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The Disciplinary Mobility of Core Behavioral Economists

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Abstract

Abstract: Disciplinary mobility occurs when researchers publish outside their disciplines of origin. It is an important mechanism of interdisciplinarity and knowledge transfer. New behavioral economics (BE) was founded by two psychologists, Daniel Kahneman and Amos Tversky, who used disciplinary mobility to influence economics. In this article, we study the disciplinary mobility of seven core behavioral economists to better understand how it has influenced the early development of BE and the interdisciplinary practices of later behavioral economists. Besides the movement of psychologists towards the center of economics, we identify an outward movement of economists away from the discipline. This movement away from economics has allowed some behavioral economists to gain new scientific legitimacy, while escaping some of the normative traditions of economics. This has enabled them to push the frontiers of economics and promote a more radical approach to BE.

Keywords: Behavioral Economics; Interdisciplinarity; Social Network Analysis

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1 Introduction

Behavioral economics (BE)¹ was founded by Daniel Kahneman and Amos Tversky, two psychologists who set out to influence economics. The act of publishing outside of one’s discipline of origin is called “disciplinary mobility”. Moving from one discipline to another can be quite challenging. Gregor Mendel’s work was rejected by biologists due to antimathematical prejudice, and Louis Pasteur’s background in chemistry initially limited the impact of germ theory on medicine, as experts in that field regarded him as “poaching on their scientific preserves” (Barber, 1961). Despite the resistance that both researchers faced, they impacted scientific research in a lasting manner, and their disciplinary mobility has come to be seen as a source of innovation. In a similar fashion, Kahneman and Tversky faced a lot of resistance in the 1980s, but the impact they had on economics is now recognized as substantial (Geiger, 2017; Angner, 2019).

Although it is largely accepted that their movement from psychology to economics played an important role in the orientation of BE as an interdisciplinary research program, the importance of interdisciplinarity between economics and psychology in BE is controversial. Some have talked about “reverse imperialism,” with psychology spearheading the end of neoclassical economics (Frey and Benz, 2004; Colander et al., 2004; Davis, 2006); others have described the role of psychology in BE as limited or mostly rhetorical (Sent, 2004; Berg and Gigerenzer, 2010). Attempts to study interdisciplinarity in BE, whether by case study (Grüne-Yanoff, 2016) or quantitative methods (Braesemann, 2019; Truc, 2020), have often concluded that after an intense period of importation in the 1980s, the field became less oriented towards psychology.

The literature on interdisciplinarity in BE focuses on the importation of psychology by economists as measured by citations to psychology publications or by the importation of psychological objects (e.g., concepts, methods, models). Despite the importance of disci-

¹For the purpose of the article, behavioral economics (BE) is understood as “new behavioral economics” (Sent, 2004) (i.e., Daniel Kahneman and Amos Tversky’s heuristics and biases program).

plinary mobility in the early years of BE, most research on interdisciplinarity has neglected this particular form of interdisciplinary exchange, and very little effort has been made to measure its importance, characteristics, or evolution since Kahneman and Tversky's initial contributions to the field. Moreover, almost no attention has been paid to the other side of disciplinary mobility, in which behavioral economists have moved away from economics to invest in cognitive disciplines. More generally, the measure of disciplinary mobility in BE should be of interest for historians interested in the interaction between economics and other disciplines (Backhouse and Fontaine, 2010b) as it represents a new way to approach interdisciplinarity and BE is increasingly influential in economics (Geiger, 2017; Angner, 2019).

Does disciplinary mobility in BE comprise a unilateral movement of psychologists towards economics ? What role does it play in the history of BE ? To answer these questions and investigate how disciplinary mobility has shaped BE, we study in this article the disciplinary mobility of a handful of central personalities in the field. In the first section of this article, we describe our quantitative approach to analyzing disciplinary mobility. In the second section, we quickly explore the historical origins of BE. In the third and fourth section we respectively study the mobility (and immobility) of the first and second generation of behavioral economists.

Starting in the 1980s, we explore how the disciplinary mobility of Kahneman, Tversky, and economist Richard Thaler impacted the early development of BE. The founders of BE worked within a particular context, where they met resistance from economists who rejected experimental works. On the other hand, Kahneman and Tversky received support from the Sloan-Sage Foundations, which sought to bring together psychologists and economists interested in developments at the frontiers of both disciplines (Heukelom, 2014, p.152). We show that the Sloan-Sage years were a pivotal time in Kahneman and Tversky's careers, when both acquired an increasing ability to publish in economics. While Kahneman's first article in economics (Kahneman and Tversky, 1979) made heavy use of psychology references,

his subsequent collaboration with Thaler and the strategies adopted by Sloan-Sage members helped him publish more economics-oriented papers in which the influence of psychology was more subtle. After the Sloan-Sage years, Kahneman's interest in economics persisted, and he remained a mobile scholar. Following the 1990s, his work in economics became more oriented towards psychology; at the same time, his work in psychology was increasingly influenced by economics. In other words, Kahneman built an individual research program in which his publications in economics and psychology influenced each other.

Later researchers in BE have taken up the disciplinary mobility deployed by Kahneman. Just as Kahneman learned to publish efficiently in economics in a way that satisfied economics (Kahneman, 2011, p.2087), some of the core second-generation behavioral economists became increasingly keen to publish in cognitive disciplines. While Kahneman moved towards economics, those researchers have moved away from it. Some members of this new generation promote a behavioral approach at the frontiers of multiple disciplines. This vision clashes with that of other second-generation behavioral economists, who see BE as a pragmatic program (Chetty, 2015) or only an importation program without mobility, wherein the relation with psychology should remain limited to its potential contribution to economics (Rabin, 2002, 2013).

The disciplinary mobility of some second-generation behavioral economists results from a different logic of publication than that of standard economists. Those second-generation behavioral economists came of age within a different context than the first generation. BE was already established as a successful approach, and the problem was no longer to convince economists to accept the influence of psychology. Instead, some core members of the second generation have forwarded research programs at the frontiers of multiple disciplines, while moving away from some of the normative concerns of economics. These behavioral economists have reoriented their research in ways that enable them to publish it in other disciplines, while also trying to make it relevant to economists. This movement away from economics has also allowed those behavioral economists to find new forms of legitimacy

against the traditional hierarchical norms of economics. Against some of the critics that emerged in the 2010s, those behavioral economists wield a new-found legitimacy provided by influential generalist journals, such as *Nature* and *Science*.

2 Methodology

2.1 Disciplinary Mobility

The concepts of interdisciplinarity and disciplines are particularly complex to approach empirically as a variety of taxonomy and definitions have emerged over the years (Klein, 1990; Abbott, 2001; Ross, 2003; Frodeman, 2010; Huutoniemi et al., 2010; Klein, 2010). Sydney J. Pierce (1999) delineates three manners in which information transfer can happen between disciplines: (1) borrowing, when researchers import methods and theories from other disciplines; (2) collaboration, when researchers publish in their own literature with co-authors from other disciplines; and (3) boundary crossing, when researchers publish in other disciplines, mixing theories or methods.

Each manners of transfer can be respectively associated to specific manner of measuring interdisciplinarity such as (1) studying cross-disciplinary citations (Pieters and Baumgartner, 2002; Angrist et al., 2020), (2) cross-disciplinary publications (Pierce, 1999) or (3) cross-disciplinary collaborations (Karlovec and Mladenić, 2015). Such empirical studies do not bring forth a definitive answer regarding the right taxonomy or definition of interdisciplinarity (Wang and Schneider, 2020), but they provide evidences that bibliographic informations can generate accurate taxonomy of scientific disciplines (Klavans and Boyack, 2017) and interdisciplinary interactions (Roessner et al., 2013), and they offer a way to operationalize interdisciplinarity and make it amenable to measurement (Porter et al., 2007; Porter and Rafols, 2009; Rafols, 2014; Leydesdorff et al., 2019; Leydesdorff and Ivanova, 2021).

Boundary crossing is distinguished as one of the strongest form of interdisciplinary, and

is the subject of a few scientometric studies. For example, Ed J. Rinia et al. (2002) examine interdisciplinarity in physics by looking at the percentage of articles published by researchers outside of their discipline. A whole segment of the research literature examines such boundary crossing more explicitly, sometimes under the concept of “field mobility.” In one of the earliest studies on this topic, C. Le Pair (1980) looks at the migration of scientists from one discipline to another in the Netherlands. According to Le Pair, a *retainer* (or *non-switcher*) is a researcher that remains in the same field of study as his master’s degree. A *switcher* moves outside of that field. Such field mobility is sometimes considered an important source of scientific innovation. When successful, the influence of such “immigrants” (Nissani, 1997) often results in the emergence of new fields or paradigms (Kuhn, 1962, p.92). Iina Hellsten et al. (2007, p.470) draw on the earlier works of Dieter Urban (1982) and Andrea Scharnhorst (2001) to speak about the “driving force for the exploration of new territories in the ‘landscape’ of science.” Finally, field mobility is also useful for investigating how different scientific specialties might follow the same evolutionary path as their communities exchange members (Hellsten et al., 2007).

In the present article, we favor the concept of “disciplinary mobility” to emphasize the disciplinary nature of the movement studied, as opposed to the more general and open notion of “field.” Our investigation will focus on a few core personalities in BE. Some scientometric studies have already approached disciplinary mobility through a micro-focused perspective using surveys and interviews (van Houten et al., 1983). In another approach, more similar to what we want to do here, Hellsten et al. (2007) develop quantitative tools to study the field mobility of one scientist: Werner Ebeling. Self-citations are usually excluded from scientometric analyses because they are either regarded as irrelevant or a sign of egoism (e.g., Hyland 2001); however, Hellsten et al. (2007) use self-citations to detect critical moments of Ebeling’s reorientation towards new fields and topics. Among other things, they provide a great indicator of how Ebeling himself organized his own research in different domains of knowledge.

We focus on a few individuals in our study for at least two big reasons. First, the hierarchical orientation that economists take towards other disciplines is mirrored by the strong hierarchy within economics itself. This is, for example, visible in the hiring processes of economics departments, which follow a prestige principle (Han, 2003). Departments tend to recruit people coming from equally or more prestigious universities. While all seven of the academic disciplines studied by Shin-Kap Han (2003) follow this principle, economics has the strongest correlation between recruitment and prestige. This means that the hierarchical relationships between economics departments have a very strong influence on the development of the discipline, and they tend to be maintained over time. In contrast with less hierarchical disciplines such as sociology and psychology, the hierarchical organization of economics displays a similar profile as mathematics. Beyond recruitment processes, we also find a great hierarchy in publications. The influence of top journals tend to be particularly prominent in economics; moreover, this hierarchy tends to be self-sustaining, with top journals often favoring in-house authors (Fourcade et al., 2015, p.99). Overall, in economics: “The authority exerted by the field’s most powerful players, which fosters both intellectual cohesiveness and the active management of the discipline’s internal affairs, has few equivalents elsewhere” (Fourcade et al., 2015, p.91). The particularly strong influence, control, and authority of “powerful players” in economics makes the study of the most influential behavioral economists particularly relevant. Whether they are departments, journals, or researchers, actors and institutions within economics tends to favor equally or more important actors, making the influence of top players all the more important. As such, looking at BE’s most influential actors gives us a good sense of what the economics profession values as a whole.

