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# Pluralism in the Market of Science? A citation network analysis of economic research at Universities in Vienna

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# Pluralism in the Market of Science?

A citation network analysis of economic research at universities in Vienna.

Florentin Glötzl<sup>1</sup> and Ernest Aigner<sup>2</sup>

## Abstract

Pluralism has become a central issue not only in the public discourse but also in heterodox economics, as the focus on impact factors and rankings based on citations continues to increase. This marketization of science has been an institutional vehicle for the economic mainstream to promote its ideas. Citations thus have become a central currency in economics as a discipline. At the same time they allow to investigate patterns in the discourse. Analyzing articles published by the two major economics departments and the more interdisciplinary Department for Socioeconomics in Vienna, this paper is novel in applying both bibliometric techniques and citation network analysis on the department level. We find that (1) Articles in heterodox journals strongly reference the economic mainstream, while the mainstream does not cite heterodox journals, (2) Articles written by researchers of the Department of Socioeconomics cite more heterodox journals irrespective of whether they are published in mainstream or heterodox journals, (3) The economics departments display a citation network exhibiting a clear 'mainstream core – heterodox periphery' structure, as Dobusch & Kapeller (2012b) suggest the overall discourse in economics to be, while the Department of Socioeconomics could be described as a plural though not pluralistic department with many distinct modules in the network, reflecting various disciplines, topics and schools of thought.

## 1. Introduction

*"We the undersigned are concerned with the threat to economic science posed by intellectual monopoly. Economists today enforce a monopoly of method or core assumptions, often defended on no better ground than it constitutes the 'mainstream'. Economists will advocate free competition, but will not practice it in the marketplace of ideas." (Hodgson, Mäki, & McCloskey, 1992)*

This *Plea for Pluralistic and Rigorous Economics* was published in the American Economic Review in 1992, signed by many of the leading economists and Nobel laureates from a variety of schools of economic thought. Famous names such as Franco Modigliani, Robert Axelrod, Richard Goodwin, J. K. Galbraith, Jan Tinbergen, Paul Samuelson, Charles Kindleberger, Kurt Rothschild and Hyman Minsky supported the plea. Over twenty years later the points addressed are as topical as ever. The increasingly narrow core of the discipline has become more dominant, even after the mainstream, characterized broadly by a neoclassical framework and a strict orientation towards formal models and econometric empirical approaches, failed to predict the financial and economic crisis. Criticism is on the rise however. Not last also students revolt. The International Student Initiative for Pluralism in Economics (ISIPE), a world-wide platform of local student groups demanding a change in curricula, brought the discussion about the mono-paradigmatic nature of economics back to the floor with an open letter published in May 2014. It is indeed an astonishing fact that economics is the only discipline facing major student revolts against the curricula. Furthermore, the use of the religious categories of orthodoxy and heterodoxy is unparalleled in science. Coincidentally, citations have become a central currency in the institutional setting of economics

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as a discipline. They are important determinants for the allocation of research funding and positions at economics departments. Analyzing citations however also reveals important structures within the academic discourse and allow identifying patterns of interaction, segregation, clusters and cliques, especially in the context of a contested discipline such as economics.

In this paper we investigate these patterns applying bibliometric tools as well as social network analysis and graph theory (see Scott, 2000) on the journal level in the institutional context of the three major university departments engaged in economic research in Vienna. We distinguish between a group of heterodox and a group of mainstream journals as suggested by Lee et al. (2010).

The paper is structured as follows. First, we discuss managerialism and quantification in the contested discipline of economics. Second, we introduce the field and case including the institutional specificities of the investigated departments, the method of social network analysis and bibliometrics applied, and the data used for the analysis. Third, we present the empirical results before providing a synthesis in the concluding section.

We find that (1) Articles in heterodox journals cite more heterodox journals than articles in orthodox or non-categorized journals, but still have negative ‘citation export rates’, thereby reinforcing the institutional dominance of the mainstream. Orthodox journals completely disregard heterodox journals. (2) The Department of Socioeconomics (DS-WU) exhibits significantly higher ratios of heterodox to orthodox citations in all three journal categories (heterodox, orthodox, not-categorized) according to the list of Lee et al. (2010). This effect is robust when only comparing journals in which both the DS-WU and an economics department have published. (3) There is a marked difference in the network structure between the two Departments for Economics (DEs) at the Vienna University of Economics and Business (WU) and the University of Vienna (UV), and the DS-WU. The empirically observed citation interactions of researchers employed at the departments for economics reveal a clear ‘mainstream core – heterodox periphery’ structure as suggested in the paradigmatic map of the current discourse in the discipline of economics by Dobusch & Kapeller (2012b). The DS-WU’s network is significantly less concentrated and does not display a core-periphery structure. (4) Investigating the modularity of the citation networks reveals a more plural discourse in the DS-WU in contrast to the economics departments.

## **2. Managerialism and quantification in the contested discipline of economics**

### **a. Managerialism, quantification and the market of science**

Largely overseen by sociological research, the quantification of the world has made a silent ascent over the last decades. Sociological phenomena were condensed into the production and communication of numbers (Espeland & Stevens, 2008). In science and especially in economics this process of quantification manifested in an increasing importance of managerialism in science (Harley & Lee, 1997) with the institutional carriers rankings and impact factors. Citations have thereby become the currency of academic research. Based on ‘naïve’ citations, which only take into account quantity, the academic world has been restructured over the last decades. Positions at universities highly depend on being ‘well-published’ in terms of the number of publications in combination with the respective journal impact factors, ignoring important functions of universities such as education, contribution to the public discourse, and policy advice. Similarly, research funding and allocation of funds between university departments are often dependent on

this criterion. In addition, impact factors and rankings bear two important characteristics of Foucault's conception of discipline: normalization and surveillance. Thereby, through their simultaneously seductive nature as researchers seek to compare themselves to others and their coercive nature as an external instrument to assess performance and quality, they produce an organizational response. As a result of the anxiety they cause, the enticement they constitute for the administrators using them, as well as the resistance they produce, researchers tend to internalize these pressures by self-disciplining (Espeland & Sauder, 2007). Over the years the new institutional environment creates a new perception and mind-set within the organization.

Assessment based on rankings and impact factors, however fails to achieve its primary goal to assess performance. It much rather redefines quality of research. Instead of evaluating whether the work is of high quality and relevant, such assessment is tailored to the question whether it is in demand (Hasselberg, 2012, p. 33). This expresses in its essence the ongoing commodification of science, where content plays a subordinate role. The mechanisms leading to this process of commodification of science can be understood in analogy to the ideas expressed by Polanyi (1944). Polanyi showed that the liberation of the market and the disembedding from its social and historical context in fact necessitated a significant amount of regulation. Similarly, the commodification of science was achieved through thorough regulation, foremost the establishment of rankings and impact factors and their incorporation into institutional rules.

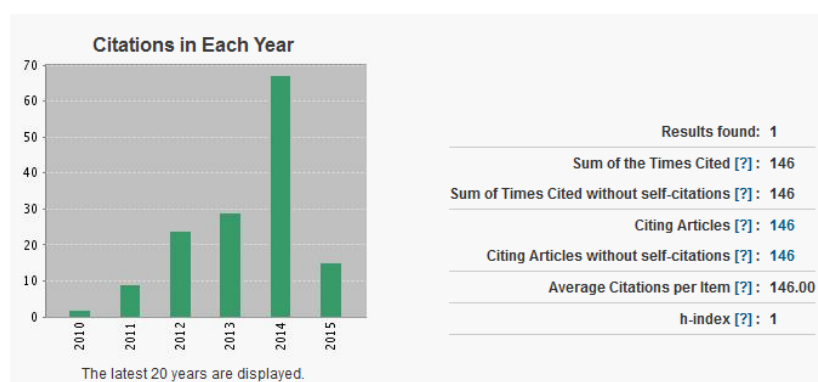
Hasselberg (2012) identifies the consequences of forcing the scientific endeavor into a market framework. The transformation of the text from a means of communication in science into a commodity leads to a shift of focus from quality to quantity which forces the scientist to minimize the amount of information in each publication while maximizing cultural and economic capital as a return. In this context the aim of a publication is not the communication of knowledge but rather maximizing 'profit' from spreading information. The reputation of a researcher in the market of science is constructed on the base of his or her historical publication records, providing a partial explanation of how it is possible that papers with significant flaws are able to pass peer-review. An example of such a case is mentioned below.

Besides general consequences that follow from the implementation of the market of science, the strict focus on impact factors entails inherent problems. Especially in economics impact factors are a flawed depiction of scientific quality and moreover skew it towards mainstream research for several reasons, some of which we highlight here (for a detailed overview over the problems involved in citation metrics see Kapeller, 2010).

