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Regional Science Reconsidered*

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Abstract: Because disciplines and their cores and boundaries are subject to change, a periodic introspective assessment can be useful in evaluating the relevance of a changing discipline to the equally dynamic and pressing needs of society. Similar examinations of other disciplines, notably economics, have been conducted in part as a means of minimizing the risks of declining credibility, policy relevance, and societal benefit. With the Southern Regional Science Association celebrating recently its 50th meeting, and as regional science itself approaches its 60th year, this paper provides a reexamination of the core of regional science. We consider the theoretical and methodological underpinnings and current status, the various roles played by space in various representations, and the values that guide our policy advice and recommendations. While cores and boundaries of regional science cannot be unambiguously identified, particularly due to the considerable overlap with and lineage to other disciplines, we conclude that it is precisely the interdisciplinarity of regional science that distinguishes it from other social sciences, and ensures its continued relevance.

Keywords: regional science, boundaries of discipline, characteristics of discipline

JEL Codes: A12, H11, R1

1. INTRODUCTION

Disciplines are characterized by a common set of research questions, values applied in addressing normative issues, and research methods (Kuhn, 1962, 1970). These common characteristics constitute a discipline's core. In principle, disciplines — and their sub-fields — can also be defined by their boundaries, but exact boundaries may be disputed and may change over time. Therefore, the focus of this article is an examination of the core of regional science. We also look at its boundaries, but because of the multidisciplinary origin and interdisciplinary nature of our discipline, they are fuzzy and ambiguous, reflecting the overlap of regional science and its parent disciplines. Just as disciplinary cores and boundaries are dynamic, so too are the pressing needs of the societies that research supports. Ideally, disciplinary shifts occur in response to societal needs, in ways that underscore rather than undermine disciplinary relevance. Therefore, the backdrop of societal relevance provides a context for our reconsideration of regional science's core and boundaries.

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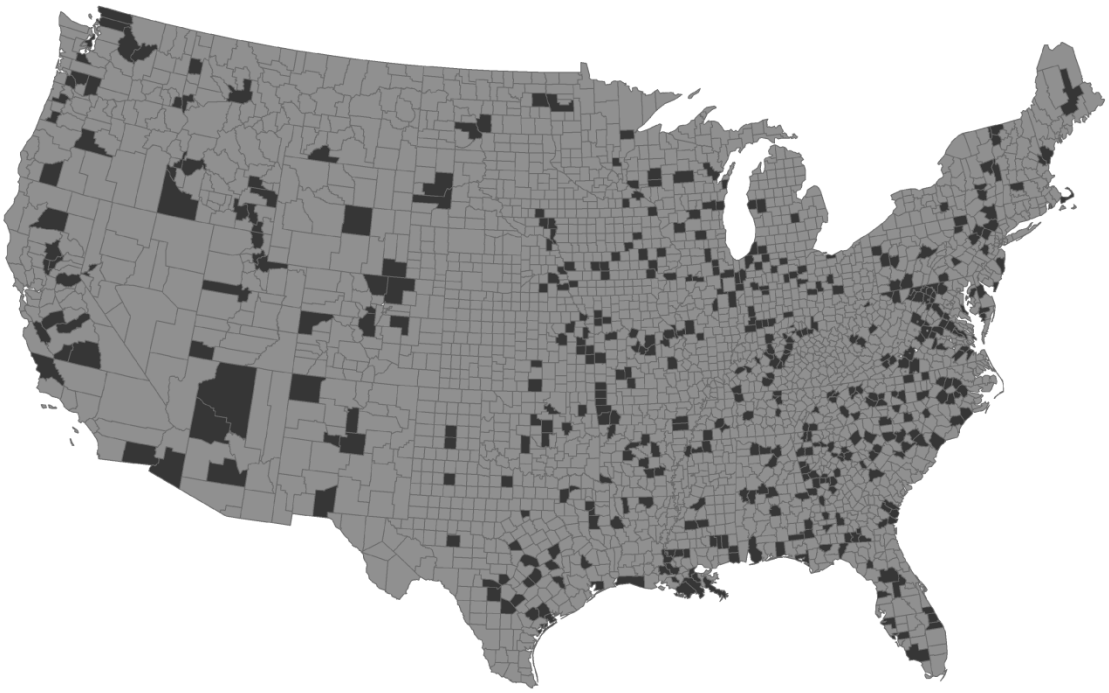
No definition of a discipline should be considered final because its boundaries and core are subject to change, as are its objects of study. The sometimes dramatic change of regions themselves occurs, for example, by the realignment of the boundaries separating rural from non-rural regions around the world, which reflects changes in the characteristics of these regions (Schaeffer, Kahsai, and Jackson, 2012). Regional science also shares with other disciplines the possibility of change due to theoretical or methodological innovations that shift boundaries and make possible the pursuit of answers to new questions.

