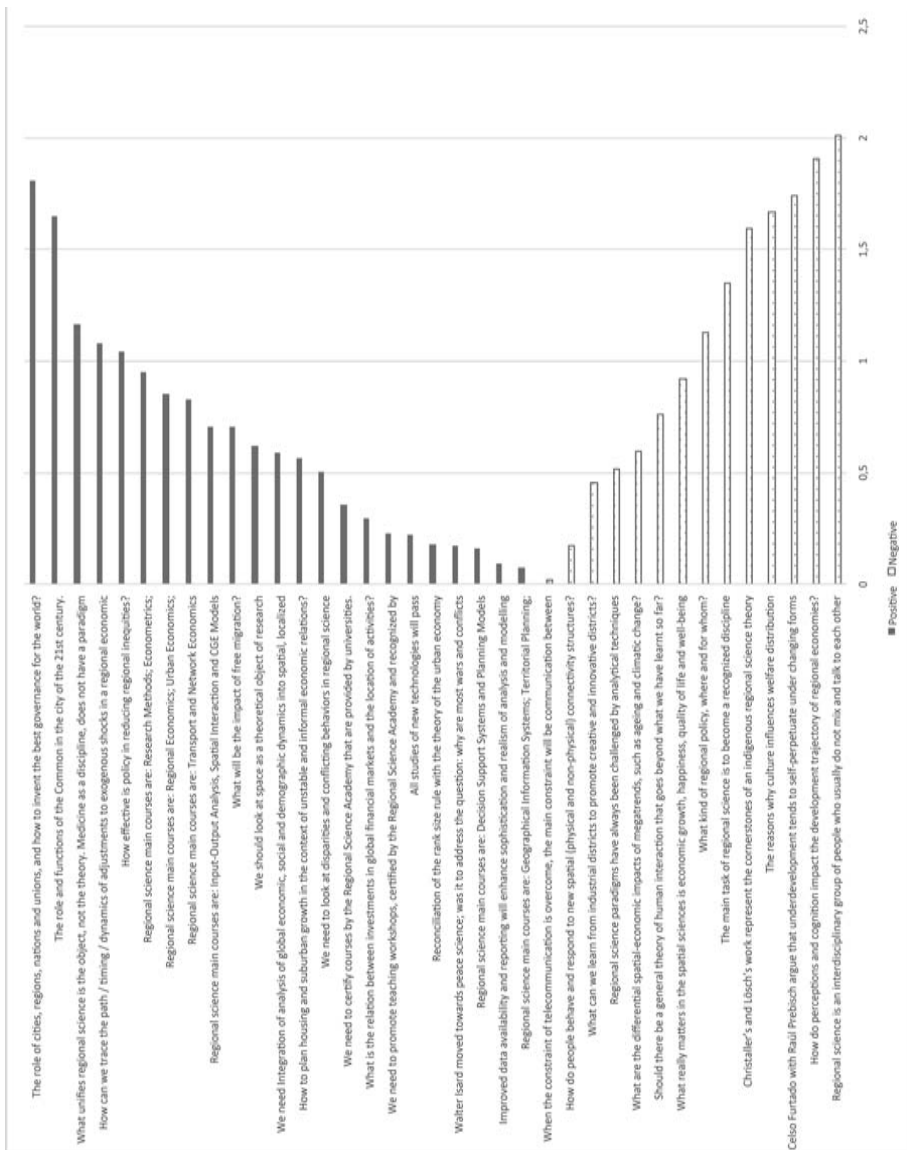


Figure 7. Factor 5. Regional