- (1) It leads to a complete disregard of scientific work not published in journals.
- (2) The most important journal impact factor provided by Thomson Scientific has a selection bias, simply due to the fact that many core heterodox journals are not included (Frederic S. Lee & Elsner, 2008) which also harms the overall scores of the non-mainstream journals included. Network effects within the greater group of mainstream researchers further push impact factors in favor of the mainstream. In a system based on citation metrics, these factors further contribute to a displacement of heterodox economists. Lee (2008) therefore proposes alternative methods of calculation impact factors to account for such biases.

- (3) Citation metrics ignores important factors influencing the impact factor including article length, language, the number of authors or the accessibility of journals. These disregarded factors also bring about a set of 'perverse incentives' such as the interest in fragmentation of work into smallest publishable units or publication with as many authors as possible.
- (4) 'Naïve' counting of citations, does not distinguish between the reasons for which an article was cited. Citation metrics are indifferent to the qualitative distinction between support and criticism. In fact, an absurd result of this mere counting exercise is that errors published in scientific journals increase the number of citations and thus also the impact factor. A prominent case for this effect is Reinhart & Rogoff's (2010) *Growth in a Time of Debt*, which was shown to be seriously flawed by Herndon, Ash, & Pollin (2014), first published online in December 2013. It is stunning that in the year after the error became public, the article was cited more than in the previous four years together. Also in 2015 it seems highly unlikely that the publication will receive citations anywhere near the 67 citations in 2014. The absurdity of this mechanism becomes obvious when reflecting that in using this example to illustrate the effect of errors within the logic of impact factors, we are reproducing the problem outlined above.

Figure 1: Citations of Reinhart & Rogoff's (2010) *Growth in a Time of Debt* – Web of Science query 10.6.2015



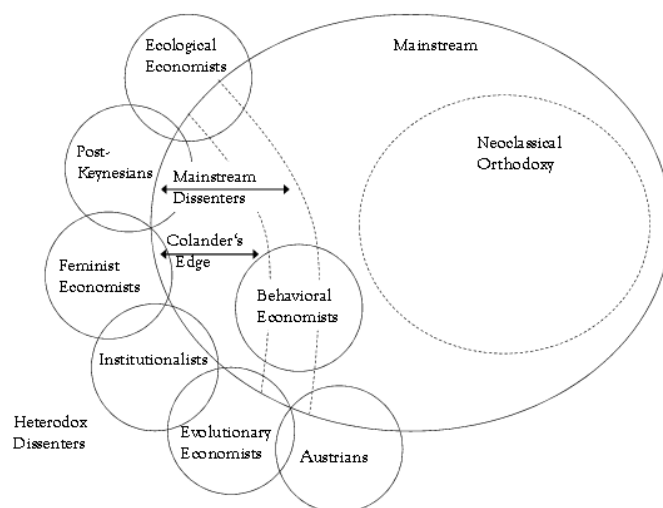
2010	2011	2012	2013	2014	2015	Total
2	9	24	29	67	15	146

## b. Economics as a contested discipline

As pointed out in the introduction, pluralism in economics is a growing concern. Next to students, especially heterodox economists have increasingly pushed for economic pluralism to break open the dominant neoclassical paradigm. Pluralism has been seen as a strategic vehicle to promote their own school of thought, as Paul Davidson's (2004) position could be described, as well as a necessary enhancement of the theoretical understanding of the economy, as proposed for instance by Dow (2004, 2008) or Garnett (2011). Few authors have tried to identify common theoretical grounds for diverse heterodox schools (see for instance Lavoie (2006)). A central debate addresses the question how the mainstream is treated within such a pluralist approach: can and should it be part of the pluralism in economics or are the differences too substantial? Lee (2011) regards heterodoxy to have no theoretical common ground with the mainstream and proposes to understand pluralism as merely mutual tolerance for the two distinct 'broad churches'. Colander (2009) on the other hand argues that heterodox economists largely provoke their exclusion themselves and pleas for building lines of communication between the heterodox schools and the

mainstream in order to establish an ‘inside-the-mainstream’ heterodoxy. Taking up these points Dobusch & Kapeller (2012a, 2012b) call for a pluralist paradigm which also includes the mainstream, but propose ‘discursive pluralism’ within heterodox economics. They suggest that increased communication between heterodox schools will enhance their explanatory power, increase their power in competition with the mainstream, and support the heterodox group institutionally through a larger number of cross-citations. In contrast to this suggested discourse pattern Dobusch & Kapeller (2012b) attest a mainstream core – heterodox periphery structure in economics, with little interaction between heterodox schools of thought, while they still strongly reference the mainstream. Figure 1 illustrates this paradigmatic map.

*Figure 2: Paradigms in the Economic Discourse (Dobusch & Kapeller, 2012b)*



Next to these calls for pluralism from the heterodox camp, some attacks against the current conditions of the discipline come from unexpected not necessarily heterodox or pluralistically oriented directions. In his heatedly debated paper (see for instance Buchanan, 2015; DeLong, 2015) on ‘mathiness’ Paul Romer attacks theory-less formalism in economics and compares modern macroeconomics to a card trick including a sleight of hand. According to him the work of Nobel laureates Robert Lucas and Edward C. Prescott serves as examples of such deplorable science in which “[...] theory is entertainment.” (Romer, 2015, p. 93).

Despite this criticism both from without and within the mainstream the face of economics is hardly changing. It remains a fact that heterodox economics is marginalized and non-mainstream economists continue to be pushed out of economics departments (Colander, Holt, & Rosser, 2010). This marginalization by the mainstream is not a new phenomenon (Frederic S. Lee, 2004) and is in part owed to the self-reinforcing mechanisms that have been established within the institutional structure of economics as a science, especially the overarching importance of journal impact factors and rankings. These constitute the institutional vehicles for the dominance neoclassical theory. Not last also tendencies of ‘self-marginalization’ (Dobusch & Kapeller, 2012a) within heterodoxy further amplify these mechanisms. This is not only the case with regard to the ‘right’ strategy for opposition as discussed by Colander et al. (2010), but also with respect to citation interactions and the associated self-excluding institutional mechanisms heterodox researchers often (re)produce.

### **c. Cognitive Bibliometrics and Citation Networks in Economics**

As discussed above bibliometrics are used to calculate impact factors for journals and publications and thereby have an ‘evaluative’ function. They are however also an interesting tool to determine latent structures of communication within science. This type of ‘cognitive’ bibliometrics as coined by (Rip & Courtial, 1984) allows to reveal which authors, journals or groups engage in a dialogue. Dense citation structures can be the result of similar content areas or similar methodologies (Pieters & Baumgartner, 2002) but also reflect a certain social function of citations: “they are there to show where you belong and which other scholars you like or feel affiliated with” (Hasselberg, 2012, p. 35). Citation analysis has been used to identify individual influential authors and papers (Pasadeos, Phelps, & Kim, 1998), theories (van der Merwe, Berthon, Pitt, & Barnes, 2007) or to investigate the relationships between journals (Cason & Lubotsky, 1936; Doreian, 1988; Eagly, 1975). The analysis of citation flows, specifically cluster analysis also allows to identify related research and to reveal theoretical and disciplinary boundaries. (Arms & Arms, 1978; Gatrell & Smith, 1984; Narin, Carpenter, & Berlt, 1972).

Also in the field of economics citation analysis has been used to uncover patterns of communication. Eagly (1975) shows that there are more systematic citation flows between journals with a theoretical orientation than between theoretical and applied journals. Intra-applied journal citations were found to be insubstantial. Similarly Stigler, Stigler, & Friedland (1995) illustrate the importance of economic theory as intellectual exporter to applied economics using citation-level data. McCain (1990, 1991) uses cluster analysis to identify the emergence of distinct schools of thought.

Less common is the use of network graphs from graph theory to illustrate citation patterns. Cronin (2008) uses such an approach to illustrate the citations between heterodox journals in the period between 1995 and 2007 to show the changing position of journals within the heterodox group over time. Similarly, Dolfsma & Leydesdorff (2008) show the incomparability of impact factors between journals by investigating the citation network of six heterodox economics journals.

Levallois, Clithero, Wouters, Smidts, & Huettel (2012) analyze the citation patterns of the growing field of neuroeconomics to reveal it as a link between neural and social sciences, while Fourcarde, Ollion, & Algan (2015) analyze the dominant position of economics within the network of social sciences using bibliometric data. In a similar vein Varga (2011) demonstrates that the citation network of sociology is significantly more fragmented than the network of economics, in line with the multi-paradigmatic nature of sociology in comparison to the mono-paradigmatic structure of economics. Combining bibliometric data and publication content with information on authors retrieved with text-mining techniques Jelveh, Kogut, & Naidu (2014) go further to quantitatively evaluate political ideology of economists.