Secondly, disciplinary mobility is a difficult feat to achieve for many researchers. There are institutional (Prud’homme and Gingras, 2015, p.48) and cognitive barriers to mobility (D’Agostino, 2012; Andersen, 2013; Holbrook, 2013; Turner et al., 2015; MacLeod, 2018). In consequence, disciplinary mobility is only possible for a handful of individuals who have the

necessary scientific capital and support networks to achieve this feat. Given that disciplinary mobility is not expected to be a large-scale phenomenon, focusing on a handful of individuals allows for a better qualitative understanding of our observations.

Even when studying only a few individuals, quantitative tools are useful. A handful of prolific economists can collectively generate a few thousands publications, tens of thousands of references, and hundreds of thousands of links for our study of relational patterns. Although it is possible to tally these data manually, or develop an intuitive sense of how individuals' work has evolved by reading their articles, network analysis allows for a more systematic and reproducible approach.

2.2 Corpus

To investigate BE through a focus on a few personalities, we must first identify core members of the field. One institution that is central to the emergence of BE is the Sloan-Sage Foundations. The Sloan-Sage Foundations developed the BE research program between 1984 and 1992 and included all of the field's founders. After the program closed in 1992, it was replaced by the Behavioral Economics Roundtable (BER), which “has kept the gatekeeper role” (Svorenčák, 2016, p.289). The BER has edited and published handbooks on BE, such as *Advances in Behavioral Economics* by Colin Camerer et al. (2004). It has 28 members and includes an array of personalities in various disciplines. In a discussion paper on important personalities of BE, Floris Heukelom (2007) uses the BER membership as a starting point to identify “core behavioral economists.” The heterogeneity we find in the BER suggests that not all members are equally relevant to BE or disciplinary mobility. In the case of some members, BE publications account for only a small portion of their overall works; in the case of others, all of their contributions can be regarded as BE.

To distinguish the former from the latter, Heukelom (2007) uses Google search functions with different keywords to determine which personalities the search engine identifies as be-

havioral economists. His resulting list of core BE members includes Camerer, Kahneman, David Laibson, George Loewenstein, Matthew Rabin, Thaler, and Tversky. In contrast, “George Akerlof, John Elster, Thomas Schelling, and Jean Tirole, although well-known in economics, have relatively little to do with behavioral economics” (Heukelom, 2007, p.4). Heukelom’s list does not seem particularly controversial to us, and therefore we will use it, with one exception: We add Ernst Fehr. Fehr co-authored the second most-cited article in BE (Fehr and Schmidt, 1999) (Angrist et al., 2019), and along with Camerer, he is co-editor of the series published by the BER. One probable reason that Fehr is not identified by Heukelom as a core behavioral economist is that in 2007, his central contribution (Fehr and Schmidt, 1999) was still relatively new, and his European origins position him as a bit of an outsider. Today, however, Fehr cannot be discounted as an important actor in contemporary BE.

Our list of eight core behavioral economists captures not only some of the most influential personalities of BE, but also a variety of personalities in terms of their approach to disciplinary mobility. Some of them are outspoken defenders of increased interdisciplinarity, while others are more concerned with BE’s contributions to economics. Thus, from this sample of behavioral economists, we are able to produce a typology of some of the kinds of mobility that can be observed in BE.

2.3 Indicators

To compile the corpus of publications for our analysis, we took all of these eight researchers’ publications that were available on Web of Science. We extensively cleaned this corpus to make sure that no publication was assigned to a particular author by mistake. To identify the discipline of the journal in which each article was published, we used the US National Science Foundation (NSF) classification system. This system includes 143 fields of research (e.g., sociology, psychiatry), which are themselves grouped under two large domains: natural

sciences, engineering, and biomedical sciences (NSE) and social sciences and humanities (SSH). For our own classification, we first grouped nine subcategories of psychology into one category, and we focused our attention on the most highly represented disciplines within the final corpus: economics and management, psychology, neurosciences and other NSE, and other SSH.

A first simple indicators to investigate mobility is to looked at the number of publications that behavioral economists have published in different categories over time.

To characterize the mobility (and immobility) of our core behavioral economists, it is important to look at how they use disciplinary references in their publications. For example, an immobile economist could be considered interdisciplinary (and an importer) if, despite publishing only in economics, he references other disciplines extensively. Similarly, a mobile economist might be deemed very disciplinary if he only references economics articles in his publications outside of economics. This might indicate that he is exporting his economics-oriented research program to other disciplines, rather than engaging in an interdisciplinary exchange. Finally, if an economist shows decreasing interest in his discipline of origin, in terms of both publications and references, that might indicate that he is developing a disciplinary mixed approach, or if he goes even further, that he is migrating away from economics as his research program outside of economics ends up completely different from his research program in economics.

To take into account this qualitative quality of mobility we used two important indicators. The first is the share of economics and management references in the authors' published articles. For each article, we took all of the references in our database for which we could identify a discipline.² We then measured how the proportion of economics references evolved over time for each author, by differentiating publications in economics and management from other publications (Figure 6). This allowed us to identify the kind of disciplinary mobility

²Out of 29729 references studied, 5593 did not have a clear identifiable disciplines. Most references without an identifiable disciplines are books, chapters, references with a mistake that prevent clear identification, or articles published a journal absent from the NSF classification

measured.

A second important indicator is “disciplinary inwardness.” We built this using a bibliographic coupling network. In a bibliographic coupling network, a link is created between two articles when they have one or more references in common. The more references that two articles have in common, the stronger the link. Bibliographic coupling is one way to measure how similar two articles are in a corpus. To normalize and weight the link between two articles, we used the refined bibliographic coupling strength of Si Shen et al. (2019). This method normalized and weight the strength between articles by taking into account two important elements:

- The size of the bibliography of the two linked articles: common references between two articles with long bibliography are weighted as less significant since the number of potential common references is higher. Conversely, common references between two articles with a short bibliography is weighted as very significant.
- The number of occurrences of each reference in the overall corpus: when a reference is shared between two articles, it is weighted as less significant if it is very common across the entire corpus and very significant if it is rare. A very rare common reference points to a higher content similarity between two articles than a highly cited reference.

For each author, we plotted the networks encompassing all of their publications, with 10-year overlapping windows (all networks are available in Appendix 7.3). In the final visualization of the networks, we color-coded the nodes according to their discipline, and we positioned each individual node using Force Atlas 2, a force-based layout that reduces crossing links (edges) as much as possible. This allows us to better understand the relationship between each author’s publications in different periods. For example, if nodes tend to be grouped by color, this means that publications in the same disciplinary group tend to be similar to each other and dissimilar to publications in other disciplines.

To approximate this visual cue, we used the “weighted disciplinary inwardness” of economics articles, which is the proportion of links (divided by the sum of edges weight in the cluster) connecting two nodes that belong to economics. A high inwardness indicates that publications within a disciplinary group are similar to each other and dissimilar to those in other disciplines because most of their links are to articles from the same discipline. Conversely, a low inwardness indicates that disciplines are not a relevant variable for understanding whether articles are similar or dissimilar to each other. This indicator provides a way for us to approximate whether authors’ research programs are disciplinary bound (publications in different disciplines are from different research programs) or not (the same research program is published across multiple disciplines and at the frontier of multiple disciplines.)

3 Historical Origins of BE

The Michigan psychology department is identified as one of the main sources of origin for BE (Heukelom, 2010, 2012b). It hosted multiple research programs that aimed to weaken the separation between economics and psychology. These included, among others, George Katona’s survey of consumer behavior, Clyde Coombs’ mathematical psychology, and Ward Edwards’ behavioral decision research. Clyde Coombs was a student of Louis Leon Thurstone. He developed mathematical psychology, a research program that would be defined by its mathematical approach rather than by its subject content (Coombs et al., 1970). Ward Edwards was the son of an economist, and he studied psychology at Harvard University under the influence of Frederick Mosteller, a statistician and psychometrician who attempted, with Philip Noguee in 1951 (Mosteller and Noguee, 1951), to experimentally measure how individuals value additional money income. Edwards moved to Michigan in 1958 and subsequently focused on investigating Leonard Savage’s decision theory in experimental settings, which would complement Coombs’ theoretical mathematical psychology,

Both Coombs and Edwards approached were heavily connected to research in economics, and some interactions between economists and psychologists occurred during research seminars organized at Michigan. However, more generally, both Coombs and Edwards remained mostly confined to psychology when it came to publication, and both are identified as psychologists. The interaction between economics and psychology remained mostly intellectual and confined to local efforts. This Michigan approach was very successful up until the 1970s when multiple psychologists left the institution, and when mathematical psychology and behavioral decision making declined in psychology (Heuvelink, 2014, p.95). However, the tradition set up by Coombs and Edwards to combine economic theory as a normative benchmark, with psychology as a descriptive and experimental approach, lived up to what some of its students like Slovic, Lichtenstein, and Tversky who developed a critical perspective on economic theory.

While Tversky was a student of Edwards and Coombs, Kahneman was not. Most of Kahneman's research before the 1970s focused on investigating the psychology of vision using experiments. The collaboration that subsequently emerged between Kahneman and Tversky was particularly fruitful, as Tversky could provide Kahneman with a normative framework for experimentally testing behavior deviations, and Kahneman could provide Tversky with insight into the empirical validity of Savage and Edwards' assumptions. In the 1970s Kahneman and Tversky broadened their research program by organizing workshops that would gather economists and psychologists, and by the end of the decade, they did manage to actually publish in economics with an article in *Econometrica* (Kahneman and Tversky, 1979). Along with other psychologists such as Paul Slovic and Sarah Lichtenstein, who were also former students of Edwards, they developed an approach that aimed to identify systematic departures from John Von Neumann and Oskar Morgenstern's axiomatic approach, while maintaining the role of that axiomatic approach as a normative theory. To achieve their goal, they pushed the approach of Coombs and Edwards further by direct contributions to economics

Kahneman and Tversky’s collaborative approach initiated a research program that developed very quickly from the 1980s onwards. Between 1984 and 1992, BE found an anchor with the help of two private foundations, the Sloan Foundation and the Russell Sage Foundation. According to Heukelom (2012a, 2014), the support of these foundations helped to give BE a “sense of mission” and catalyzed different trends of research that would construct BE as a “new behavioral sub-discipline in economics” (Heukelom, 2014, p.149). It is during that time that behavioral economics will emerge as a research program with both psychologists and economists eager to weaken the frontier between the two disciplines.