Figure 1 presents a map of the continental United States. In black are those counties that were reclassified between 1974 and 2003 from non-metro to metro, based on the rural-urban continuum code. There are two possible reasons for reclassification. First, some counties changed and no longer fit the criteria of a non-metro county. Second, in 2003 the classification criteria were changed so that more counties became classified as metro than was the case under the old criteria. Note that the change of the classification criteria indicates more general changes in the nature of many counties, even those that were not reclassified, so that old classification criteria no longer seemed to fit well enough. Figure 1 excludes independent cities in Virginia because they are not considered part of a county. Over the three decades from 1974 to 2003, the classification of 477 out of 3,073 counties in the lower 48 U.S. states changed from non-metro to metro, or 15.5 percent of all counties. Because of such dynamic processes, and also because of the combined effects of the computational revolution and theoretical and methodological

FIGURE 1. Counties that Changed from Nonmetropolitan to Metropolitan between 1974 and 2003



Source: Based on data from USDA-ERS
Note: Counties in black are those who saw a change of their classification from non-metro to metro

innovations, regional science today is not the same as when earlier reviews were published, which we discuss below.

Nearly 50 years ago Meyer (1963) published an influential survey of regional economics in the *American Economic Review*. This publication, in one of the profession's most prestigious journals, constituted official recognition of a then new specialization within economics. It did not signal the beginning of regional analysis, however (e.g., Schneider, 1935).[1]

> Regional economics has very obvious and important intellectual forebears, and indeed, it seems highly probable that certain theoretical developments in general economics, particularly having to do with general interdependence systems, provided the conceptual basis without which regional economics could not have flourished. (Meyer, 1963, p. 20)

In his survey, Meyer treats regional economics, regional analysis, and regional science as synonymous. We do not follow his example, but regard regional economics as an, albeit large, proper subset of regional science. We consider regional economics a subset because disciplines other than economics, particularly geography, public administration, sociology, and urban and regional planning have also contributed to the theories and methods, and the development of normative views in regional science.

A question that is not asked by Meyer (1963) and others who have reviewed the field of regional science is about the values that guide our policy advice and recommendations, an oversight that should be corrected. Because regional science is influenced particularly strongly by economics and geography, as well as urban and regional planning, sociology, demography, political science, and public administration, the values of these disciplines are also represented among regional scientists. We should explore how these diverse traditions influence the values and attitudes of those who consider themselves regional scientists. For example, not all parent disciplines are as strongly based on a utilitarian ethics as is economics, which has implications particularly for policy recommendations relative to issues of equity and the environment (Murphy and Nagel, 2002; Olsaretti, 2004; Sandel, 1982, 1988; Sen, 1987; Sennet, 2006; Smart and Williams, 1973).

The remainder of this article is organized as follows. In Section 2 we explore the roles played by space in various representations. Section 3 shifts the attention to other criteria typically present in regional science research. This is followed by a discussion in Section 4, and a summary and conclusions in Section 5.