Others have investigated the development of a specific technique or approach within economics. For instance Basturk, Cakmali, Ceyhan, & van Dijk, (2013) shed light on the evolution of Bayesian econometrics in economics, Panhans & Singleton (2015) show the increase of quasi-experimental techniques in economics over the last decades, and Hoover (2010) the rise of micro foundation as a concept in economics. Guo et al. (2015) analyze the evolution of conceptual diversity in economics paper titles from 1890 to 2012 using social network analysis



### 3. Method & Data

#### a. Method – Bibliometrics and Social Network Analysis

Our analysis is based on bibliometric methods and social network analysis. The basic logic of this approach is to treat each journal as one node in the network and each edge between the nodes as a citation directed from the journal published in to the respective citation. The more often a citation directed from one journal to another occurs the higher the weight of the edge. In the graphs created with the social network analysis software Gephi, which are presented in the results section, this is illustrated through an increased thickness of the edges. The nodes are colored red for heterodox journals, green for orthodox journals and blue for non-categorized journals, unless explicitly specified differently<sup>3</sup>. The node size<sup>4</sup> is ranked according to the Weighted In-Degree i.e. the number of direct connections directed to the respective node, weighted by the frequency of occurrence of the respective connection. Other ranking measures are used for the graphs in the annex, where also a complete glossary with explanations of all terms used can be found.

The layout chosen for the network graphs is ‘Force Atlas 2’<sup>5</sup>, developed by Jacomy, Venturini, Heymann, & Bastian (2014) for Gephi. Force Atlas 2 is a force directed layout, simulating a physical system with charged particles (nodes) repulsing each other while springs (edges) attract connected particles thus leading to the spatialization of the network (see Noack (2009) for a discussion of force directed layout and spatialization). The specific placing of the nodes thus is always dependent on all other nodes and their connections. The algorithm is non-deterministic (i.e. the position of the nodes is dependent on their previous position and will change when the algorithm is applied on the raw data a second time) and cannot be read as a Cartesian projection. The position of a node can therefore not be interpreted on its own but only in relation to others.

The layout allows for a direct visual interpretation of the network as at the core the algorithm produces a visualization of structural proximities as spatial proximity in the network graph. These proximities can be interpreted as communities in which actors (in our case journals) have more and/or denser relations with each other than with the rest of the network. As a measure for such collective proximity Newman (2006) proposes an unbiased measure called ‘modularity’, which will also feature in our analysis in the following and is optimally depicted in force-directed layouts which generate visual densities that denote structural densities (Noack, 2009). The modularity measure used in the following is based on an algorithm by Blondel, Guillaume, Lambiotte, & Lefebvre (2008).

#### b. Field and case

We will apply the above described techniques to illustrate how the growing managerialism and quantification in economics discussed in the previous section also manifests on the organizational level, often in the form of a displacement of heterodox economists.

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<sup>3</sup> Graph Coloring: Green (5,250,0), Red (250,0,0), Blue (10,160,255)

<sup>4</sup> Node size setting: ranked between 2 and 40.

<sup>5</sup> Specific settings: Activated algorithms (Dissuade Hubs, Prevent Overlap, Approximate Repulsion); Edge Weight Influence (1.0); Scaling (2.0); Gravity (1.0); Tolerance [speed] (0.1); Approximation (1.2)



“... [H]eterodox economics are being squeezed out of the U.S. programs and more and more are being squeezed out of European and Latin American programs.”  
(Colander, Holt, & Rosser, 2010, p. 407)

The University of Notre Dame is one of the most prominent examples of the squeezing out of heterodox scholars. In January 2003 it became public that the University decided to mirror the theoretical divide in the department with a new structure. By pushing heterodox researchers into a separate department, the administration hoped to be able to increase the ranking of its mainstream department (Monaghan, 2003). The Department of Economics was split into two departments. The new Department for Economics and Econometrics (DEE) constituted a predominantly mainstream department in terms of the neoclassical theoretical framework, the formal and econometric methodology applied as well as the fields of study, focusing on topics such as growth and industrial organization (McCloskey, 2003). The Department of Economics and Policy Studies (DEPS) incorporated a more pluralistic and heterodox approaches to economics, addressing issues of inequality, development, race, and gender, as well as history of economic thought (Schiffman, 2004, p. 1082). These issues, while relevant, cannot be easily published in high-ranked mainstream journals. Paradoxically, less than ten years after the decision to split the department, the heterodox DEPS was dissolved with the argument that its ranking was too low. The mainstream DEE was renamed Department of Economics, its faculty was essentially identical to the DEE's. The new department describes itself as “a neoclassical economics department” (Department of Economics, University of Notre Dame, 2015). Heterodoxy at Notre-Dame was effectively eradicated (Steelman, 2014).

Forces to drive out heterodox researchers have also been present at Viennese economics departments. Over the last decades continuously increasing pressure on the Institute for Institutional and Heterodox Economics at the DE-WU from the side of the mainstream department management is an ideogram for this process. Not least due to the rationale detailed in the case of the University of Notre-Dame, demanding more publications in high-ranking journals, the institute's staff number was reduced steadily. Currently there is no more full professor at the institute.

This development, as well as the circumstance that the curricula of the undergraduate and graduate economics programs both at the Vienna University of Economics and Business and the University of Vienna are oriented strongly towards neoclassical theory, sparked the foundation of the Society for Pluralist Economics Vienna (Gesellschaft Plurale Oekonomik Wien, 2015b), supported by the legal student representations for the respective programs. Trying to raise awareness for the necessity of opening up narrow economics curricula the society participated in the ISIPE Open Letter and organized a Conference on Pluralist Economics in April 2015 with more than 300 participants (Gesellschaft Plurale Oekonomik Wien, 2015a).

Moreover, also the Vienna University of Economics and Business (WU) experienced a splitting of the economics department. Similarly to the University of Notre-Dame's DEPS, the Department for Socioeconomics at the WU was only founded in January 2010, while the economics departments at both universities can look back at a long history<sup>6</sup>. The circumstances of the

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<sup>6</sup> The Department of Economics at the University of Vienna has its origins in 1763, and home to important economists such as Menger, Böhm-Bawerk, Schumpeter and Hayek (Department of Economics, University of Vienna, n.d.), while

foundation of this new department are however distinct from those which led to the splitting of the department at the University of Notre-Dame. Rather than being a result of trying to shut out heterodoxy, the establishment of this new department was a deliberate step of the WU to strengthen interdisciplinary and holistic approaches to economic research (Lenoble, 2010), including hiring a significant amount of new faculty for the department. Also the introduction of two new Master programs, Socioeconomics<sup>7</sup> (in 2010) and Socio-Ecological Economics and Policy (in 2012) constituted a strengthening of the not mainstream-oriented camp.

### c. Data

To analyze the citation networks present in economic research at the major faculties conducting economic research in Vienna we first extracted the employee data of the respective faculties. For reasons of feasibility we chose to investigate the publications of all researchers employed at the Vienna University of Economics and Business in the Department of Economics and the Department of Socio-Economics as well as the University of Vienna in the Department of Economics in February 2015. For the former the BACH database of the Vienna University of Economics and Business was used, which includes the necessary information about employees, including their full name, institute affiliation and academic degree. For the latter, the employee information was extracted from the respective webpage. The alternative, to investigate only publications of researches in the time during their employment at these institutions, would have also involved a bias as many research projects may be completed after the employment has ended even if the majority of the work was done during the time of employment. Moreover, the lack of consistent historical employment data at these institutions did not allow for such an approach.

From the employee data we constructed a search string to retrieve the relevant publications from the Web of Science Core Collection (WOS) and their cited references. To restrict our search string we only searched for researchers at post-doctoral level and professors. Due to the fact that many entries in the database only the first letter of the first name is included we chose to set up our search string respectively, as the possibility to restrict it to publications where the full name of the authors is known was still given with this approach. We searched for the researchers with their last name and the first letter of the first name<sup>8</sup> and restricted the research areas to economics as well as other sciences with potential overlaps with economics, such as other social sciences or psychology. The dataset after this search encompasses 3944 publications. Initial-based name disambiguation however still leads to distorted results as the authors' identity cannot be unreservedly confirmed (Kim & Diesner, 2015). To ensure that our dataset only includes work of the researchers at the investigated institutions, the list of publications was also extracted from the databases the respective departments use to document their work i.e. the BACH database (for the WU) and the IDEAS: Economics and Finance Research – RePEc database (for the University of Vienna). The list of publication comprises in total 10928 publications of various types (including book-chapters,

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the Department of Economics at the Vienna University of Economics and Business has its origins in the Imperial Export Academy founded in 1898 (Brusatti, 1998).

<sup>7</sup> As a successor to the old diploma program in Socioeconomics, according to the old Austrian system prior to the Bologna-reforms.

<sup>8</sup> i.e. with a string of the following form: "(*Lastname<sub>1</sub>*, X\*) OR (*Lastname<sub>2</sub>*, X\*) OR ... OR (*Lastname<sub>n</sub>*, X\*)". In the case of double names or two first names both variants were included in the search string.

reports ...). After merging the two datasets on the basis of their titles<sup>9</sup>, publications not comprised in both extractions were discarded from our analysis. Our final dataset then comprises 551 articles from the authors currently employed at the investigated institutions between 1980 and 2015 with a total of 11344 citations<sup>10</sup>. In the next step we matched the publications to the employee data to be able to attribute them to the individual departments and categorized the journals into a heterodox, an orthodox and an uncategorized group, both for the publications and the cited references<sup>11</sup>, using the list provided by Lee et al. (2010). The list comprises a total of 254 journals<sup>12</sup>, of which 62 are categorized as heterodox and 192 as orthodox.