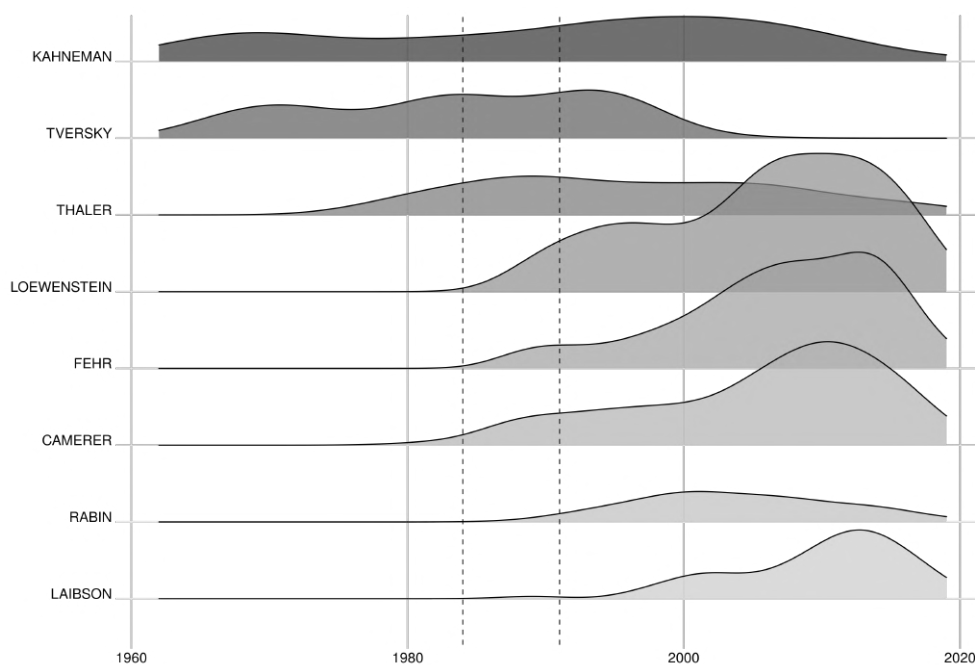


Figure 1: Publication density of different authors over time. The two dotted lines mark the beginning and end of the Sloan-Sage program.

A quick look at our list of authors’ publication dynamics over time makes two to three generations of behavioral economists distinguishable in relation to the Sloan-Sage Foundations (Figure 1). The first generation comprises Kahneman, Tversky, and Thaler. They had already established track records of academic publication before the Sloan-Sage Foundations launched the BE program in 1984. A second generation comprises Loewenstein, Fehr,

Camerer, and (as a borderline case) Rabin, who started their academic careers soon after the Sloan-Sage program started. And finally, we may delineate a third generation with Laibson, who started his career well after the Sloan-Sage program ended. Along with Kahneman, Tversky, and Thaler, Loewenstein and Camerer were directly involved with the Sloan-Sage Foundations. When the BE program ended in 1992, they were among the first ten members of the BER, with other behavioral economists such as George Akerlof and Robert Shiller. Ernst Fehr, Matthew Rabin, and David Laibson became involved with the roundtable later, and they are presently all members.

4 The First Generation: An Inward Movement by Outsiders

Making it in Economics

Mobile researchers face institutional and cognitive barriers (MacLeod, 2018). Because of the institutional environment of research, the potential loss of time in making interdisciplinarity work can pose a substantial career risk if it results in fewer publications (Prud'homme and Gingras, 2015, p.48). When a researcher publishes in a different discipline, it is harder to evaluate their achievement, and the cost of overcoming institutional obstacles does not always result in more successful articles (Yegros-Yegros et al., 2015). Peer-review processes might also be biased against interdisciplinary work, although some suggest that might not be the case at a global scale (Rinia et al., 2001). We also find a variety of factors on the cognitive side that can hinder mobility: conceptual and methodological distance between fields (Huutoniemi et al., 2010), linguistic and epistemic tensions (Turner et al., 2015), and implicit norms that are hard to acquire for outsiders (Bird, 2008).

These barriers are particularly strong in economics, especially in the 1970s and 1980s. Economists are unique among social scientists as the majority disagree with the statement

that interdisciplinary knowledge is better than knowledge from a single discipline (Fourcade et al., 2015, p.95). Moreover, the relationship between economics and psychology was at a low point between the 1950s and 1970s as psychology was dominated by behaviorism which was hardly compatible with economists turn towards revealed preferences (Hands, 2010). The failed integration of economics as parts of the Ford Foundation's Behavioral Sciences Program in the 1950s settled economics distinct identity from the other social sciences (Pooley and Solovey, 2010, p.230). More generally, while psychologists became a central disciplines of many cross-disciplinary research during the post-war period, economists were more reluctant to interdisciplinary interactions where economics was not the dominant disciplines, which in turn "made their association with other social scientists more difficult" (Backhouse and Fontaine, 2010a, p.221). During the 1980s, cognitive psychology became the new dominant paradigm of psychology (Ash et al., 2010, p.25), and while a cognitive approach does not make the interaction with economics intrinsically easier, it did not carry the negative connotations of behaviorism and opened new areas of scientific inquiry that might have peaked the interest economists (Hands, 2010, p.642).

In the 1970s Kahneman and Tversky had already crossed the frontiers between economics and psychology with Kahneman and Tversky (1979), but economics remained a very minor part of their publications and never accounted for much of their output (Figure 2). Moreover Kahneman and Tversky (1979) flagship contribution took Kahneman and Tversky was difficult to complete as it took five years to get published with "the last four of these five years were used to tweak a for the most part finished argument to fit an economic audience" (Heukelom, 2014, p.119). Much of the work done by Kahneman and Tversky was about adapting the rhetoric and formalism of the paper in a way that it would be accepted by economists. With the creation of the Sloan-Sage Foundations' BE program in 1984, things changed rapidly in terms of publications. Between 1984 and 1991, both Kahneman and Tversky turned their attention towards economics by publishing extensively in the discipline. Publications in economics then respectively represented 73% and 30% of their output

(Figure 2). The case of Kahneman is particularly persuasive. During his involvement in the BE program, he greatly reduced his publications in psychology to focus heavily on economics in some of the most influential economics journals (e.g., *Quarterly Journal of Economics*, *Journal of Political Economy*, *American Economic Review (AER)*, *JEP*). After 1991, with the end of the BE program and its replacement by the BER, Kahneman reinvested in psychology but remained throughout his career a mobile researcher. The emerging success of BE allowed Kahneman to pursue a more mixed approach that would blur the line between publications in economics and psychology.

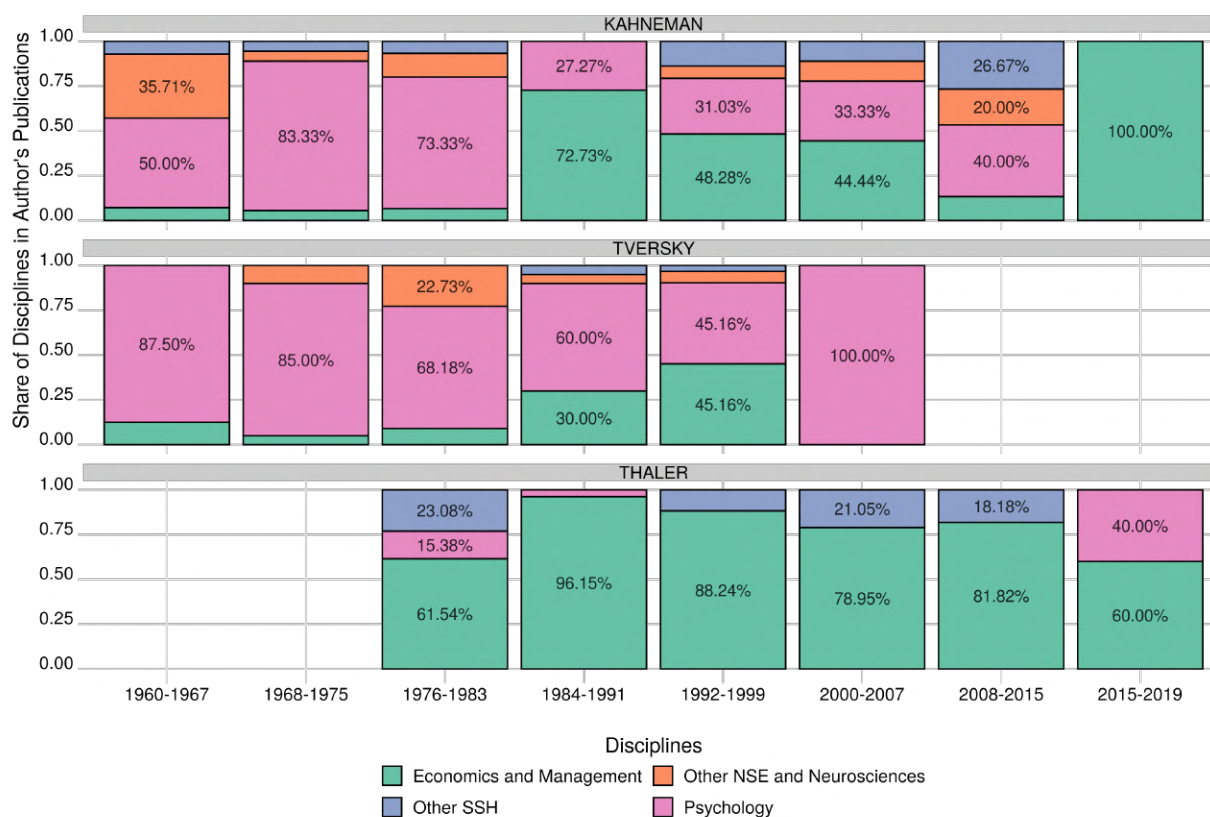


Figure 2: Kahneman, Tversky, and Thaler's publications by discipline, centered around the Sloan-Sage years (the x-axis is split into discrete values for readability; for a continuous version of the same data, see Appendix 7.2)

Despite the successful publication of Kahneman and Tversky (1979) after five years of work, in 1983, Kahneman and Tversky were not very confident of their ability to influ-

ence economics as their approach might not be mathematically sophisticated enough for economists (Heukelom, 2014, p.152). Managing to get one publication in a top economic journal was one thing, but it did not made the task of publishing in economics much easier for Kahneman and Tversky. The Sloan-Sage Foundations years played an important role in the ability of Kahneman and Tversky to develop a support network and systematic strategies to publish in economics.

First, the approach of Kahneman and Tversky involved accommodating economists (at least rhetorically), in a way that psychology would become more acceptable. Behavioral economists wanted to avoid being identified as part of Simon’s program, heterodox, or overly-critical of economics. They avoided loaded concept like irrationality or bounded rationality, and engage economists in a way that would not antagonize them. Similarly, they contained their criticisms of economics to the descriptive aspects of the theory, and avoided any implications on normative theory (Heukelom, 2014, p.120).³ These type of strategies would also be shared across the board of the foundations as it was understood by members of the program that the critic of economics should remain subtle, similar to a Trojan Horse (Earl and Peng, 2012), rather than engaging in big theoretical questions that might lead to paradigms clashes (Heukelom, 2012a, p.274). Finally, unlike recent approaches like neuroeconomics or econophysics (Stanley et al., 1999; Camerer, 2008b), behavioral economists simply rarely engaged economists with programmatic writings as they favored direct contributions to the disciplines. This is particularly evident from the fact that most articles by Kahneman, Tversky and Thaler in the 1980s rarely even mention the word “behavioral economics”. This posture was more largely shared by all economists doing experiments at the time as it was understood that being identified as a separate speciality of economics, most notably through JEL codes or particular journals, might lead to isolation from most of the profession (Maas and Svorenčák, 2016, p.39)

³See Berg (2003, 2014) for more on the recent shift in rhetoric of behavioral economists on normative issues.