and Urban Economic Theory for a Better World

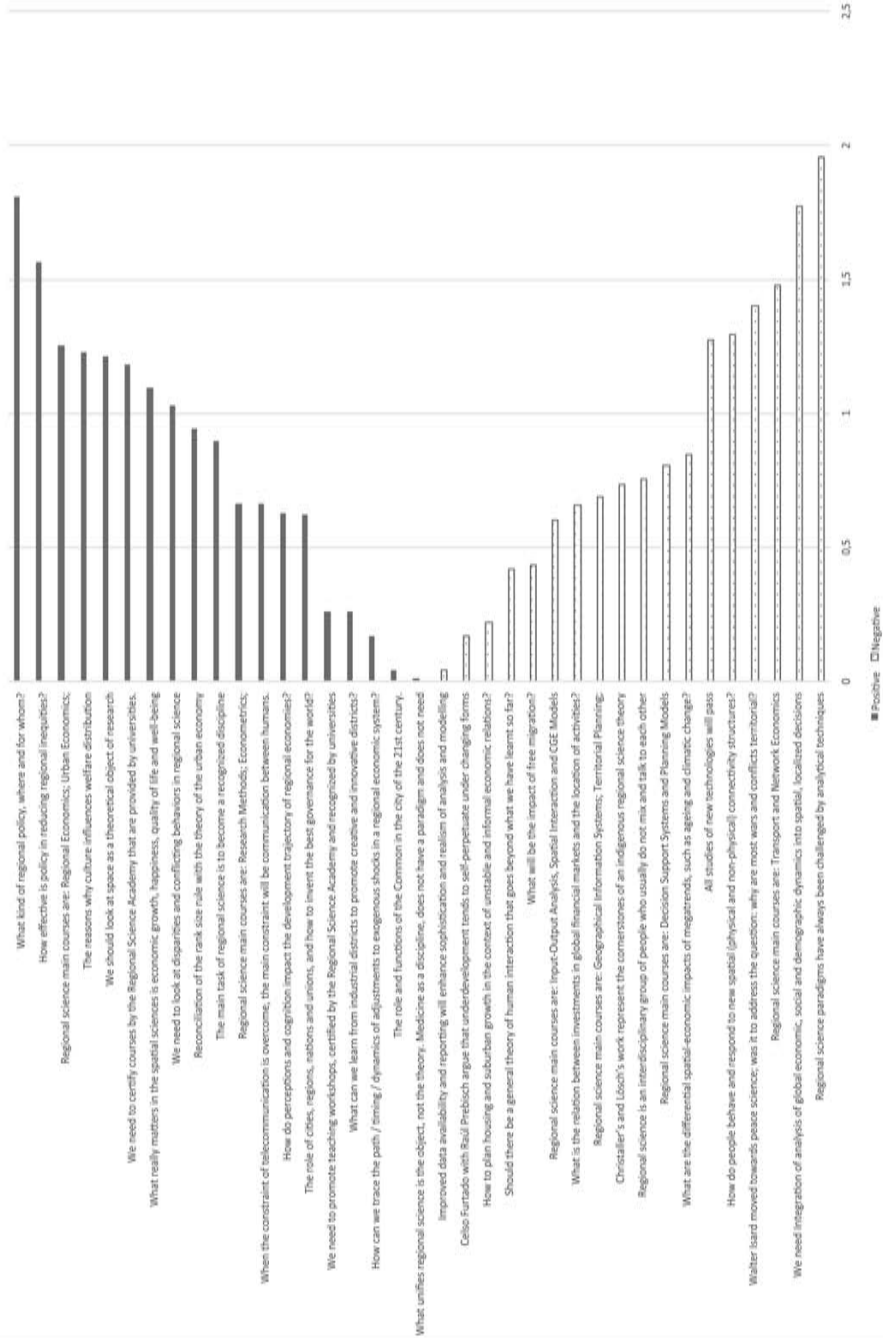
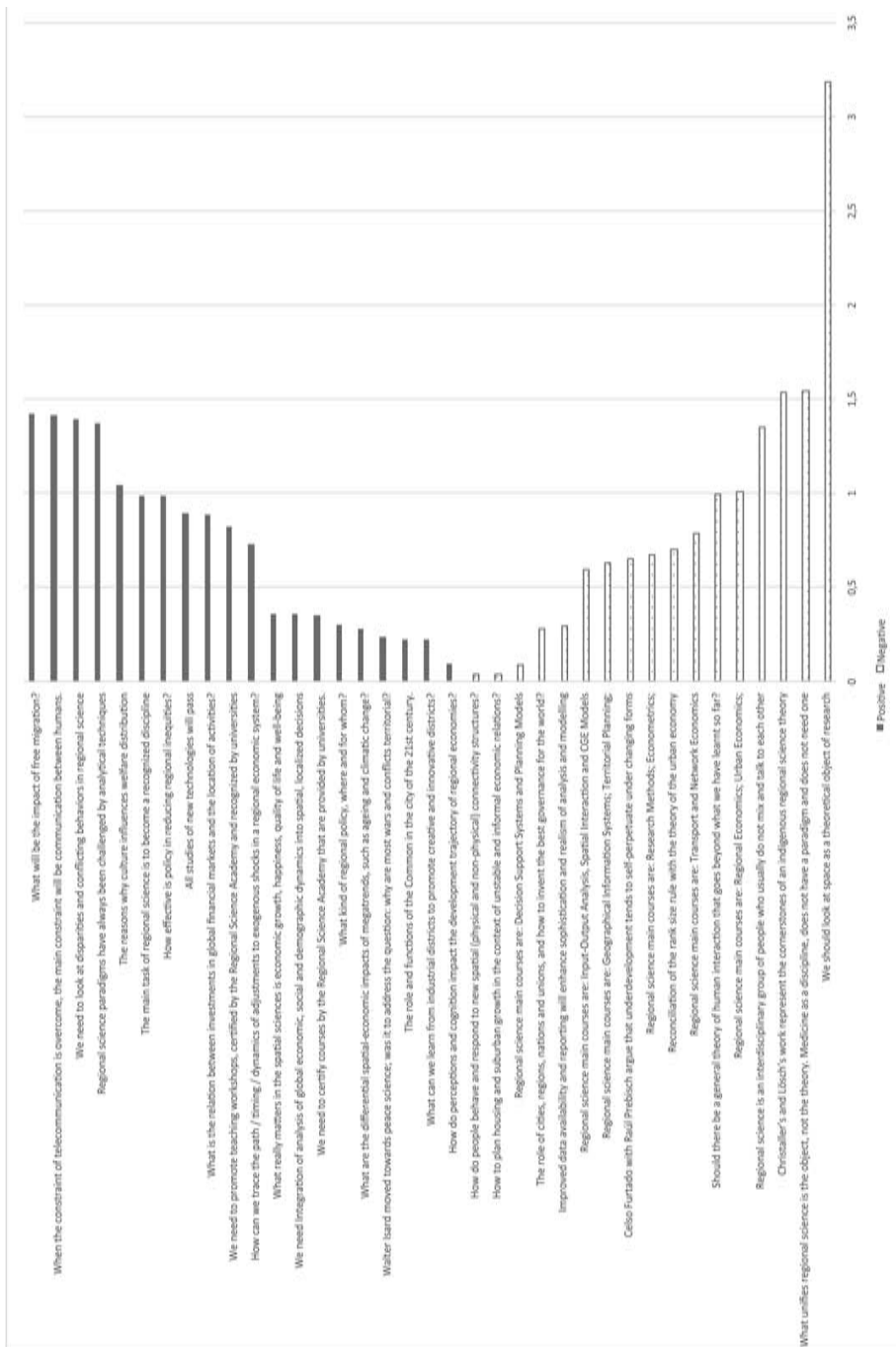