2. ON THE CORE AND BOUNDARIES OF REGIONAL SCIENCE

In this section we explore those aspects of the core and boundaries of regional science that are related to space. The terminology—core and boundaries—has been borrowed from an article by the Regional Science Seminar (1958), a group affiliated with the University of Pennsylvania.[2] Like many writers, the Regional Science Seminar authors stress the central role of space in regional science. Space enters models in different ways. In empirical work we are concerned with choosing the appropriate geographical scale and spatial unit of analysis, choices that are interdependent, though not necessarily identical. Space can also be represented by distance, e.g., between input and output markets, as is common in location models. Finally,

[1] Erich Schneider was an influential German economist (1900-1970).

[2] At its start, the Regional Science Seminar's members were William Alsonso, David Bramhall, Walter Isard, and Ben Stevens (Regional Science Seminar, 1958).

spatial properties can be represented by specific features of a region or location, such as climate, topography, natural resources, and amenities. These representations of space are not mutually exclusive and can be used in combination. Following the different ways of representing space, we start with a discussion of geographical scale. We then move to the geographical unit of analysis, and finish with distance and space *per se*.

2.1 Geographical Scale

Concern about the appropriate geographic scale of analysis is one of regional science's core issues, as demonstrated by various definitions of "region" and "regional science" (e.g., Vining, 1946, 1949, 1953; Wetmore, 1957; Regional Science Seminar, 1958; Berry, 1961; Hoover, 1962; Richardson, 1969, 1973, 1978; Isard, 1960, 1975; Boulding, 1985; Behrens and Thisse, 2007). Regarding scale as a core aspect, Meyer (1963, p. 20-21) writes:

> An almost unavoidable temptation when first coming to grips with the problem of defining regional economics is to assert that it is simply all of economics scaled to whatever level is required to adequately measure or forecast economic activity for a specific geographic area.

The concern for geographic scale in regional science is an inheritance from one of its parent disciplines, geography, which continues to exert a strong influence, particularly in spatial analytical methods. It remains to be seen if the fairly new trend away from quantitative/ mathematical geography will reduce the influence of this discipline, since regional science continues to be dominated by quantitative approaches.

Of course, geographers are not alone in stressing the importance of geographic scale. In the 19th century Ravenstein's (1885) demographic research demonstrated that residents of Ireland had higher internal but lower inter-kingdom mobility than residents of the Kingdoms of England, Wales, and Scotland. This should surprise us—if at all—only until we realize that these differences reflect the much lower level of Irish industrialization in the 19th century. Hence, the Irish left Ireland to find better economic opportunities while residents of England, Wales, and Scotland found them in another county of the same kingdom.

Economists also pay attention to geographical scale. For example, Vining (1946) highlights the importance of geographical scale in the macroeconomic study of business cycles. Although Richardson (1969) includes a discussion of business cycles in his widely adopted textbook, the study of business cycles at a subnational scale is not included in all regional science texts (e.g., the popular textbook by McCann (2001) does not mention business cycles), suggesting that it is not part of the discipline's core. The following quote from Vining indicates that we may not be able to completely understand business cycles if we limit our research to only one geographical scale. His argument, therefore, provides strong support for a regional science discipline (Vining, 1946, p. 202):

> The 'wave' that is observed in national averages and sums appears as something different if not entirely apart from the movements exhibited by the underlying economic 'particles' or units and a national 'turning point' appears as merely a shift in the direction of movement of the preponderance of the 'particles' or units. …The turning point occurs when a particular direction of movement ceases to be 'counter' and assumes its role of ascendancy. Aggregative analysis does not show these adjustment processes of economic evolution that are so emphasized by Professor Schumpeter, and our problem is to devise a means by which a more complete observation may be obtained.

Another example of attention paid to geographic scale in the economics profession is a policy report published at the height of the Great Depression (National Resources Committee, 1935). The National Resources Committee[3] was established in June 1935 by President Roosevelt. The report was particularly concerned with natural resources, including water and mining, where political authority rarely coincides with regions defined on the basis of ecology and habitat. Thus, the report commented on appropriate geographical scale as well as spatial-political unit of analysis. It also stressed the importance of coordination of natural resource policies among different levels of government.[4] For regional scientists, the committee's report and Gruchy's (1939) analysis of it are interesting documents of our discipline's history.