A second important element that the Sloan-Sage brought was the expertise of both economists and psychologists. Members of the advisory committee were equally economists and psychologists. Invited researchers and grant were carefully balance in a way that would prevent one discipline from having a lot more influence on the other within the program (Heukelom, 2014, p.168).⁴ The program also involved personalities like Hebert Simon who had experience engaging with the economics profession on interdisciplinary grounds. More importantly, the Sloan-Sage actively promoted economists-psychologists pairing that would help orient the program towards substantial economics contributions. The integration of Thaler into the program in July 1984 was specifically aimed at making the work of Kahneman and Tversky into something that could impact economics. As expressed by cognitive psychologist Robert Abelson to Eric Wanner: “Getting Thaler and Kahneman together is bound to produce progress. Their teamwork could be as seminal as the Tversky and Kahneman pairing, but more market oriented” (Heukelom, 2014, p.154). In, a 1985 conference in Chicago opposed what Thaler identify as a team of “behaviorists,” including Tversky, Kahneman, Herbert A. Simon, and Kenneth Arrow, against a team of “rationalists,” composed of Robert E. Lucas, Merton Miller, Eugene Fama, and Sherwin Rosen (Thaler, 2015, p.159). This association between Kahneman and Thaler would lead to a collaborative attempt that would range from 1986 to 1994 to influence and engage the economic profession.

Thaler has been described as the “earliest and strongest advocate” (Heukelom, 2007, p.17) of BE. One of his main contributions was to bridge BE with finance and pinpoint anomalies in the market, which he identifies as the “most disturbing to the defenders of the standard paradigm” (Thaler, 2015, p.174). Thaler contributed directly to the field by tackling others questions than risk and uncertainty with self-control in relation to intertemporal choice (Thaler, 1981; Thaler and Shefrin, 1981) or fairness in relation to pro-social behaviors (Kahneman et al., 1986b). Moreover, as an economist, Thaler highlighted the main contri-

⁴To give an idea of the diverse personalities working within the program, the first explanatory BE meeting in 1984 included Hillel Einhorn, Baruch Fischhoff, Donald Hood, Thomas Juster, Charles Plott, Howard Kunreuther, Howard Raiffa, Oliver Williamson, and Richard Zeckhauser.

butions of behavioral economists by promoting their work as fundamentally changing economics: from 1987 to 1991, Thaler published a series of fourteen anomalies-focused columns in the *Journal of Economic Perspectives* (*JEP*), each of which pointed out a weakness of the dominant “paradigm” while also presenting alternative (psychological) explanations (Thaler, 1987, p.2).

Compared to Kahneman and Tversky movement towards economics, we do not find any significant disciplinary mobility in Thaler’s publications (Figure 2). Despite the attention to the balance of power between economics and psychology within the Sloan-Sage program, it is clear from the disciplinary mobility observed of the three founders that the crossing of the economics-psychology frontiers only went from psychology to economics. While Kahneman and Tversky promoted interdisciplinary by continuously publishing in economics and psychology, Thaler remained confined to the role of importer and promoter of the program in economics. This strong orientation towards economics was not particularly obvious in the early 1980s given the equal importance of economists and psychologists in the program. As expressed by Kahneman about the early years of his research program: “Tversky and I viewed our research primarily as a contribution to psychology, with a possible contribution to economics as a secondary benefit” (Kahneman, 2003a, p.1449). The situation clearly turned around in the late 1980s when Kahneman’s own publications were mostly in economics.

Working at the Frontiers

As we explained in section 6, measuring publications in different disciplines is not enough to measure all dimensions of disciplinary mobility. Thaler might have not published in economics, but his publications in economics might rely heavily on psychological knowledge as he imports outside knowledge. Inversely, Kahneman and Tversky might have crossed the frontiers by publishing in economics, but if their publications in economics are just pure economics, then the interdisciplinary nature of their mobility might be deemed weak.

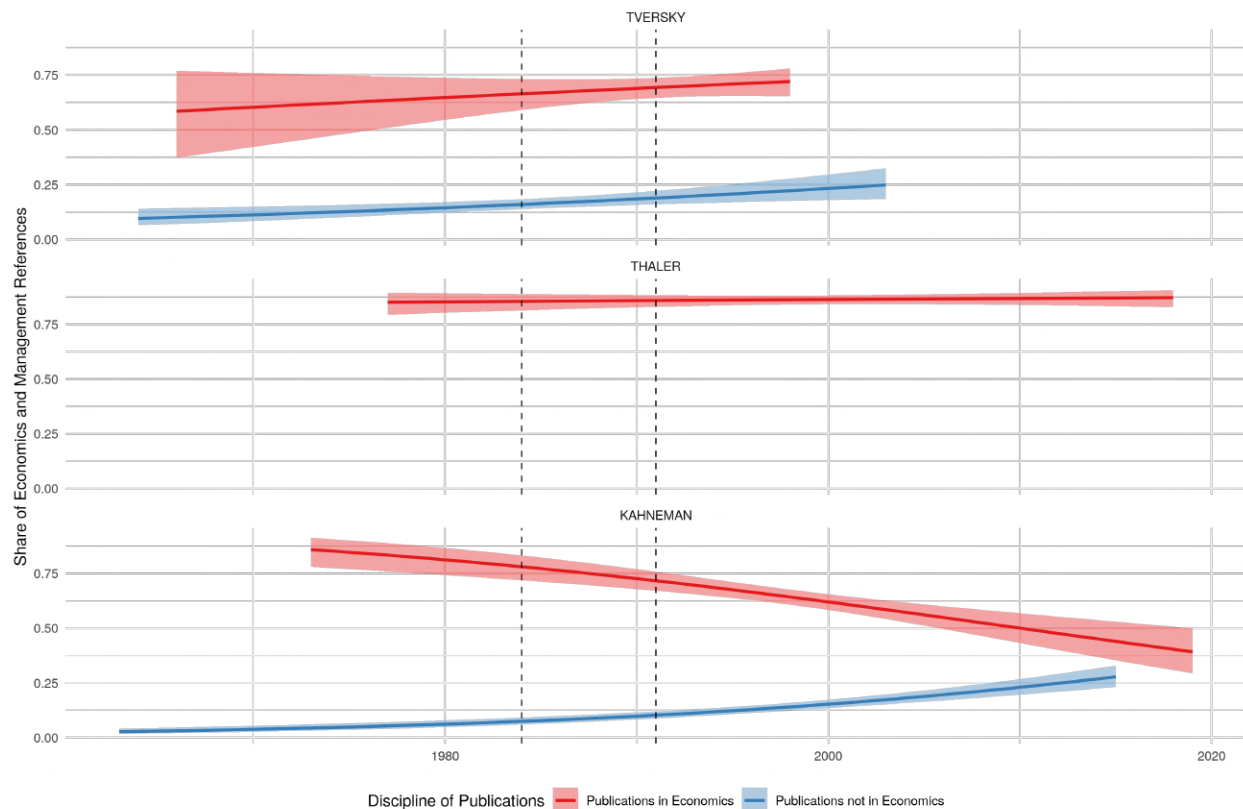


Figure 3: Share of references in economics, in economics (red) and non-economics (blue) publications (curves were smoothed using a binomial generalized linear model)

The first interesting pattern is the one from Thaler. We find that he did not cite other disciplines extensively as his references to economics and management represents more than 80% of his references. In addition to being immobile, Thaler did not cite psychology or any other cognitive disciplines extensively. This includes articles by Kahneman, Tversky or other behavioral economists who might have published works close to BE outside of economics. This confirms the “market-oriented” nature of Thaler’s work, but also the more general results that behavioral finance is a research program that is way less interdisciplinary than other branches of behavioral economics (Truc et al., 2020).

The second interesting pattern is that Kahneman’s economics references increased over time in his psychology publications. We find a similar pattern for Tversky, but the pattern

can't be confirmed as Tversky because he died prematurely in 1996 at the age of 59. Kahneman's pattern show that his movement towards economics also influenced his publication outside of economics; his work in BE was not solely oriented towards changing economics, as economics also fed into his research in psychology. The second interesting pattern is that Kahneman's economics references decreased over time in his economics publications. This is counter-intuitive. One might think that migrating from psychology to economics is a long process, wherein a researcher learns to rely less and less on his discipline of origin as he learns more about economics. Instead, the pattern observed with Kahneman is rather a testimony to the strategy adopted by behavioral economists.

One role of the Sloan-Sage program was to increase the influence of psychology in economics by pairing economists and psychologists together. One of the expected effects of this collaborative approach was to make the BE program more market-oriented (i.e. how biases in behavior affect markets outcomes) (Heukelom, 2014, p.154), and it certainly helped psychologists such as Kahneman and Tversky learn the ropes of economics publication. One particular trait of economics is its insularity from other disciplines, especially in the 1980s and in the top five journals of economics (Fourcade et al., 2015; Truc et al., 2020). If behavioral economists were to adopt a "Trojan horse" strategy (Earl and Peng, 2012), they would have to make the role of psychology in their contributions to economics subtle – or they would risk being accused of being irrelevant to economists' concerns (Gul and Pesendorfer, 2008).

If we look at Kahneman and Tversky's first articles in economics, we find that they did not rely heavily on economics references. In Kahneman and Tversky (1979), only about half of the references are to economics sources, and the rest are to psychology. However, during the Sloan-Sage years, as Kahneman and Tversky increased their number of publications in economics, they relied heavily on economics references. This made their behavioral approach easier to integrate and publish in economics. The strategy adopted within the Sloan-Sage Foundations worked. To take a few examples, after Kahneman and Tversky (1979) which

took 5 years to publish, Kahneman did not publish in economics again until 1986. That year, Kahneman published three articles in economics: two articles with Thaler and Jack Knetsch on fairness (Kahneman et al., 1986b,a) and one with Tversky (Tversky and Kahneman, 1986). Collaborating with Thaler and Knetsch led Kahneman's research to become more economics-oriented. Kahneman's references to psychology decreased, and the few that remained were to his own work that he had published with Tversky outside of economics. In the 1990s, the trio published Kahneman et al. (1990) on the endowment effect and Coase theorem, and the same pattern can be observed. As hoped by members of the Sloan-Sage Foundations, the collaboration between Kahneman and Thaler led BE publications to become more economics-oriented, thus leading to a decreasing visibility of psychological research in Kahneman's published work.

Over time, however, Kahneman began to extensively reference psychological sources in his economics publications once again. For example, the year after his Nobel Prize win, Kahneman (2003a) was published in AER, and Kahneman went back to citing psychological works relevant to economics. Especially following his Nobel Prize win and the advent of BE, psychology became increasingly legitimized as a source of knowledge in economics, and Kahneman used his psychological background more explicitly in his economics contributions. This leads to a feedback loop as his own publications in psychology became more economics-oriented, thus making them more relevant to economists.

More generally, the convergence of the share of economics references in Kahneman economics and non-economics publications point out towards an increasing coherence of his research program. In the 1970s, Kahneman's individual research program was a split between different theme. This is visually measurable by the fact that his articles coupling networks are composed of multiple disconnected groups of articles between 1968-1977 (Figure 4). Kahneman's work was split between his initial research on vision and in psychology, and his new research with Tversky on decision and biases. We observe a strong effect of the Sloan-Sage years on his research organization. By the 1980s, Kahneman had abandoned his

initial research program, and he focused solely on the bias and heuristics approach, which include publications in economics. However, at that point, his publications in economics and psychology were very different as they both relied heavily on their respective disciplinary knowledge (Figure 6).

This is also visible visually in Kahneman’s network as his publications in economics and non-economics journals appears distinctively different in the 1980s than in the 1990s (Figure 4). Such visual cues can be misleading, and one way to approximate this visual pattern is to measure the inwardness of authors’ articles by discipline in each time window by quantifying the weighted share of links between economics articles. Using this indicator, we find that Kahneman’s publications in economics during the Sloan-Sage years became increasingly distinctive from his publications outside of economics as his inwardness went from 30% to 74% in 1991. This remained true until the 2000s, as the inwardness of Kahneman’s publications dropped from 74% back to 33% in the mid-2000 (See Figure 8 for a comparison with other authors). After the 1990s, Kahneman research program promoted an increasingly coherent approach to integrate his production in economics and in psychology.