## 4. Empirical Results

### a. Statistical Results

The investigated sample includes 161 articles of authors currently employed at the DS-WU, 183 articles of authors currently employed at the DE-WU, and 219 articles of authors currently employed at the DE-UV. The composition of articles differs substantially between departments. The share of articles in heterodox and non-categorized journals is significantly higher in the DS-WU (about 90%) than in the DEEs (between 40 and 50%). In total the three departments published in 186 different journals, while only little variation in the number can be observed between the departments (72, 91, 77 journals for DS-WU, DE-WU, DE-UV respectively). Relative to the respective number of publications, the biggest variety of journals published in can be observed in the DE-WU (0.5), the lowest in DE-UV (0.35) and DS-WU sits approximately in the middle (0.45).

Table 1: Descriptive statistics:

		Socio-economics (WU)	Economics (WU)	Economics (Univie)	Total
Publications	O	16 (9.9%)	106 (57.9%)	144 (65.8%)	257 (46.6%)
	H	27 (16.8%)	14 (7.7%)	24 (11.0%)	64 (11.6%)
	N	118 (73.3%)	63 (34.4%)	51 (23.3%)	230 (41.7%)
	T	161 (100%)	183 (100%)	219 (100%)	551 (100%)
Citations	O	858 (5.360)	3205 (18.010)	3012 (14.010)	6643 (12.280)
	H	425 (2.660)	139 (0.780)	113 (0.530)	671 (1.240)
	N	2316 (14.470)	1115 (6.260)	743 (3.460)	4030 (7.450)
	T	3599 (22.490)	4459 (25.050)	3868 (17.990)	11344 (20.970)
Journals published in	O	12	43	52	72
	H	7	8	4	14
	N	53	40	21	100
	T	72 (0.450)	91 (0.50)	77 (0.350)	186 (0.340)
Journals cited	O	99 (3.180)	134 (8.780)	114 (7.420)	147 (6.550)
	H	24 (0.820)	18 (0.350)	10 (0.310)	33 (0.480)
	N	491 (7.790)	247 (3.340)	245 (2.540)	751 (4.330)
	T	614 (11.80)	399 (12.470)	369 (10.270)	931 (11.360)

<sup>9</sup> To ensure that all relevant titles are matched, we recoded punctuations, digits & and special characters. We applied the same routine to both datasets.

<sup>10</sup> All journals which are not included in the Web of Science (except *Kurswechsel*) and could thus not be found with the help of the journal abbreviations are not included in the network graphs and statistics. The abbreviations were also checked for potential spelling mistakes impeding automatic matching and manually matched for all journals on the Lee et al. (2010) list. The same was done for all abbreviations with more than 5 citations.

<sup>11</sup> As the variable including the cited references only includes an abbreviation of the cited journal name in the next step these abbreviations had to be matched with the list of abbreviations, provided by the Web of Science (Web of Science, n.d.)

<sup>12</sup> As a reference value, the list of economics journals in the SSCI comprises 321 journals.

O – Orthodox, H – Heterodox, N – Not Categorized, T – Total,  
 Ø – respective values per publication, % respectively in percent of total

Looking at the composition of the citations reveals a phenomenon, which will be further discussed in the following: citations rarely go to heterodox journals and even in the DS-WU where more articles in heterodox journals were published orthodox journals receive drastically more citations. Evidently this is in part due to the biased list used for categorization provided by Lee et al. (2010) which includes around four times as many orthodox journals as heterodox journals. This bias, however represents the factual bases that there is a substantially greater number of orthodox journals than heterodox journals.<sup>13</sup>

Next to a larger ratio of heterodox journals the statistics of the journals cited show that the network of DS-WU is substantially broader with 614 journals cited than that of the economics departments whose network comprises only around two-thirds of the number of nodes. This, however is only true for the department overall, each article on average cites on average 12 different journals, similar to the economics departments. This suggests that the department structure of the DS-WU incorporates a broader variety of fields than in the DE-WU or DE-UV department.

*Table 2: Ratio of Heterodox to Orthodox Citations*

		Socio- economics (WU)	Economics (WU)	Economics (Univie)	Total
<b>Orthodox Publication</b>	O	176	2025	2014	3893
	H	39	28	70	131
	N	133	566	461	1064
	T	348	2619	2545	5088
	R	0.222	0.014	0.035	0.034
<b>Heterodox Publication</b>	O	168	144	292	560
	H	296	86	26	408
	N	460	60	117	629
	T	924	290	435	1597
	R	1.762	0.597	0.089	0.729
<b>Not Categorized</b>	O	514	1036	706	2190
	H	90	25	17	132
	N	1723	489	165	2337
	T	2327	1550	888	4659
	R	0.175	0.024	0.024	0.06
<b>Total</b>	O	858	3205	3012	6643
	H	425	139	113	671
	N	2316	1115	743	4030
	T	3599	4459	3868	11344
	R	0.495	0.043	0.038	0.101

O – Orthodox, H – Heterodox, N – Not Categorized, T – Total, R - Ratio

Table 2 shows the Ratio of Heterodox to Orthodox Citations (R) broken down to the three departments and the journal category (heterodox (H), orthodox (O), not categorized (N)). This allows to interpret the ratios distinctly for each combination of journal category and department.

Four major observations can be made:

<sup>13</sup> If heterodox and orthodox journals were cited equally a ratio of 4:1 between citations of orthodox and heterodox journals should thus be expected. In this case the DS-WU cites more than expected heterodox articles with a ratio of 2 (858:425), while DE-WU and DE-VU cite less than expected heterodox journals with ratios of 23.1 and 26.7 (3205:139 and 3012:113, respectively).

- (1) Articles in heterodox journals cite more heterodox journals than articles in orthodox or non-categorized journals. This is true for each department but also for the Total dataset (with the respective ratios 0.034 and 0.729 for publication in heterodox and orthodox journals. Hence, independently of the department employing the researcher it is more likely that he or she cites more articles in heterodox journals if publishing an article in a heterodox journal. This will be called *journal effect* in the following
- (2) Overall, the DS-WU has a ratio of 0.495 heterodox to orthodox citations. This is more than ten times the ratio of the DE-WU (0.043) and the DE-UV (0.038). The Department of Socioeconomics thus strengthens the heterodox community more than the economics departments, even though still around twice as many citations go to orthodox journals.
- (3) The ratio is below one for all department-journal category pairs except one. The heterodox camp thus strengthens the orthodox camp by citing its articles over-proportionally. The orthodox camp in contrast hardly cites articles in heterodox journals. Only articles in heterodox journals written by employees of the DS-WU have a ratio of 1.762. These articles significantly strengthen the heterodox group within the content-blind logic of citation metrics attributing 72 percent more citations to heterodox journals than to orthodox ones.
- (4) The substantially higher ratio of the DS-WU shows within each journal category i.e. orthodox articles written in the DS-WU cite more heterodox journals than orthodox articles in the economics departments. The same holds true for heterodox articles and non-categorized articles. This can be due to the *journal effect*, as researchers in DS-WU publish more in heterodox journals or a *department effect*. Under the *department effect* we understand that researchers cite more heterodox literature even when comparing only articles published in the same journals as the economics departments.

Table 3 provides a comparison of the ratios for intersecting journals in our sample. The result shows that there is a *department effect* present, when comparing journals in which both the DS-WU and the DE-WU or the DE-UV respectively published. The average ratio of heterodox to orthodox citations for articles in journals published is around ten times (12.6 & 6.7) times as high for the DS-WU. Researchers of the Department of Socioeconomics thus do not only publish in more heterodox fields of economics, they cite more heterodox publications, independent of the journal they publish in. The combination of the department and the journal effect is evident in the only intersection of department and journal which has a ratio higher than 1.

*Table 3: Journal Effect vs. Department Effect – investigation of ratios of heterodox to orthodox citations for journal intersections*

	Socio-economics (WU)	Economics (WU)	Economics (Univie)	Ratio	Intersecting Journals
Socio-economics (WU) & Economics (Univie)	0.542	-	0.043	12.6	8
Socio-economics (WU) & Economics (WU)	1.721	0.256	-	6.7	14
Economics (Univie) & Economics (WU)	-	0.026	0.038	0.7	34
Journals of Department	72	88	76		

To sum up, the analysis suggests that besides the journal researchers publish in, also the department employing them affects their citations. Only publications in heterodox journals from a researcher employed in departments with a considerable amount of heterodox publications lead to citation ratios that support heterodoxy.