In summary, the scale of the spatial unit of analysis is a central concern of regional science that shapes its core. It cannot serve, however, as a boundary separating regional science from other social sciences. The major reason why it cannot serve that role is the multi-disciplinary heritage of regional science, which ensures that it overlaps with its parent disciplines, including geography, economics, and sociology. Meyer identifies the interdisciplinary nature of our discipline as one of its key characteristics even though he focuses only on the overlap between regional science and economics.

2.2 Spatial Unit of Analysis

Regional science owes its recognition of the importance of the spatial unit of analysis to its parent disciplines, particularly geography. Ideally, the choice of the spatial unit of analysis in regional science is dictated by research requirements. However, in empirical research the choice of the "appropriate" spatial unit of analysis — the region — is often difficult because boundaries of regions can be fuzzy and changing (Boulding, 1985). Pragmatic considerations are of even greater importance, particularly availability of data that constrains the range of available choices (Guttenberg, 1977). Thus, regional scientists often choose spatial units of analysis that are political units, but only rarely do these constitute the region best suited to the research in question. When research is undertaken to analyze or inform public policy, adherence to political boundaries is so important as to override other criteria suggested by research requirements. In the growing area of overlap between regional science and environmental research, scholars also struggle to define regions that reconcile the appropriate spatial/ecological scale with policy and data-collection/reporting regions. Statistical problems resulting from necessary compromises are well known and have been extensively studied, e.g. the Modifiable Areal Unit Problem (MAUP) (e.g., Cressie and Wikle, 2011; Reynolds and Amrhein, 1998).

Although monetary policy usually focuses on the national economy, there is a growing part of this literature exploring regional dimensions, such as Miller (1978), Mathur and Stein (1980), Carlino and DeFina (1998), Goodfriend (1999), di Giacinto (2003), Rodríguez-Fuentes (2006), and Angelini et al. (2008). Not surprising in the aftermath of the great recession of 2008, there are several very recent additions to the regional-monetary literature (Beckworth, 2010; Mann, 2010; Fielding and Shields, 2011). Similarly, the economic crises in southern European European Union member states that began in 2008 has raised questions even in popular media regarding the monetary policy of the European Central Bank, and the choice of and membership in the Euro Zone (region) (e.g., Feldstein, 2011; Ewing, 2012).

[3] The National Resources Committee was preceded by the National Resources Board, established in 1933.

[4] For more information on the National Resources Committee, see Gruchy (1939).

In summary, the choice of the spatial unit of analysis is central to regional science and is part of its core, but cannot serve as a boundary. Because the concern for the choice of the spatial unit of analysis is part of the inheritance received from regional science's parent disciplines, it is something we share in common with rather than something that distinguishes our discipline from them.

2.3 Space and Distance

Without mobility costs—of time and money—distance would not matter and there would only be one single, global market for each good or service and type of labor. Thus, when we assume the existence of sub-global markets we implicitly assume that there are different locations separated by distance, and that overcoming distance has a cost. To avoid possible misunderstanding, we want to stress that zero mobility cost does ***not*** imply that space does not matter. Even if mobility costs nothing, unique properties of a location are reflected in land rents, and economic activities still consume space. If it were possible to move people and goods and services from one location to another in an instant and at zero cost, however, then distances separating markets would be irrelevant.

There are many spatial models in economics, geography, urban and regional planning, etc. The earliest German tradition, represented particularly by von Thünen, supplied the historical foundation of location analysis. In the 20th century important contributors come from a more diverse geographical and disciplinary background. In addition, models of spatial interaction were developed and have found many applications. Among these, the gravity model of spatial interaction has had a particularly great impact and is still in use. For the early history of the gravity model, see Carrothers (1956), and for the foundation of the modern version, consult Lowry (1966), Niedercorn and Bechtholt (1969), and more recently Fotheringham and O'Kelly (1989).