The disciplinary mobility models set by Kahneman and Thaler illustrate two archetypal visions of BE. One vision interprets BE as an interdisciplinary program at the frontier of economics and psychology, which implies some form of mobility. Kahneman initially crossed the frontiers between psychology and economics by adopting a generally Trojan Horse approach that favor satisfying economists to ensure the success of BE. Kahneman recognized some of the limits of this type of approach as what made his contributions so appealing to economists can also lead similar caveats than traditional economics models: “But of course theory-induced blindness is not restricted to expected utility theory. Prospect theory has flaws of its own, and theory-induced blindness to these flaws has contributed to its acceptance as the main alternative to utility theory.” (Kahneman, 2011, p.2087). As behavioral economics garnered more success over time, Kahneman progressively reaffirmed the interdisciplinary nature of BE. In 2003, he published two similar articles about “mapping

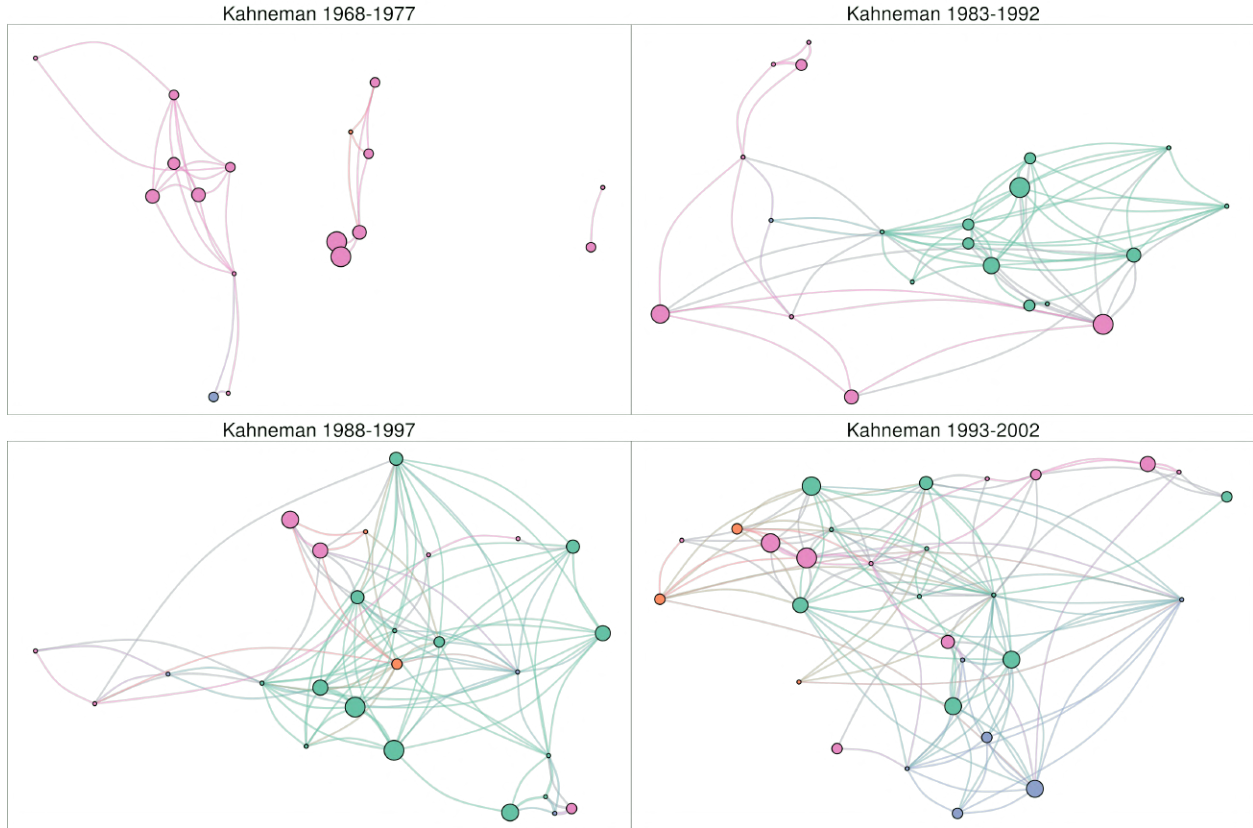


Figure 4: Bibliographic coupling networks of Kahneman's publications (green = economics and management, orange = other NSE and neurosciences, pink = psychology, blue = other SSH)

bounded rationality” in the *American Economic Review* (Kahneman, 2003a) and in the *American Psychologist* (Kahneman, 2003b). While the psychological text is mostly about Kahneman's general framework, the economics text is a defense of psychology and restate the necessity of economists to continue bringing more psychology in economics:

Economists often criticize psychological research for its propensity to generate lists of errors and biases, and for its failure to offer a coherent alternative to the rational-agent model. This complaint is only partly justified: psychological theories of intuitive thinking cannot match the elegance and precision of formal normative models of belief and choice, but this is just another way of saying that rational models are psychologically unrealistic. (Kahneman, 2003a, p.1449)

Incorporating a common sense psychology of the intuitive agent into economic models will present difficult challenges, especially for formal theorists. It is encouraging to note, however, that the challenge of incorporating the first wave of psychological findings into economics appeared even more daunting 20 years ago, and that challenge has been met with considerable success. (Kahneman, 2003a, p.1470)

As Kahneman published more in economics, the relationship between economics and psychology improved overall after the 1990 (Truc, 2021). This allowed him to develop a coherent research program at the frontier of both disciplines, and to successfully published programmatic writing in the top journals of both disciplines simultaneously (Kahneman, 2003b,a).

The second vision of BE is the one adopted by Thaler and entails a behavioral economics program very much focused on economics. His mobility and cross-disciplinary citations remained very limited, and despite wishing for more change in economics (Thaler, 2016, 2018), Thaler's practice emphasize that BE importation of psychology into economics does not imply that economists should contribute to psychology or even cite it explicitly. The contribution of psychology in Thaler's work is more inspiration than something at the frontier of both disciplines.

The next generation of behavioral economists therefore inherited two archetypal exemplary approach to BE. BE as a frontier program which encourage mobility, and BE as an economics-oriented program which only encourage limited importations from psychology. It took 5 years for Kahneman and Tversky to publish their first article in economics, and the second only came 7 years after. In that context, one can understand why very few researchers engage in disciplinary mobility. But Kahneman is also an example of successful mobility, and a proof that mobility can garner recognition (Nissani, 1997; Kuhn, 1962, p.92). Once Kahneman had acquired the ability to publish in both disciplines, he did not stop and became increasingly mobile.

5 The Second and Third Generations: Inheriting Disciplinary Mobility

In 1992, the Sloan-Sage BE program was replaced by the BER and endowed with \$100,000 annually (Heukelom, 2014, p.164)). While Camerer and Loewenstein joined the BE program in the mid-1980s and were among the first ten members of the BER (Heukelom, 2014, p.158), Rabin, Fehr, and Laibson only became involved in the 1990s and 2000s after the Sloan-Sage program had ended. During the 2000s, the position of behavioral economist started to shift as the program garnered recognition (Geiger, 2017) and economics as a whole became more oriented towards applied and empirical work (Backhouse and Cherrier, 2017; Angrist et al., 2017). Disciplinary wise, while economics as a whole also became more open to external influence (Angrist et al., 2020), the boundaries between economics, psychology, neuroscience remain strong (Truc et al., 2021).

If we look at the disciplinary mobility of our second and third generation core members, we find three differing patterns of disciplinary mobility.

Following Thaler's Path: Bringing Behavioral Economics Back in Economics

The first pattern is immobility. Economists like Rabin were involved in the BE program, but they did not pursue publication in other disciplines (Figure 11). Following in the steps of Thaler, Rabin's research program is oriented towards changing economics through the influence of other disciplines, rather than building a frontier research program.

One of Rabin's main and earliest contribution to the field was the incorporation of fairness in economics in a relatively standard game theoretical framework in which player's pro-social behavior are determined by their anticipation of other players kindness (Rabin, 1993). Rabin endorsed the general Trojan Horse strategy adopted by behavioral economists, even after BE

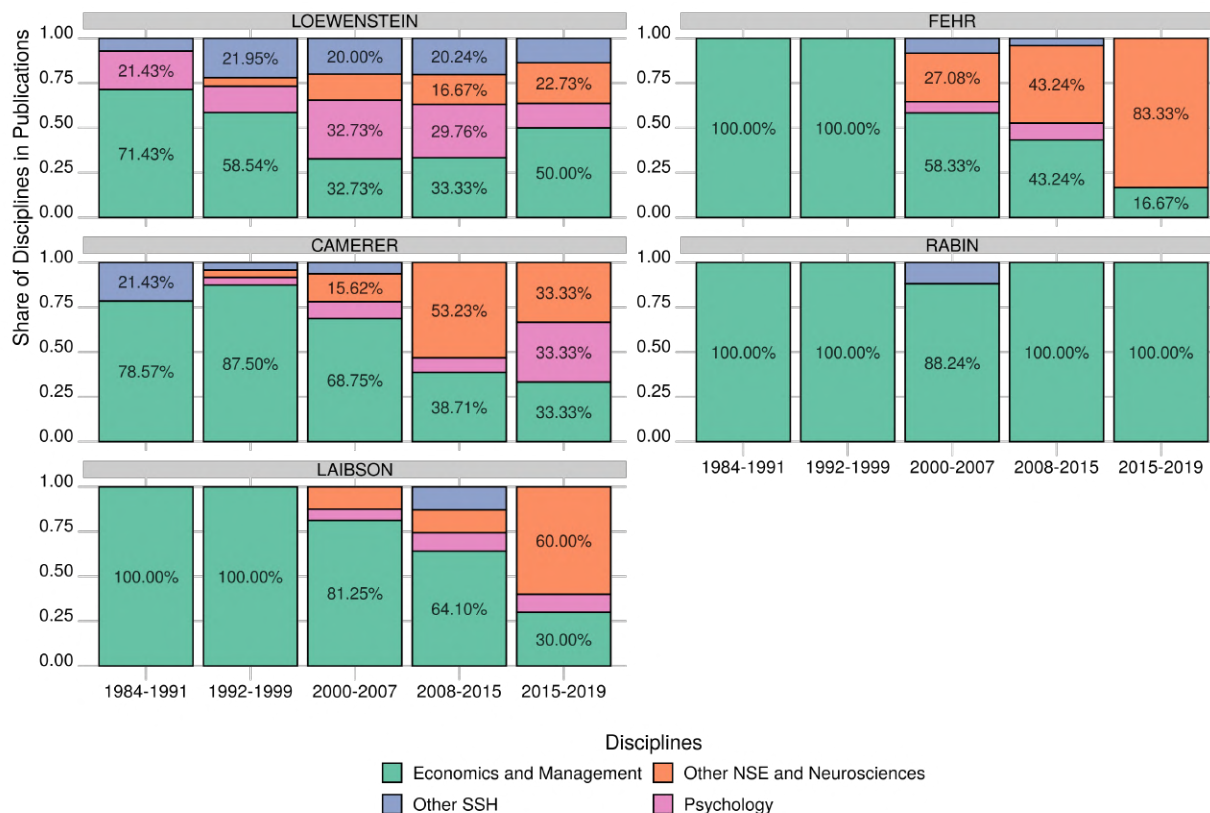


Figure 5: Second and third generation core behavioral economists’ publications by discipline, centered around the Sloan-Sage years (the x-axis is split into discrete values for readability; for a continuous version of the same data, see Appendix 7.2)

was recognized as a legitimate part of economics. In the early 2000s, he was asked to join the board of the *Journal of Economic Psychology* with Thaler. While Thaler accepted, Rabin declined “saying that to succeed in his mission to get psychology taken seriously by economics in general it was vital he restricted his work to the mainstream. In other words, if he associated himself with a non-core journal, he risked having his contributions to core journals taken less seriously.” (Earl and Peng, 2012, p.456).