#### b. Department-level Citation Networks

Coming to the analysis of the data with the help of social network analysis, several of the differences already discussed above are also visible in the descriptive statistics of the departments' citation networks. The DS-WU's network includes substantially more nodes (journals), however it displays less unique edges than the economics departments. Thereby also its Average Degree, the average number of connections a journal has, is substantially lower with 2.360 in comparison to 4.343 and 4.131 in the networks of the economics departments. This picture remains unchanged when taking into account the frequency of a specific citation i.e. the Average Weighted Degree. Congruently the graph density of the DS-WU, which is a measure a measure of overall connectedness in the network (see glossary), is 0.004 for the DS-WU and 0.011 for both DEs. To point out a final feature, which we will discuss in more depth in the following, the DS-WUs modularity value is higher (and it exhibits more communities), suggesting that groups of nodes are tightly connected to each other, but loosely connected to nodes outside the module.

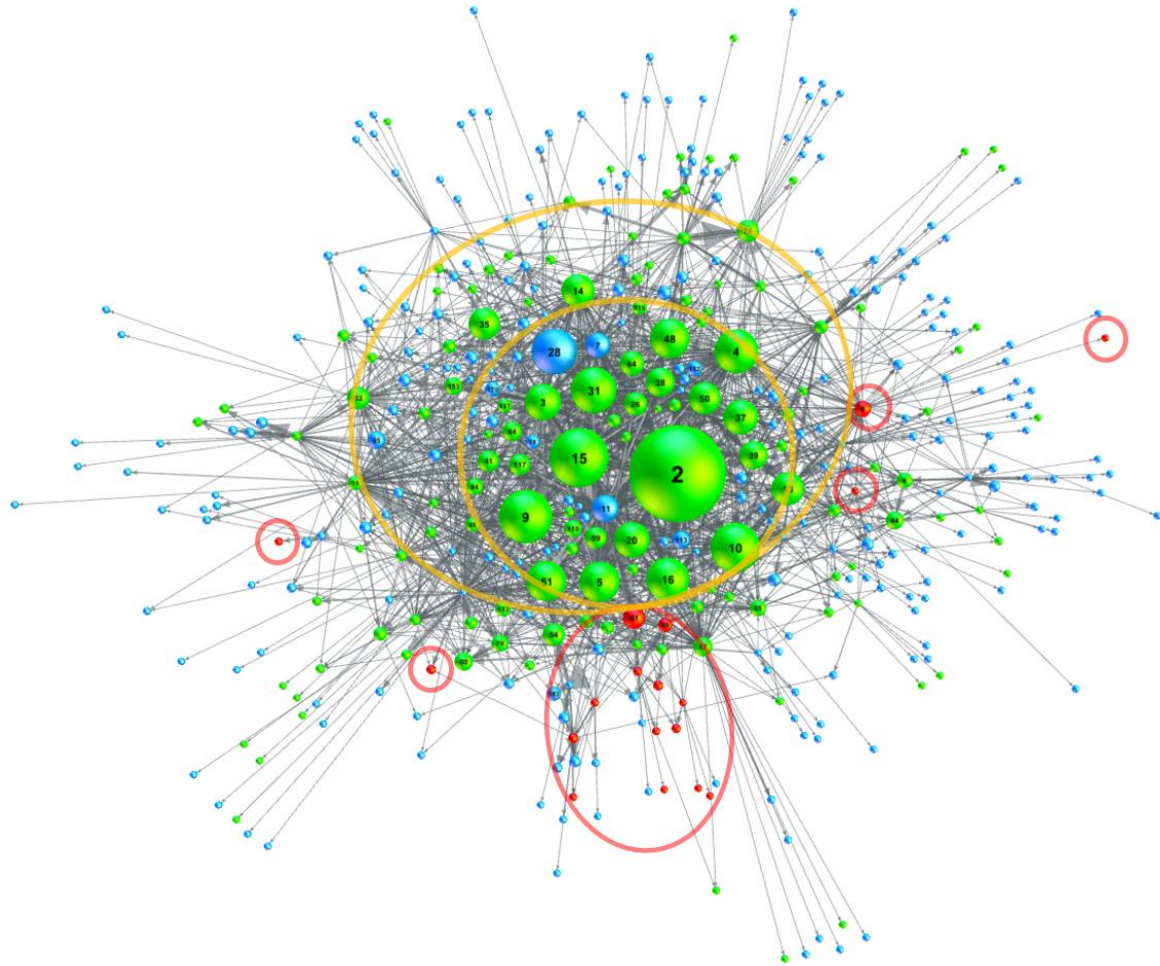
*Table 4: Network Statistics*

	<b>Socio-economics (WU)</b>	<b>Economics (WU)</b>	<b>Economics (Univie)</b>
Nodes	623	414	375
Edges	1470	1798	1549
Average Degree	2.360	4.343	4.131
Average Weighted Degree	4.902	11.196	7.139
Network Diameter	7	8	6
Average Path Length	3.13	3.089	2.826
Graph Density	0.004	0.011	0.011
Average Clustering Coefficient	0.147	0.117	0.156
Modularity	0.592	0.383	0.333
Number of communities	13	9	11

Turning to the citation networks of the departments, which allow for an intuitive visual interpretation, many features previously touched upon become clear. The following figures show the network graphs for the three departments, where node size is ranked by Weighted In-Degree.



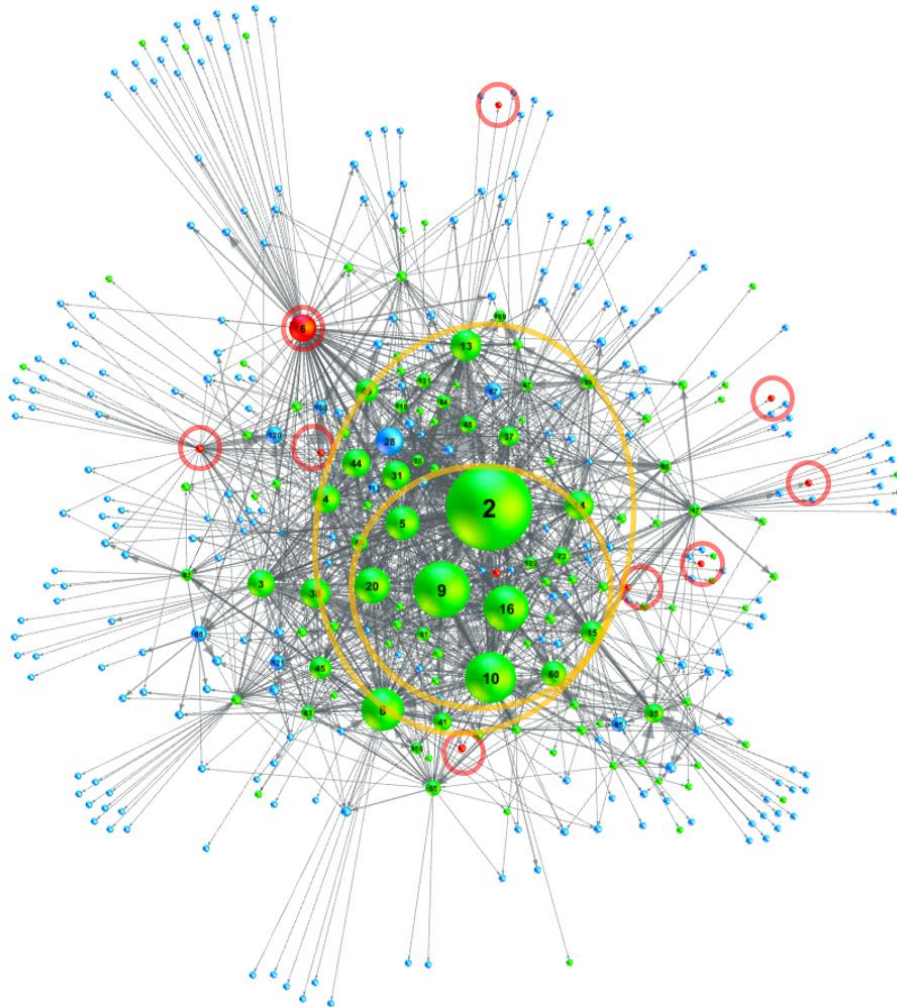
Figure 3: Citation Network Department of Economics WU – Node size ranked by Weighted In-Degree



2	AMERICAN ECONOMIC REVIEW	20	REVIEW OF ECONOMIC STUDIES
15	REVIEW OF ECONOMICS AND STATISTICS	37	JOURNAL OF ECONOMIC PERSPECTIVES
9	QUARTERLY JOURNAL OF ECONOMICS	14	ECONOMICS LETTERS
10	ECONOMETRICA	13	JOURNAL OF PUBLIC ECONOMICS
31	JOURNAL OF FINANCIAL ECONOMICS	50	JOURNAL OF INDUSTRIAL ECONOMICS
28	JOURNAL OF FINANCE	35	JOURNAL OF ECONOMETRICS
4	EUROPEAN ECONOMIC REVIEW	38	RAND JOURNAL OF ECONOMICS
16	JOURNAL OF POLITICAL ECONOMY	39	PUBLIC CHOICE
5	ECONOMIC JOURNAL	...	...
51	JOURNAL OF INTERNATIONAL ECONOMICS	61	CAMBRIDGE JOURNAL OF ECONOMICS
48	JOURNAL OF ECONOMIC LITERATURE	6	JOURNAL OF ECONOMIC BEHAVIOR AND ORGANIZATION
3	INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION	69	METROECONOMICA