The gravity model can be used to illustrate how methodological advances can add new content to an established modeling approach. In this case, the relevant methodological advances are in spatial econometrics (e.g., Paelinck and Klaassen, 1979). The growing use of spatial econometrics owes much to Anselin (1988, 1992, 2010), LeSage (1999, 2010), and LeSage and Pace (2009), in part because these scholars have also provided software and subroutines for implementing their models.

LeSage and his coauthors enhance the gravity model by introducing spatial interdependence (LeSage and Fischer, 2010; LeSage and Pace, 2008, 2009). In the process they realize that in the past, coefficients of the estimated model were frequently misinterpreted as partial derivatives. This is incorrect because the flows between a location, A, and all other locations, depend on A's relative attraction. Thus, if A's attraction changes, it impacts not only the flows from A to all other locations and vice versa, but potentially ***all*** flows being modeled. LeSage and Thomas-Agnan (2012) correct this mistake and extend the gravity model by relaxing the assumption of independence between flows. Anderson's (1979) and Anderson and van Wyncoop's (2003) widely cited related work precedes the research of LeSage and colleagues. While the gravity model in regional science is particularly often used to represent migration behaviors, Anderson's research focuses on trade, particularly between national economies.

Thus, space and distance are present in most regional science models, if only implicitly, and therefore are part of its core. On the other hand, for the same reason as in the case of geographical scale and spatial unit of analysis, space and distance do not satisfy the characteristics of a

boundary between regional science and other social sciences. So we reach a conclusion similar to Smith (1957, p. 14) who noted "The distinction between regional science and geography in this context appears largely as a matter of methodology and the contribution of regional science to geography can be considered at the substantive and methodological level." Thus, Smith proposes a "relaxed" conception of regional science which does not attempt to deliberately delineate its boundaries relative to other disciplines.

3. OTHER CRITERIA

Space in its various aspects is particularly central to regional science, but there are additional criteria that can be used to characterize its scope and nature. Hoover (1971, 1975) based his characterization of regional economics on three "foundation stones" (1) imperfect factor mobility, (2) imperfect mobility of goods and services (see also Dubey, 1964), and (3) imperfect divisibility. See also Hoover and Giarratani (1984, 1999). In our opinion, this characterization can equally be applied to regional science. Guthrie (1955) also stresses the important role played in location decisions by internal and external economies of scale and Hoover's third foundation stone has gained even more importance thanks to innovations in modeling monopolistic competition (Dixit and Stiglitz, 1977; Krugman, 1991, 1998; Meardon, 2001; Neary, 2001). Returns to scale today have applications beyond those based on Marshallian agglomeration effects (Fujita, Krugman, and Venables, 2001; Fujita and Thisse, 2002; Beenstock and Felsenstein, 2010; Parr, 2002).

Because of its intellectual debt to other disciplines, particularly geography, economics, sociology, demography, urban and regional planning, political science and public administration, transportation engineering, and (to a lesser degree) design, it is difficult to define the boundaries of regional science. There simply is too much overlap with its "parent disciplines" (Isard, 1960; Meyer, 1963) to tell where regional science ends or begins. With Smith (1957), we agree that the examination of the core promises higher returns than further attempts to identify its boundaries. Since "frontier" is a term closely related to "boundary," we want to clarify that a boundary here means a pretty clear dividing line with regional science on one side and other disciplines on the other; we argue that such lines do not exist. However, it still makes sense to talk of frontiers or frontier issues in regional science when referring to new and emerging areas or approaches (e.g., as in Markusen, 2002).

Isard (1960) regards regional science as mostly a social science and acknowledges its pronounced interdisciplinary nature. Meyer (1963) perceives the interdisciplinary approach to be one of regional science's distinguishing characteristics, an aspect that is expressed by Garnsey (1956, p. 27) who even refers to disciplines beyond the social sciences in the following: "Regional science is that branch of discipline which is concerned with the analysis of areal groupings of physical, biological, and societal phenomena on the surface of the earth." Smith (1957, p. 14) stresses methodology as a feature that distinguishes regional science from geography: "Walter Isard espouses the 'concrete' conception according to which regional science, like geography, deals with positional and spatial analysis."