However, beyond strategical considerations, there are reasons to think that Rabin really do believe that the golden age of the interdisciplinarity between economics and psychology is over, and that it is now time to bring BE back in economics and away from its frontiers. Outside of his contribution to fairness, Rabin published extensive programmatic writings

(Rabin, 1998, 2002, 2013). Rabin (2013) invented the term PEEMs (portable extensions of existing models) to describe how BE should incorporate psychology. There are two elements to them: extensions (parameters clearly different from the standard model embedded in existing models) and portability (defined across domains of economics by using the same independent variable). In other words, behavioral economist should ensure some continuity between standard models and behavioral models. More generally, Rabin see the interdisciplinarity between economics and psychology as limited and conditional. First, behavioral economists should devote their attention “to all the desiderata of economic models (parsimony, predictiveness, generality, relevance, insight, etc.)” (Rabin, 2010, p.2). Second, psychological research is only useful parsimoniously when useful to economics and when it is as robust as economics because “not all psychological research will be both confirmed by field data and proven to be of great economic importance” (Rabin, 1998, p.41).

Rabin does recognized the importance of the initial mobility of Kahneman and Tversky in the development of the program, but for him, this is “first wave behavioral economics” (Rabin, 2010, p.2). The first wave identified what was wrong with economic theory and proposed some alternatives. The “second wave” is the formalization of alternative theory and their empirical validations. More importantly, for Rabin, since the end of the 2000s we entered the “third wave” which consist of a return to “normal-science ways” by “embedding old and new assumptions as special cases of general models” (Rabin, 2010, p.2).

Rabin do value the desiderata of economic models. Using the example of social preferences models , Rabin (2013) warns behavioral economists that if not enough attention is paid there is a risk of a multiplication of models as behavioral models (Rabin, 2013, p.622). In other words, Rabin do adhere to the criticism targeted by Kahneman that psychology lacks a unifying framework (Kahneman, 2003a, p.1449), but he goes further by warning that behavioral economists risk a similar fate if the third wave of BE does not embedded itself in the more general models.

While Rabin did not published much outside of economics, we do find that his economics’

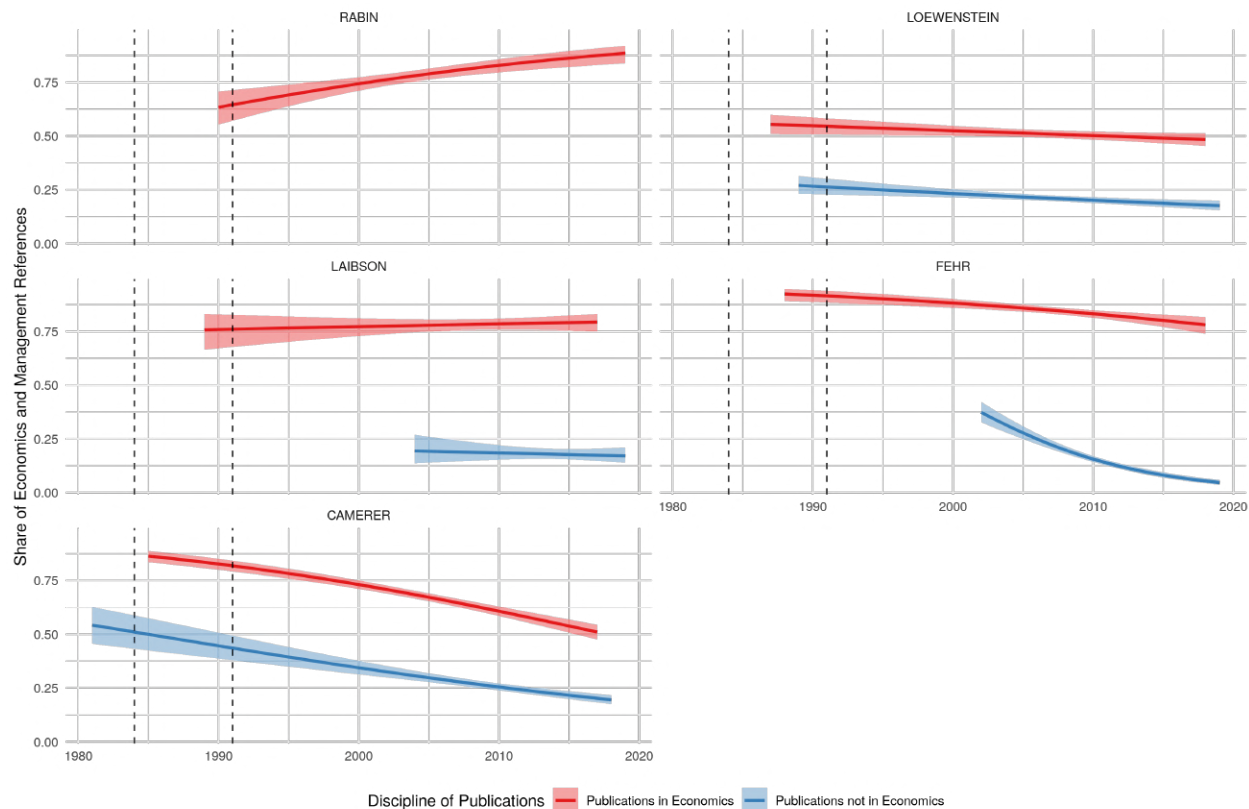


Figure 6: Share of references in economics, in economics (red) and non-economics (blue) publications (curves were smoothed using a binomial generalized linear model)

publications in the early 1990s cited more non-economics references than Thaler or Camerer with around 63% of his references in economics publications to economics. However, after this initial interdisciplinarity we find that he cites proportionally more sources from economics over time. In the 2010s, the proportion of references in economics publications to economics rose to 88% (Figure 6).

In his early contributions to BE in relation to social preferences (Rabin, 1993) or intertemporal choice (O'Donoghue and Rabin, 1999), Rabin did use psychological references by using concepts imported from social psychology like greed or retaliation, or by relying extensively on George Ainslie for concepts like impulse control. However, Rabin later followed what he advised, and most of his latter publications would be focused on the integration of

this psychological knowledge in a more traditional economics framework.

The approach adopted by Rabin is consistent with the often observed pattern of “obliteration by incorporation” (McCain, 2014) or of “interdisciplinary success without integration” (Grüne-Yanoff, 2016). Researchers need to cite other disciplines in the early years of an interdisciplinary research program, but that need fades as outside knowledge gets incorporated into the importing discipline. For example, early behavioral economists cited George Ainslie extensively both for his conceptual and experimental contributions. However, as concepts and experimental methods are imported in economics, the need to cite outside references diminishes. Economists make their own experiments, and original concepts from psychology are neglected in favor of their economics counterpart once they are formalised. Engaging directly with the psychological literature has become less of a necessity as BE has incorporated and transformed psychology into the discipline.

Rabin followed Thaler’s Path. While this is one often observed pattern in the case of interdisciplinary importation, this is not the path followed by most of the behavioral economists we study here. Among the second generation, others followed Kahneman’s path.

Following Kahneman’s Path: Pushing the Frontiers Further

The second pattern observed is immediate mobility: From the beginning of his career, Loewenstein was a relatively mobile researcher with publications in economics and psychology. While economics occupied a more important role in the very early years of his career, he rapidly developed an interest in cognitive sciences and other SSH (e.g., law, public health). This particularity is also reflected in his institutional career. His first associate professor position was in behavioral science at the University of Chicago Graduate School of Business. After that, he became a professor of economics at Carnegie Mellon University in 1990, a position that transformed into a professorship of economics and psychology in 1992.

The third pattern is acquired mobility: Following in the steps of Kahneman and Tver-

sky, Camerer, Fehr, and Laibson began their career with a focus on their discipline of origin (economics) and only developed an interest in other disciplines later on (Figure 5). These behavioral economists inherited the vision of BE developed by Kahneman and Tversky during the Sloan-Sage years (Heukelom, 2014, p.152). From this perspective, BE is an interdisciplinary program at the frontiers of economics and cognitive sciences, and researchers within the program can and should contribute to multiple disciplines.

We find that the disciplinary movement of the second and third generation has contrasting characteristics with the initial mobility of Kahneman and Tversky. The first obvious difference is the direction of movement. While BE was founded by two psychologists that moved *into* economics, the mobility of the second and third generation is characterized by a movement *away* from economics. Camerer, Fehr, and Laibson all started their careers as economists with more than 90% of their publications in the discipline (Figure 5). During the 2010s, Camerer and Fehr published more than half of their articles outside of economics, and Laibson’s publications in economics dropped from 100% to 30%. Loewenstein, while mobile from the early years, still increased his mobility with 71% of his publications in economics to 33% between the 1980s and the mid 2010s.

For this new mobile generation of behavioral economists, BE is clearly understood as an interdisciplinary program at the frontiers of economics and cognitive sciences, rather than a program solely oriented towards influencing economics. Their research in BE feeds other disciplines as much as it imports for economics. This idea is best expressed by Herbert Gintis, an economist close to Camerer and Fehr’s networks:

[W]e are more generally behavioral scientists, not just economists, and we have published in first-ranked professional journals in biology, anthropology, psychology, sociology, and political science. Our results do not “belong” to economics, and indeed can be evaluated profitably by psychologists, sociologists, and indeed any professional acquainted with the scientific method. The papers published in *Science* and *Nature* are extensions of research published widely in all the behav-

ioral sciences. Rather than attempting to discredit neoclassical economics, we expect our findings to be added to its repertoire. (Gintis, 2011, p.101)

A second important characteristics of this movement is that it extends beyond the economics-psychology relationship. For Kahneman and Tversky, these two disciplines have always represented no less than about 80% of their publications. Although both disciplines remain important to the second and third generations of behavioral economists, the new generations also show interest in the natural sciences and a variety of other disciplines. For example, 53% of Camerer's publications are in natural sciences and neurosciences. Kahneman also developed an interest for natural sciences in the 2010s, but it never represented more than 20% of his publications.

As expressed in the Gintis quote above, BE is understood by the new generations as a program at the frontier of all cognitive sciences, including biology, neurosciences, and anthropology. More importantly, it is also understood to be a generalist research program, as reflected by the strong interest in publishing in journals such as *Nature*, *Science*, *PLOS One*, and *Proceedings of The National Academy of Science of the United States of America*. Over his long career, Kahneman only published nine articles in such generalist journals. Camerer and Fehr respectively published twenty-eight and thirty-three articles in these journals.