Figure 4: Citation Network Department of Economics Univie – Node size ranked by Weighted In-Degree



2	AMERICAN ECONOMIC REVIEW	44	GAME AND ECONOMIC BEHAVIOR
9	QUARTERLY JOURNAL OF ECONOMICS	28	JOURNAL OF FINANCE
10	ECONOMETRICA	31	JOURNAL OF FINANCIAL ECONOMICS
16	JOURNAL OF POLITICAL ECONOMY	4	EUROPEAN ECONOMIC REVIEW
8	JOURNAL OF ECONOMIC THEORY	3	INTERNATIONAL JOURNAL OF INDUSTRIAL ORGANIZATION
20	REVIEW OF ECONOMIC STUDIES	6	JOURNAL OF ECONOMIC BEHAVIOR AND ORGANIZATION
5	ECONOMIC JOURNAL	60	JOURNAL OF MONETARY ECONOMICS
13	JOURNAL OF PUBLIC ECONOMICS	49	EXPERIMENTAL ECONOMICS
38	RAND JOURNAL OF ECONOMICS	15	REVIEW OF ECONOMICS AND STATISTICS
14	ECONOMICS LETTERS	45	ECONOMIC THEORY

A key feature of the citation networks of the two economics departments that catches the attention is that they reveal the same ‘mainstream core - heterodox periphery’ structure schematically illustrated by Dobusch & Kapeller (2012b). Also non-categorized journals are located rather on the periphery of the networks. The core-periphery structure of economics as a discipline is thus not only to be found at the aggregate level, but also at the micro-to-meso level of university departments.

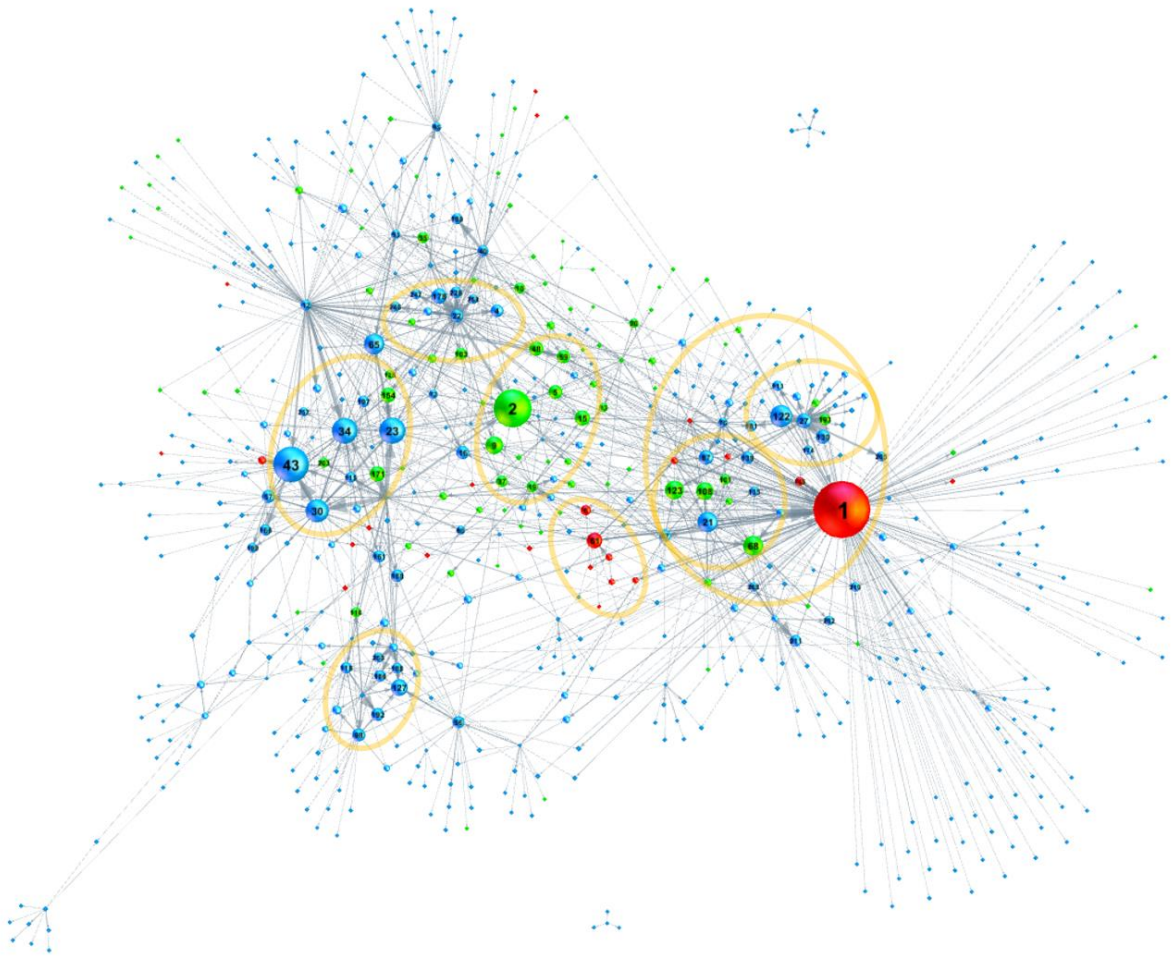
The dominant core of the network consists of several heavily cited orthodox journals. For both DEs the *American Economic Review* is the most important Journal in this respect. Together with the *Quarterly Journal of Economics* (Place 2 and 3), *Metroeconomica* (Place 3 and 4) and the *Review of Economics and Statistics* for the DE-WU and the *Journal of Political Economy* for the DE-UV they build the center of the core group. Heterodox and non-categorized journals constitute the periphery of the network. In the DE-WU there is a small heterodox group around the *Cambridge Journal of Economics* and *Metroeconomica*<sup>14</sup>.

The structure of the DS-WU’s citation network differs substantially. It is less dense and does not show a clear core-periphery structure. It is rather composed of a number of distinct groups which are strongly connected within but relatively loosely connected to other groups. Non-categorized journals play an important role, while the orthodox group around the *American Economic Review* is, while present, not dominant as is the case in the economics departments. The greater importance of the heterodox group in the DS-WU is strongly linked to *Ecological Economics*, which is the most important journal in the network. The *Cambridge Journal of Economics* is the only other heterodox journal ranked under the Top 20 when considering the Weighted In-Degree.

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<sup>14</sup> The only other more important journal in the heterodox group, the *Journal of Economic Behavior and Organization* (JEBO), is isolated from other heterodox journals. The same holds true for the DE-UV where the JEBO plays a more important role in the network<sup>14</sup>, is however barely connected to other heterodox journals. Recalling the paradigmatic map this is consistent with the notion of Behavioral Economics being closer to the mainstream than other fields and or schools of thought in economics. Indeed when analyzing the network for the JEBO, becomes apparent that the journal only cites orthodox journals. It is thus questionable whether the categorization of Lee et al. (2010) as heterodox is adequate. In fact it rather seems that consistent with the scheme of Dobusch & Kapeller (2012b), Behavioral Economics has indeed been integrated into mainstream.

Figure 5: Citation Network Department of Socioeconomics WU – Node size ranked by Weighted In-Degree