By contrast, Smith favors what he calls a relaxed definition. It seems clear that the methodological contributions of regional science depend in part on its interdisciplinary nature. Dubey (1964) who like Smith bases his definition on the approach being used rather than the topic being studied, points out that many research questions overlap or are shared among parent disciplines of regional science. For example, migration is studied in sociology, demography,

political science, geography, and economics. But in each case from a somewhat different point of view, and it is the combination of perspectives in regional science that has the potential of generating new insights. Together with the approach, Smith considers space, or rather spatial separation and imperfect mobility as belonging to the core of regional science.

Behrens and Thisse (2007, p. 460) argue that "The idea of **spatial interaction** is central to regional economics" and definitions of regions as a subsystem of a larger whole imply the same thing (e.g., Boulding, 1985; Isard, 1975; Siebert, 1969; Richardson, 1969; Regional Science Seminar, 1958; Garnsey, 1956; Vining, 1953). But spatial interaction requires mobility of people, goods, and/or information. Without such interaction, not only would interregional trade be at a much lower volume, but the diffusion of knowledge and innovations would also be slowed. Imperfect mobility is therefore a critical assumption. As we argued earlier, in the absence of spatial friction distance does not matter.

4. FURTHER DISCUSSION

In addition to different spatial aspects, we identified interaction as a key feature of the core of regional science. Of course, the nature of interaction differs if there is spatial friction because it then requires more resources than would otherwise be the case. Ideally, the size and shape of the spatial unit of analysis is defined by the needs of the research being conducted. However, in practice, availability of data often forces a suboptimal choice. Overlapping government roles and functions may further complicate matters. For example, in the United States and other federally organized countries, national, state, county, and various other local governments exercise control over potentially important policy variables that affect the region. A part of the issues related to overlapping and potentially competing government bodies have implications for the relationship between macroeconomics and regional economics (Chinitz, 1995; Schaeffer and Bukenya, 2001).

Analysis is less complicated with regard to policies that are the exclusive domain of only one government because then modeling government as a single institution is at least a good approximation (Schaeffer and Bukenya, 2001). This generally applies to monetary policy, but not to fiscal policy since taxation and government spending is not the exclusive domain at the level of national governments. Environmental policy is another area where various levels of government exert influence. In the U.S., California has stricter car emission standards than those mandated by the federal government's Environmental Protection Agency (EPA). Gun control laws provide an example of overlapping jurisdictions that have led to conflicts requiring court action to resolve,[5] and healthcare is the most recent policy area where several state governments are taking the federal government to court. Even immigration and border policies, though considered the exclusive domain of the national government, have become embroiled in controversy and conflict between state and national governments, very likely because the consequences of immigration differ by level of government (Schaeffer, 1983). Such conflicts illustrate the potential for complication in regional (subnational) policy development. In federally organized countries, the smaller the geographical unit of analysis, the less we can ignore the influence of overlapping and possibly competing governmental entities (for a theoretical treatment of competing policy-makers, see Siebert 1969, chapter 8).

[5] For example, in 2010 in McDonald v. City of Chicago, the United States Supreme Court ruled that certain gun restrictions imposed by the City of Chicago were invalid (http://www.law.cornell.edu/supct/html/08-1521.ZO.html, accessed May 22, 2012). A somewhat similar case was decided by the Supreme Court in 2008 in District of Columbia v. Heller.