These behavioral economists form a coherent network of co-authors, but they come from different backgrounds and institutions. Ernst Fehr particularly stand out as he is the only European economist. While all the others are relatively close to Kahneman and Tversky by the way of the Sloan-Sage and related networks, Fehr's origin is better understood through the "Selten School" of behavioral economics (Selten et al., 2010). In parallel to the American movement towards more psychology in economics, German economists also developed an interest for experiments in the 1950s. A small group initiated by Heinz Sauermann, with Reinhard Selten as one of the early and most prominent members of the group, brought economics and psychology closer through experiments (Maas and Svorenčák, 2016, p.192). Reinhard Selten played an important role in the development of experimental economics in

Germany (and Europe) and became one of the founders of the German Society for Experimental Economics Research in the 1977s (Svorenčák, 2021). In 1984, Selten became a full professor at the university of Bonn where Klaus Schmidt would do his PhD. In the 1990s, Fehr had run a few experiments and published a few papers in psychology. His collaboration with Schmidt would lead to the publication Fehr and Schmidt (1999), a model of pro-social behavior that would rapidly a seminal contribution of the field. While American behavioral economists covered risk and intertemporal decision, European (German) behavioral economists rapidly became specialized around the question of social preferences with Werner Güth, Ersnt Fehr, Klaus Schmidt, and Simon Gächter, just to cite a few, as the spearhead of European behavioral economics.

Initially, most of these behavioral economists started their career with theoretical contributions that could be deemed relatively standard in their formalisation (Berg and Gigerenzer, 2010) and that were very much oriented towards economics (Figure 5). Laibson (1997) and Fehr and Schmidt (1999) added social preferences and hyperbolic discounting to a relatively standard utility function in a way that do not radically alter the underlying cognitive mechanisms. However, these economics-oriented contributions represented an important step in their careers. Researchers pursuing interdisciplinary or innovative research program first need to establish their legitimacy and expertise through traditional contributions to establish their “classical scientific capital” (Bontems and Gingras, 2007, p.646). Just like Kahneman and Tversky satisfied economists’ expectations with prospect theory to establish themselves as legitimate researchers, these mobile behavioral economists did the same with economics contributions that were not too challenging for the standard framework. However, they capitalized on the general success of BE and their own career to push the frontiers of economics further.

Part of the movement we observe is explained by the rise of neuroeconomics in the early 2000s. Fehr, Laibson, and Camerer published extensively in neuroeconomics and contributed to its foundations with programmatic writing and a handbook (Camerer et al.,

2005; Camerer, 2008b; Glimcher et al., 2009; Camerer, 2013). For Camerer, Loewenstein, and Drazen Prelec, neuroeconomics is the natural extension of behavioral economics and the next step for the program: “Behavioral economics has mostly been informed by a branch of psychology called “behavioral decision research,” but other cognitive sciences are ripe for harvest” (Camerer et al., 2005, p.9). For them, the goal is to enlarge the sources of interdisciplinary importations into BE by including all cognitive sciences. Following the tradition set out by Kahneman, their interdisciplinary practices include publishing in other disciplines.

Camerer and Fehr (in collaboration with others including Gintis) also developed a research program at the frontiers of economics and anthropology (Henrich et al., 2004). They conducted economics experiments in small-scale societies across different parts of the world to investigate the robustness of experimental results and behavioral models in society that are not western and industrialized. This would latter allow Fehr to develop a full-fledged approach to social preferences which includes studying economic topics like labor market (Fehr and Falk, 1999), the effects of hormones and oxytocin in trust (Kosfeld et al., 2005), the evolutionary explanations of altruism in humans (Fehr and Fischbacher, 2003), and the effects of culture and norms on the stability of preferences (Henrich et al., 2004; Bruhin et al., 2019).

Laibson has pursued even more exotic research, with dozen of publications in genetics journals, *Nature*, and *Science*, as part of his “genoeconomics” research program (Benjamin et al., 2012; Rietveld et al., 2013; Chabris et al., 2015). This type of approach encourage the use of genotypic data in economics research in relation to health or addiction (e.g., genetic vulnerabilities) to add new control variables to econometric models. One particularity of his research in genetics is that many of his articles have dozens of co-authors, and a few of them have hundreds (e.g., Rietveld et al. (2013) with 204 authors) as the research program impose pooling many ressources and datasets from multiple research teams.

Overall, we find that several core members of the BE program inherited the disciplinary mobility of Kahneman and Tversky and shared a common idea of BE as program at the

frontiers of many disciplines. Because of their economics background, their mobility differs from the founders. They are more interested in partly moving *away* from economics towards other disciplines, and they are more interested in a *diversity of disciplines* rather than psychology alone. Moreover, they also have a strong interest in generalist journals, reflecting a search for new source of legitimization away from the top economics journals.

A Frontier Too Far ?

While Kahneman and Tversky's mobility of the 1980s seemed more oriented towards finding a middle ground between economics and psychology, the inherited and acquired mobility of Camerer, Fehr and Laibson seems more like a migration partly away from economics.

If we look at our mobile researchers, we find that Loewenstein, Laibson, Fehr, and Camerer have a lower level of reliance on economics references than immobile research, with a share between 50% and 75% of economics references in their economics publications (Figure 6). From the start of his career, even when publishing in economics, Loewenstein never relied heavily on economics references. The share of economics references in his work never rose above 57%. This is probably explained by the previous pattern we observed of immediate mobility. From the very beginning, Loewenstein's research program was at the frontier of economics and cognitive sciences, whether he was publishing inside economics or outside.

In the case of Fehr and Camerer, their reliance on economics references decreased over time. It appears they became more inclined to rely on non-economics sources after becoming mobile researchers. In their economics publications, the share of economics references decreased from 90% to 77% for Fehr and 87% to 50% for Camerer (Figure 6). In their publications outside of economics, we also observe rapidly decreasing reliance on economics references, which might indicate an overall decreasing interest in economics. This effect is particularly strong in the case of Fehr: by the end of 2010s, he had nearly stopped referencing

economics sources altogether in his non-economics publications.

The trend observed in Fehr and Camerer’s publications indicate that both became increasingly interested and influenced by non-economics disciplines, to the point that economics became a secondary discipline of interest. The strength of the pattern observed suggests that Fehr and Camerer are partly migrating away from economics. By the mid-2010s, more than half of their publications were not in economics. Their publications in economics relied less on economics knowledge than in the early 2000s, and their recent publications outside of economics make very few references to economics. It does not mean that they abandon economics, but rather that, overtime, their contributions in and out of economics appear increasingly like contributions to two different research programs: one in economics, and one outside of economics.

To investigate this idea further, we can look at the publications of each behavioral economist and investigate how their individual research programs have been structured through time. To examine research programs, we measured the coherence of individual publications with ten-year overlapping windows by using bibliographic coupling and plotting all corresponding networks (minus isolated nodes) (see Appendix 7.3 for all networks).

While all of our authors have one main group of articles, some have clear frontiers between their publications inside and outside of economics. This is something we can evaluate visually. As hinted by our analysis of references (Figure 6), if we look at the networks of Camerer, Fehr, and Laibson, we can easily find an imaginary line that would split most of the networks between economics articles (green) and non-economics articles (not green) (Figure 9). This divide is particularly strong in the case of Laibson, as many of his articles outside of economics are almost completely differentiated (detached visually) from his articles within economics. Conversely, the same imaginary line would be harder to find in the case of Loewenstein, as his economics and non-economics articles (and therefore the color of the nodes) are more mixed. Compared with Camerer, Fehr, and Laibson, Loewenstein’s research is less structured by the discipline in which he publishes.

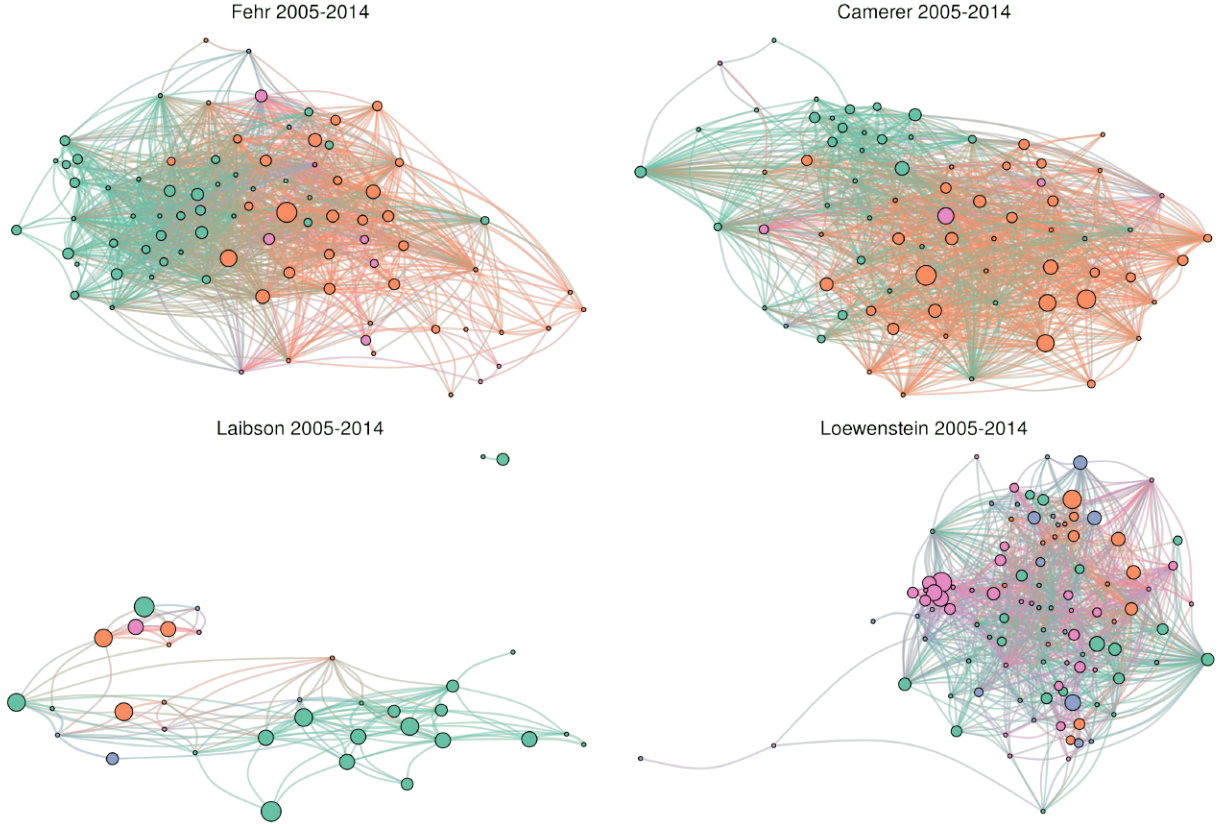


Figure 7: Bibliographic coupling networks of second and third generation behavioral economists' publications between 2005–2014 (green = economics and management, orange = other NSE and neurosciences, pink = psychology, blue = other SSH)

One way to approximate this visual pattern is to measure the inwardness of authors' articles by discipline in each time window by quantifying the weighted share of links between economics articles (Figure 8). Using this indicator, we find again the previously observed pattern, that Kahneman's publications in economics during the Sloan-Sage years became increasingly distinctive from his publications outside of economics. This remained true until the 2000s, as the inwardness of Kahneman's publications dropped from 74% in 1991 to 33% in the mid-2000s. A similar pattern can be observed in Loewenstein's publications, as his inwardness remained under 33% at the height of his career in the 2000s and 2010s. Conversely, the inwardness of Fehr and Laibson largely remained above 50% during the same period. In fact, Fehr even increased in inwardness in the early 2010s. This indicates that his

research in economics became increasingly distinct from his research outside of economics. Finally, Camerer had relatively high inwardness for most of his career, at a level between 70% and 50% in the 2000s; however, his research became increasingly mixed after the 2010s, dropping to a level similar to Loewenstein, around 33% (See Figure 9).