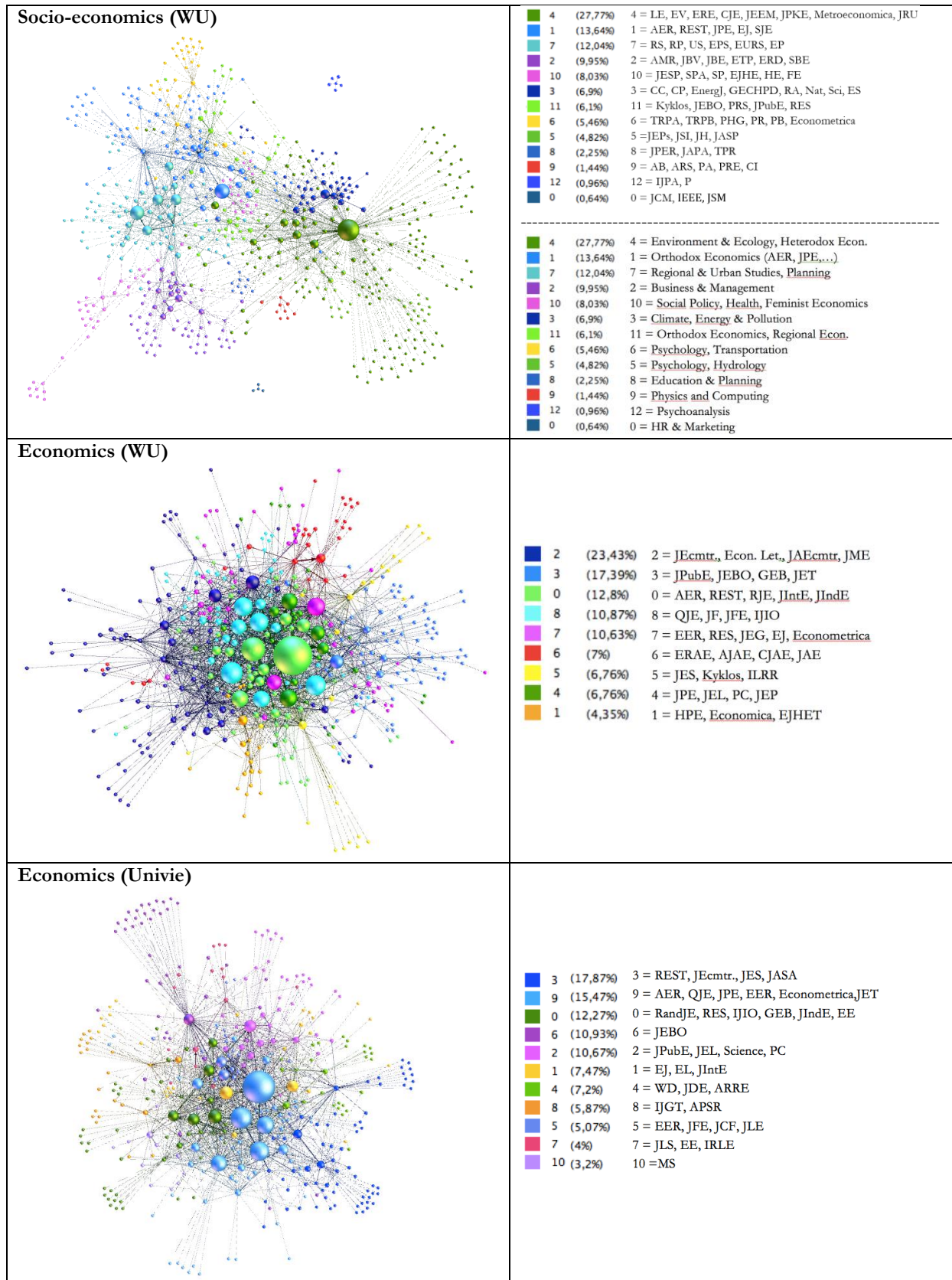
1	ECOLOGICAL ECONOMICS	123	ENVIRONMENTAL AND RESOURCE ECONOMICS
2	AMERICAN ECONOMIC REVIEW	9	QUARTERLY JOURNAL OF ECONOMICS
43	URBAN STUDIES	108	JOURNAL OF ENVIRONMENTAL ECONOMICS AND MANAGEMENT
23	REGIONAL STUDIES	127	ACADEMY OF MANAGEMENT REVIEW
34	RESEARCH POLICY	61	CAMBRIDGE JOURNAL OF ECONOMICS
30	EUROPEAN PLANNING STUDIES	15	REVIEW OF ECONOMICS AND STATISTICS
122	CLIMATIC CHANGE	171	INDUSTRIAL AND CORPORATE CHANGE
65	ENVIRONMENT AND PLANNING	178	PHOTOGRAMMETRIC ENGINEERING AND REMOTE SENSING
21	ENVIRONMENTAL VALUES	154	JOURNAL OF ECONOMIC GEOGRAPHY
68	LAND ECONOMICS	27	GLOBAL ENVIRONMENTAL CHANGE HUMAN AND POLICY DIMENSIONS

### c. Modularity

Finally, an analysis of the citation networks with the help of the concept of modularity reveals that the economics departments exhibit a rather insular network in the disciplinary context. There is a strong focus on intra-disciplinary citations and also little discourse between schools of thought within economics. In contrast, the DS-WU exposes a different structure of the network, which can be explained through the broader and more interdisciplinary research agenda at the DS-WU. The

department's network consists of a big number of also spatially distinct modules, which can be described on the basis of distinct disciplines, topics and schools of thought.

Figure 6: Modularity in the citation networks of the departments





While within the modules there is strong interaction, it is less pronounced between the modules suggesting that the Department for Socioeconomics is rather a plural than a pluralistic department. Still it seems more apt to relate to research from diverse schools of thought and different disciplines, with modules focusing on topics including environment, ecology, climate, energy, geography, regional science, urban policy, social policy, business and management, behavior and psychology, feminist economics, as well as broadly heterodox economics and orthodox economics. In contrast, the economics departments are consistent with the observation of Fourcarde et al. (2015) that economics shows very little ties to other disciplines in comparison to other social sciences. In the figure below, the legend for the economics departments therefore only shows the most important journals of each module rather than also distinct topics or disciplines as done for the DS-WU, as such a distinction is not easily made in this case. The vast majority (of the important journals) could be subsumed under the category orthodox economics. Only few modules are concerned with a specific topic, for instance module 6 in the DE-WU network is focused on agricultural economics. The modular structure of the economics departments also differs spatially from the DS-WU. It resembles an onion, with concentric modules as layers around the core.

## 5. Conclusions

Several interesting conclusions can be drawn from the bibliometric analysis of journal to journal citations and the analysis of the citation network of the three major departments conducting economic research in Vienna.

- (1) Articles in heterodox journals cite heterodox journals more strongly than articles in orthodox or non-categorized journals: the *journal effect*. However, articles in heterodox journals still cite relatively more orthodox journals, with a ratio of heterodox to orthodox citations ( $R$ ) of 0.729, and thereby strengthen the mainstream institutionally in the logic of impact factors. The mainstream ignores heterodox publications with a ratio in articles published in orthodox journals of 0.034. Also articles in journals not attributable to the heterodox or the orthodox camp with the help of the list provided by Lee et al. (2010) refer negligibly to heterodox journals ( $R=0.06$ ).
- (2) The Department of Socioeconomics exhibits significantly higher ratios of heterodox to orthodox citations, independent of the journal category. This result, the *department effect*, is confirmed when only comparing articles published in the same journals as the economics departments. The combined journal and department effect lead to the only ratio above 1. Heterodox articles published by researchers of the DS-WU exhibit a ratio of 1.762.
- (3) The application of social network analysis to citations on the journal level reveals that the “simplified paradigmatic map of economic theorizing” developed by Dobusch & Kapeller (2012b, p. 1037) is consistent with the citation networks of the economics departments. Both departments exhibit a clear ‘mainstream core - heterodox periphery’ structure. The postulated structure of the economics discourse for the entire discipline can therefore be found at the micro-to-meso level, the level of economics departments.

- (4) In contrast, the DS-WU reveals a set of spatially distinct modules within its network. These modules reflect a wide set of specific disciplines, both in the realm of social and natural sciences, and deal with a broad range of topics and reflect certain schools of thought. Due to the relatively loose connection between these modules the DS-WU is best described as a plural rather than as a pluralistic department. Unlike the DS-WU the modules of the economics departments all fall into the broad category of orthodox economics and cannot easily be associated with specific topics or schools of thought. In these departments, the modules rather form around the core journals in concentric layers.

In light of the perverse mechanisms in the market of science and the resulting self-reinforcing marginalization of heterodox economics and the relatively more promising results for the Department of Socioeconomics, in our view strategies to achieve a paradigmatic change need to go beyond solutions *within* the market, relying solely on the individual researchers and an altered citation behavior. While such efforts may improve the position of heterodoxy in economics within the citation metric, they are part of uphill battle and are also dialectic in nature, institutionally strengthening at the same time the mechanisms such as impact factors which are cementing the marginalization of heterodox economists. In order to be successful a pluralist movement therefore also needs to address the organisations and institutions themselves that impede pluralist research in economics. Evidence that more diversity in terms of research fields within departments has a high explanatory power of individual publication performance (Bosquet & Combes, 2013) is a further reason to expedite change on the organizational level. Developing strategies to undermine the marketization of economics, to influence the evaluation of scientific quality, to change hiring policies at departments and develop alternative career prospects for non-mainstream researchers, will be essential in the future.

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## Glossary – Social Network Analysis (following Cherven (2015)):

### Node-based measures:

1. **In-Degree:** The number of direct connections directed to the respective node.
2. **Out-Degree:** The number of direct connections directed away from the respective node.
3. **Weighted In-Degree:** The number of direct connections directed to the respective node, considering the weight of the edges.
4. **Weighted Out-Degree:** The number of direct connections directed away from the respective node, considering the weight of the edges.
5. **Betweenness Centrality:** The value expresses on how many shortest paths between every possible pair of nodes in the network the investigated node lies.