We qualified the previous statement by pointing out that it universally applies to federally organized countries, but, by implication, not necessarily to centrally organized ones. Tiebout's (1956) seminal article assumes that a heterogeneous population will undergo spatial sorting so that similar individuals are more likely to live together in the same community (see also Waldfogel, 2007). A follow-up hypothesis is that if a country with greater diversity has subnational political units that differ one from the other but are internally relatively homogeneous, it will be more likely to choose a decentralized form of government to better meet needs that differ systematically by group membership. Not surprisingly, the nine federally organized OECD member countries Australia, Austria, Belgium, Canada, Germany, Mexico, Spain, Switzerland, and the United States, have either very large differences in geography, climates, topography, or industrial structures, are multi-lingual nations, or a combination of several attributes. In federally organized bi-lingual Canada, about half of all government revenues are raised and more than half of all government expenditures are made by subnational governments. By contrast, in Greece less than five percent of government expenditures are made at the subnational level (OECD, 2003; Stegarescu, 2005).

It is therefore possible that centrally administered "one size fits all" policies will not yield optimal outcomes in a heterogeneous country (on policy differentiation at the state level, see Nizalov and Loveridge, 2005). One can reasonably assume that the more heterogeneous a country, the greater will be the optimal degree of decentralization of government functions. The hypothesis that fiscal federalism affects growth dates back at least to Oates (1972, 1993, 1999). Feld, Baskaran, and Schnellenbach (2008) summarize theoretical and empirical research on the Oates hypothesis. They pay particular attention to the mechanisms through which fiscal federalism could differentially affect economic growth, a question of great interest to regional scientists.

In the introduction we briefly mentioned the values implied by regional science models and approaches. An exploration and analysis of values held in common by regional scientists is beyond the scope of this article and we, therefore, have not followed up the initial comments with explicit analysis. However, we want to call attention to the importance of values that guide regional scientists in providing policy analyses and recommendations. For example, the discussion in the preceding paragraphs illustrates that dominant values may vary with the degree of homogeneity of a country or region. Thus, we think it is likely that large wealth differences between regions are more likely to trigger a policy response in a multi-ethnic country, particularly if regional divisions coincide with ethnic or other group membership, than in a country with a homogeneous population. In a heterogeneous country, inter-regional equity is likely to be a more important value—one that shapes policies—than in a country where the population is homogeneous or regions do not coincide with different constituencies.

Conflicting values are possible even within a single general policy approach. Take, for example, market-oriented policies, an approach particularly popular in environmental policy (Schaeffer, 2008). Since markets rely on both cooperation and competition, two seemingly conflicting values, emphasizing one over the other is likely to shape the outcomes. Bowles and Jayadev (2007, p. 1) study data on spending as a share of gross domestic product (GDP) on guard labor, defined as "the police, private security guards, military personnel and others who make up the disciplinary apparatus of a society." Guard labor is entrusted with "providing security for people and property and imposing work discipline" (ibid). Guard labor is a substitute for community values such as trust, integrity, mutuality, etc., and large expenditures

indicate a relative absence of the latter. For more on markets and ethics from an economic perspective, see Bhagwati (2011), Friedman (2011), and Sedlacek (2011). Graeber (2011) writes on some of the same issues, but from the perspective of an anthropologist rather than that of an economist. The distinguished German sociologist Georg Simmel (1900) contributed a detailed, and now classic, analysis of how money influences and changes institutions and societal values.

Because community values are more likely to be compromised in large and often more impersonal organizations (e.g., see Olson, 1965, 1971), policies that encourage large organizations may reduce social efficiency, without us being aware and taking account of it. Nobel laureate Elinor Ostrom is one of the most prominent scholars studying such issues in conjunction with common pool resources (e.g., Ostrom 1990). For a philosophical analysis of ethical issues related to markets, see Olsaretti (2004).

5. SUMMARY AND CONCLUSIONS

Not unexpectedly we found it impossible to draw unambiguous boundaries separating regional science from other disciplines. Because of its heritage, regional science intersects with and overlaps other disciplines, and we suspect that ambiguity about borders also exists in other social sciences. The diverse heritage makes it impossible to define a set of questions or methods that are unique to regional science. However, we confirmed that regional science shares with geography the inclusion of space and/or spatial characteristics in its core.