Figure 8. Factor 6. Scientific Responses to Emerging Challenges



recognized discipline by responding to emerging issues such as migration, technological change, conflicts, disparities and so on. Respondents that are more identified with this point of view are: from different age cohorts, male, coming Europe and North America, interested in methods and policy, and focused on sustainable development.

#### • *Other Perspectives*

There are eight more statistically significant perspectives, but whereas the first six represent 60% of the total variance, the other eight ones represent only 20% of the variance. Notwithstanding, it is interesting to identify them:

- Factor 7: Regional science is a discipline based on econometric methods, operational models and Christaller's and Lösch's seminal works. This perspective is represented by: seniors, males and North-American academics, interested in methods, and focused on networks and development.
- Factor 8: Regional and urban economics to address sustainable regional development issues is defended by senior, male and European academics interested in theoretical approaches to sustainable development.
- Factor 9: Urban planning for the 21st century is associated with: relatively young, male and European researchers concerned with policy and urban sustainable development.
- Factor 10: A group of people that do not mix and talk to each other, although being rejected by most of the respondents, has representatives that are concerned about data and modelling. They are: male, North American or European, and concerned with communication between humans.
- Finally, factors 11,12,13 and 14 are represented by: relatively young, male and western academics concerned with global issues and with the recognition of regional science as a discipline (and its curriculum).

The tentative findings from this imagineering experiment are that the core interests of regional science are to be found at the interface of individual and collective human behavior and geographical space (be it physical or virtual).

### 3.4. Interactions between perspectives

There is a great consensus on the first factor that regards *Regional Science as the Study of Human Interaction*, most of the time in a spatial referential situation and sometimes with space itself. The other factors represent different, but complementary methodological approaches to understand human interaction in space. Perspective 2 clearly defends an interdisciplinary approach to spatial data to feed and test a *General Theory of Human Interaction*. Perspective 3 starts from the problems that should be addressed by *Territorial Competence*. Perspective 4 is very much similar to Perspective 3, but most of the territorial problems are policy failures and those are the needles



to be found behind the problems. Like all other perspectives, Perspectives 5 and 6 are interested in a better world; Perspective 5 does so through regional economic theory, and Perspective 6 by looking at problems from a scientific point of view.

Most respondents agree that *Regional Science* is the *Study of Spatial Human Interaction*, competing with other approaches that use spatial data for spatial planning and regional policy, but with a variety of expertise to deal with emerging territorial problems and long-term sustainable development problems through an interdisciplinary dialogue, sound research methods and well-structured and still evolving theories and analysis frameworks.

## 4. Conclusion

Regional science has a rich history and challenging agendas. It has attracted the attention of thousands of scholars from all over the world. Measured in terms of conference participation and research publications, it has turned into a vital research approach to spatial issues in relation to human interaction and place orientation.

It goes without saying that such a rich history created the potential for a promising future agenda of regional science. In fact, the concern about real-world regional and urban development issues has led to a solid research tradition and orientation that is forced to combine conceptual and applied research in a fruitful and creative manner. To cope with such challenging research tasks in the decades to come requires innovative and advanced research endeavours that are at the forefront of modern social science research. Regional science is work in progress, at the frontiers of our knowledge on the space economy.

The experiment presented in this study has brought to light enlightening findings. The multidisciplinary focus on human interaction in space, in a geographical or in a topological sense, is a common element in the majority of regional science research. A paradigm shift towards entirely new horizons is not very likely.

The challenge to focus human interaction in space has increasing potential due to the growing access to spatial data and with improving methodologies based on geographical information systems, methods which improvement requires applications and training, pushed and pulled by people's issues, aims and policies.

Clearly, regional science has to find a respected place «in a wonderland full of human spatial interactions». Of course, it ought to be recognized that spatial (regional, urban, rural) development is no longer a policy issue in itself, but ought to be positioned in a broader context of technological innovation, cyber space developments, social tension, environmental threats, sustainable development and economic competitiveness at both local and global levels. Regional science and regional development are tied together. The alarming issues related to regional development in poor countries highlight the broad societal relevance of regional science, now and in the future.

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