### Network-based measures:

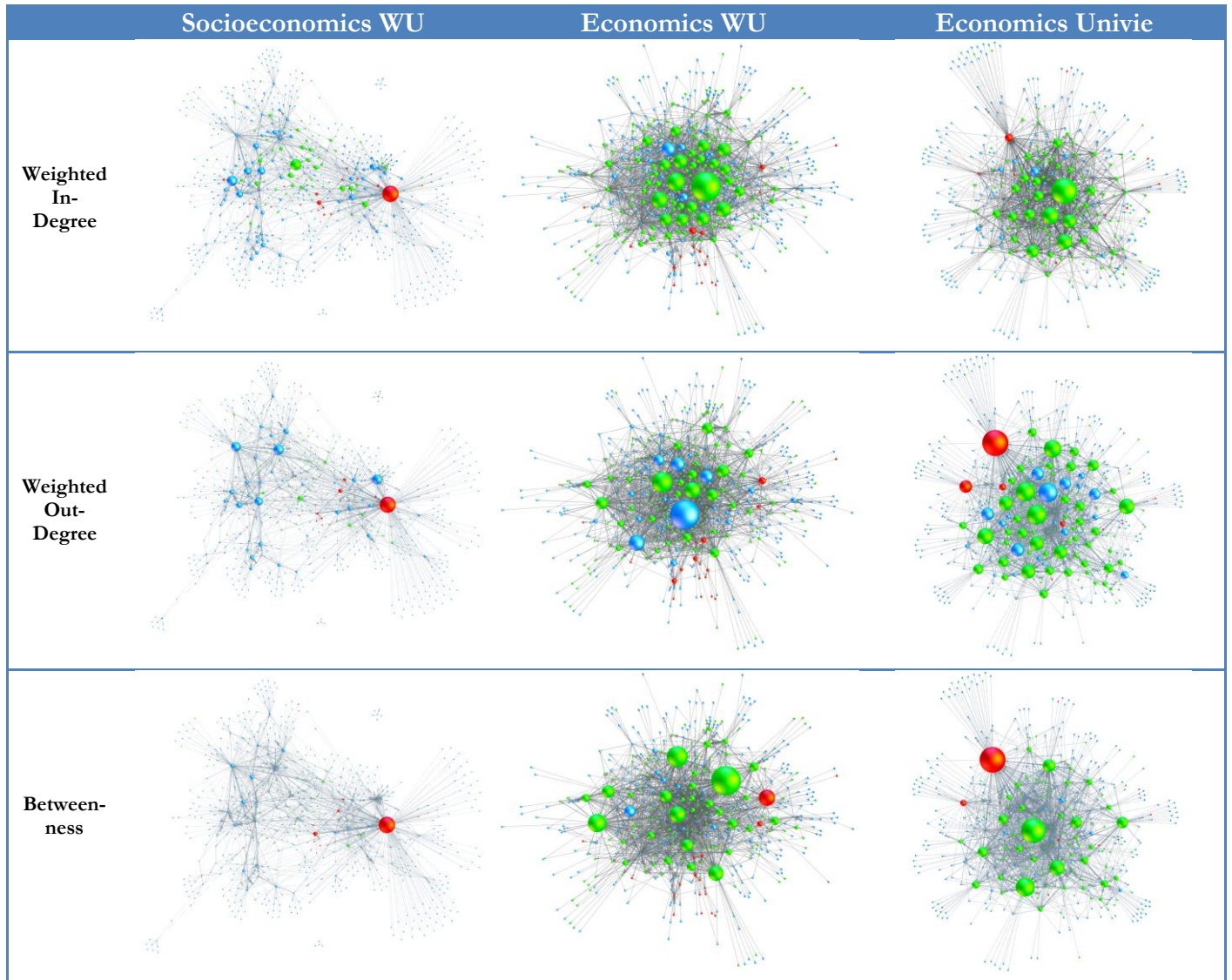
6. **Nodes:** Number of journals in the network.
7. **Edges:** Number of unique connections between nodes of the network
8. **Average Degree:** The mean amount of connections per node on the graph, ignoring edge weight.
9. **Average Weighted Degree:** The mean amount of connections per node weighted by the weight of the edges.
10. **Network Diameter:** The greatest distance between two nodes in the network.
11. **Average Path Length:** The number of steps needed to reach one node from any other node on average.
12. **Graph Density:** A measure of overall connectedness in the network. It is the number of connections (edges) in the network divided by the total amount of possible connections. A network in which all nodes are directly connected to each other has a density of 1.
13. **Average Clustering Coefficient:** The average clustering coefficient is based on the concept of node triplets. It simply divides the number of closed triplets (triplets where all three nodes are connected to each other) by the overall number of triplets to yield a value between 0 and 1.
14. **Modularity:** Is based on an algorithm by Blondel, Guillaume, Lambiotte, & Lefebvre (2008) and identifies groups of nodes which are tightly connected to each other, but loosely connected to nodes outside the group or module. The value the degree to which the network is modular, or put differently to what degree it is fragmented into distinct groups. The resolution parameter (Lambiotte, Delvenne, & Barahona, 2008) which influences the number of groups the algorithm produces is kept 1, the standard setting.
15. **Number of communities:** The number of groups found by the modularity algorithm (Blondel et al., 2008).

## Glossary - Journal Abbreviations

AER – American Economic Review	HPE – History of Political Economy	JPKE – Journal of Post Keynesian Economics
AB – Adaptive Behavior	IE – Izinerine Ekonomika	JPubE – Journal of Public Economics
AJAE – American Journal of Agricultural Economics	IJGT – International journal of Game Theory	JRU – Journal of Risk and Uncertainty
AMR – Academy of Management Review	IJIO – International Journal of Industrial Organization	JSI – Journal of Social Issues
APSR – American Political Science Review	IJPA – International Journal of Psycholanalysis	Kyklos – Kyklos
ARRE – Annual Review of Resource Economics	IRLE – International Review of Law and Economics	LE – Land Economics
ARS – Annual Review of Psychology	JAE – Journal of Agricultural Economics	Metroeconomica – Metroeconomies
CC – Climate Change	JAEmtr – Journal of Applied Econometrics	MS – Management Science
CI – Computing and Informatics	JAPA – Journal of the Economic Planning Association	Nat – Nature
CJAE – Canadian Journal of Agricultural Economics	JASA – Journal of the American Statistical Association	P – Psyche
CJE – Cambridge Journal of Economics	JASP – Journal of Applied Social Psychology	PA – Physica A
CP – Climate Policy	JBE – Journal of Business Ethics	PB – Psychological Bulletin
Econ. Let. – Economics Letters	JBV – Journal of Business Venturing	PC – Public Choice
Econometrica – Econometrica	JCF – Journal of Corporate Finance	PHG – Progress in Human Geography
Economica – Economica	JCM – Journal of Consumer Marketing	PR – Psychological Review
EE – Ecological Economics	JDE – Journal of Development Economics	PRE – Physical Review E
EE – Experimental Economics	JEBO – Journal of Economic Behavior and Organization	PRS – Papers in Regional Science
EER – European Economic Review	JEmtr. – Journal of Econometrics	QJE – Quarterly Journals of Economics
EJ – Economic Journal	JEEM – Journal of Environmental Economics and Management	RA – Risk Analysis
EJHE – European Journal of Health Economics	JEG – Journal of Economic Growth	RES – Review of Economic Studies
EJHET – European Journal of the History of Economic Thought	JEL – Journal of Economic Literature	RP – Research Policy
EnergJ – Energy Journal	JEP – Journal of Economic Perspectives	RS – Regional Studies
EP – Environment and Planning	JEPs – Journal of Environmental Psychology	SBE – Small Business Economics
EPS – European Planning Studies	JES – Journal of Economic Surveys	Sci – Science
ERAe – European Review of Agricultural Economics	JESP – Journal of European Social Policy	SJE – Scandinavian Journal of Economics
ERD – Entrepreneurship and Regional Development	JET – Journal of Economic Theory	SP – Social Policy
ERE – Environmental and Resource Economics	JF – Journal of Finance	SPA – Social Policy Analysis
ES – Earthquake Spectra	JFE – Journal of Financial Economics	TPR – Town Planning Review
ETP – Entrepreneurship Theory and Practice	JH – Journal of Hydrology	TRPA – Transport Research Part A
EURS – European and Urban Regional Studies	JIndE – Journal of Industrial Economics	TRPB – Transport Research Part B
EV – Environmental Values	JIntE – Journal of International Economics	US – Urban Studies
FE – Feminist Economics	JLE – Journal of Law and Economics	WD – World Development
GEB – Games and Economic Behavior	JLS – Journal of Legal Studies	ZPF – Zeitschrift für Personalforschung
GECHPD – Global Environmental and Human Policy Dimensions	JPE – Journal of Political Economy	
HE – health Economics	JPER – Journal of Planning Education and Research	

## Appendix

Figure 7: Citation Networks of the three departments – node size ranked by Weighted In-Degree, Weighted Out-Degree and Betweenness





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