Neither the boundaries nor the core of disciplines are constant. There are many reasons why boundaries, research questions, and methods—which are all part of the core—will change over time. The values implicit in the theories, models, methods, and questions of a discipline will also change. Because of ongoing changes, it is necessary from time to time to re-examine our discipline. An example of such a re-examination in economics is provided by Sichel (1989), who asks six Nobel laureates to write on the state of the discipline. Since regional science borrows many tools, models, and theories from economics, the opinions and perceptions presented in Sichel's volume are also relevant to our discipline. A lack of such examinations risks the long-term credibility of policy analysis and advice (e.g., Roll, 1968; Tribe, 1972).

A subnational "…region offers a less remote and possibly more manageable vantage point for viewing complex activity" (Wengert, 1955, p. 253). In general, it is likely that we see different manifestations of the same policy or problem if we study it at different levels of aggregation. Thus, beyond being "more manageable," studying "a complex activity" at different scales can yield complementary information. In particular, the systematic study of programs and policies at different scales may help us to better understand how their impacts are propagated through the system. Along similar lines, Taylor (2009) suggests that regional scientists should conduct research to better understand how globalization affects subnational regions.

While most regional research is conducted at the subnational scale, economic integration particularly through the European Union, North American Free Trade Agreement (NAFTA) and other, similar agreements and organizations, and the increasing global integration of economic activities, supranational and international systems of regions are likely to become a more frequent subject of study by regional scientists (van Dijk, 2012). Bogue (1955), arguing from the perspective of a demographer, made an early case for more international research in regional science. Globalization means more interactions between regions in different countries. We should, therefore, pay heed to Behrens and Thisse (2007), who argue for more research on

systems of regions which, unlike systems of cities, have not received much attention outside of interregional input-output analysis.

Finally, in addition to the treatment of space and spatial issues, we confirmed that regional science is characterized by its interdisciplinary nature. This is true even in subsets of regional science, such as regional economics (e.g., Meyer 1963). In 1963 the American Economic Association (AEA) started publishing the *Journal of Economic Abstracts* (JEA) which, in 1968, was renamed the *Journal of Economic Literature* (JEL). At first, the JEA had no classification system for different specialties within economics. Starting in 1966, the journal distinguished between 14 specialties, and the last issue in 1968 had 18. Regional economics was not mentioned, not even as a subspecialty.

This changed with the publication of JEL in 1969. From 1969 until 1990, JEL classified economics into 10 major subject categories, which were further divided into subcategories. Regional economics was included in the title of major subject category 900: Welfare programs; Consumer economics; Urban and regional economics. Regional economics was subcategory 940. In 1991 the JEL classification system was revised into 18 major subject categories A–R and Z (Other special topics). Regional economics is now included in major category R: Urban, Rural, and Regional Economics. Category R is divided into five subcategories: R1 General Spatial Economics, R2 Household Analysis, R3 Production Analysis and Firm Location, R4 Transportation Systems, and R5 Regional Government Analysis. Because regional economics is a large contributor to regional science, these five subcategories might also be appropriate for regional science.

Economists and geographers have historically been the two largest disciplinary groups in the various regional, national, and supranational regional science organizations. The values of these two disciplines therefore influence and shape the values of regional science more so than do other disciplines, such as, for example, sociology or political science. However, the values of regional science are not usually discussed. We think that this is an oversight that should be corrected and we have included references to help the interested reader find relevant publications. Economic theory, in particular, is based on values of individualism and a utilitarian ethics. Schaeffer (2009) points out that there are situations where a utilitarian ethic may not be acceptable to large segments of the population (see also Smart and Williams, 1973).

In summary, the literature indicates that regional science is now well established as an interdisciplinary field, mostly but not exclusively as a social science. The current JEL classification shows that space and spatial issues are also part of urban, rural, and regional economics, specialties that contribute to and help shape regional science. Because of extensive overlapping interests with parent disciplines, interdisciplinarity more than spatial orientation distinguishes regional from other social sciences.

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