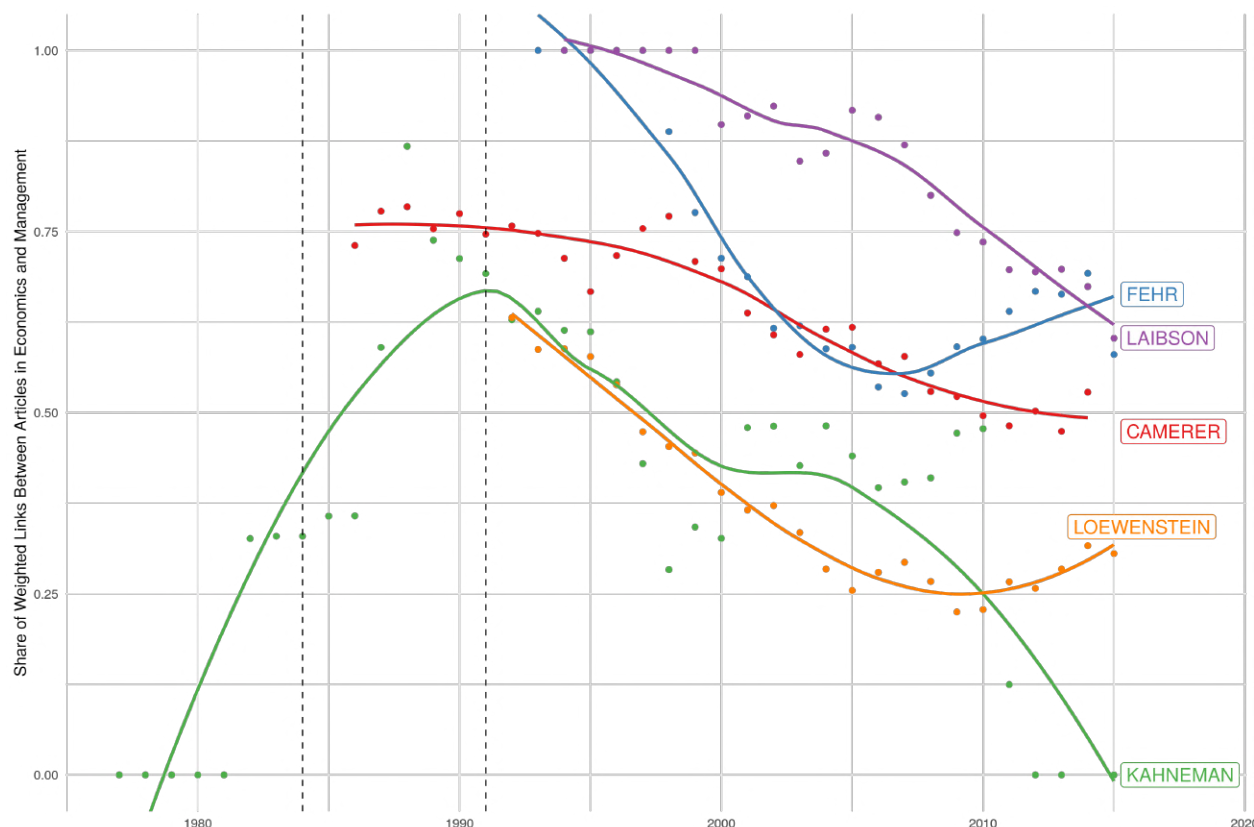


Figure 8: Disciplinary inwardness of economics articles, with a year corresponding to the higher median year (e.g., the year 2015 is computed on the 2010–2019 network). A high inwardness is interpreted as a high degree of differences between publications in economics and publications outside of economics

Overall, while Kahneman and Loewenstein have had relatively mixed research programs throughout their careers, the disciplinary mobility of Fehr, Laibson, and to a lesser degree, Camerer, has led them further away from economics. More importantly, their research programs have become increasingly dependent on other disciplines than economics.

Camerer, Laibson, and Fehr's situations differ from that of Kahneman in the 1980s. Camerer, Fehr, and other second-generation behavioral economists enjoyed the success of

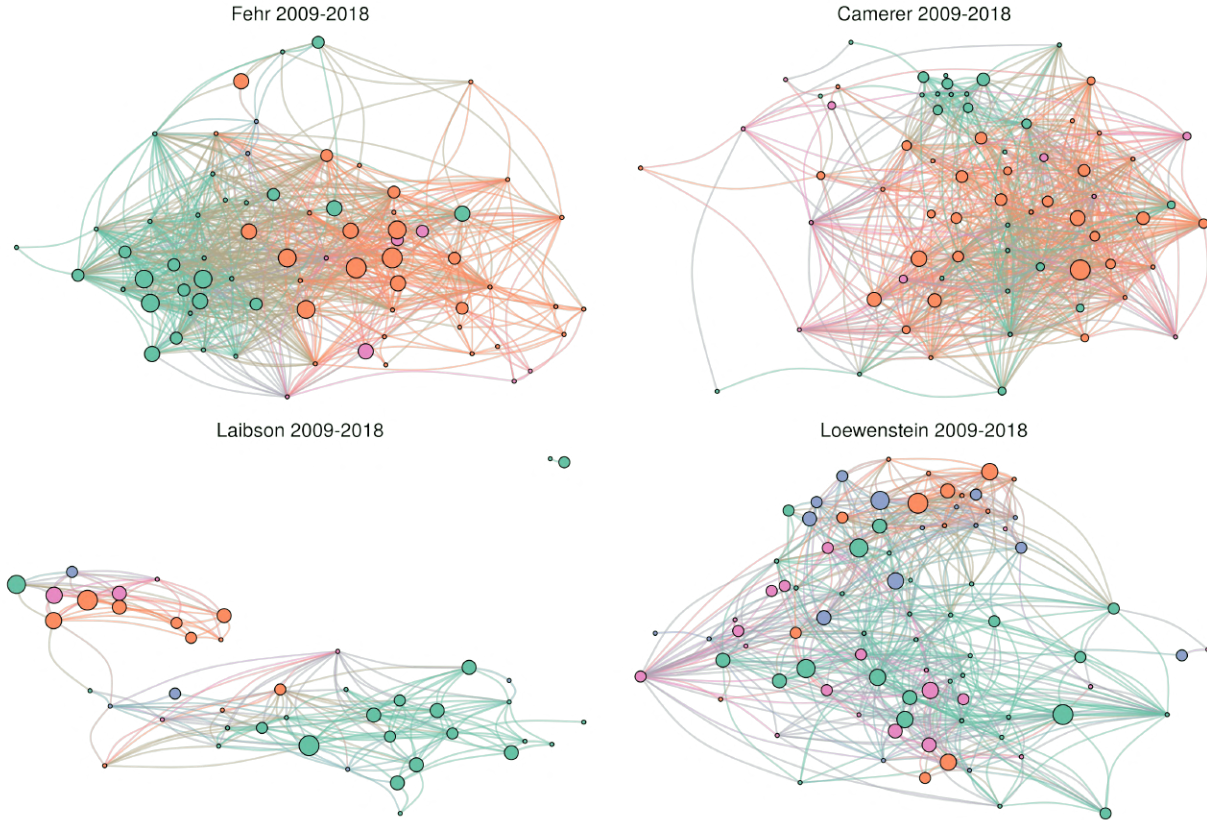


Figure 9: Bibliographic coupling networks of second and third generation behavioral economists' publications between 2009–2018 (green = economics and management, orange = other NSE and neurosciences, pink = psychology, blue = other SSH)

BE in the early parts of their careers. They did not need to employ a particularly subtle strategy to pursue their ideas. Camerer and Fehr were rising stars in the 2000s. They both received important grants and major prizes throughout the decade to pursue their research programs. For example, between 2000 and 2010, Fehr received more than 2,000,000 € in grants, including one grant of 400,000 CHF from the European Union for the European Network for the Advancement of Behavioral Economics. Both have many publications in top journals, and by the end of the 2000s, they had accumulated enough classical scientific capital in economics – enough credibility in the eyes of economists – to allow them to explore more risky ventures.

This confidence to push the frontiers of economics further is also visible in some of their

programmatic writing. Camerer, sees other disciplines as a way to push the limits imposed by some economics traditions, such as the “preferences-beliefs-constraints structure” (Camerer et al., 2005, p.9) that capture much of the criticisms addressed to BE (Berg and Gigerenzer, 2010). For Camerer, interaction with all cognitive sciences can lead to either an incremental approach (based on the traditional foundations of economics) or a radical approach with new foundations, which: “involves turning back the hands of time and asking how economics might have evolved differently if it had been informed from the start by insights and findings now available from neuroscience” (Camerer et al., 2005, p.10).

Challenging the stability of preferences (Bruhin et al., 2019), the traditional formalism of economics (Camerer et al., 2005), or normalizing the uses of a large variety of non-choice data ranging from hormones to genetics in empirical studies (Rietveld et al., 2013; Nave et al., 2017) led most of these behavioral economists to engage in strong controversies with economists in the last few years (Shaked, 2005; Gul and Pesendorfer, 2008; Binmore and Shaked, 2010). These behavioral economists are engaged in research programs that push the boundaries of economics a lot further than what is now widely accepted, especially if most economists adhered to the view that economics should be a return to “normal-science ways” (Rabin, 2010) or simply be “an updated reading of the as-if approach” (Chetty, 2015, p.29).

Therefore, one way to avoid the weight of traditional economics norms is to simply publish in other disciplines, while also trying to stay relevant to economists. Gintis’ response to criticism of economists is to mention “papers published in *Science* and *Nature*” (Gintis, 2011, p.101) as a way to establish a new hierarchy away from the traditional “tyranny of the top five” economics journals (Heckman and Moktan, 2020). When interacting with more standard economists, behavioral economists invoke some of these generalist publications as authoritative arguments: publication in generalist scientific journals is better than in top economics journals. This publication logic makes sense in relation to the culture of economics. Economists have often been described as having “physics envy”(Mirowski, 1989, p.354), and in the last few years, economists have favored interdisciplinarity with natural sciences

rather than with other social sciences (Truc et al., 2020). The move of these behavioral economists outside of economics also garner some support on the part of researchers from other disciplines who want to integrate economics as part of the general science rather than a distinctively separate discipline. *Nature's* editorial welcomed the first economist in the board as way to promote more interdisciplinarity as “Economists and scientists: solve big societal problems by working together” (Editorial, 2020). However, access to generalist science journals only became possible for behavioral economists when they developed research programs at the frontiers of multiple disciplines.

The mobility of these behavioral economists might also be risky. Despite wishful “physics envy”, the overall the scale of the interaction of economics with natural sciences remains low (Fourcade et al., 2015; Truc et al., 2020, p.17), and recent attempts like econophysics rather failed as interdisciplinary research program (Gingras and Schinckus, 2012). Similarly, while the support of other researchers and the editorial board of *Nature* is important, it does not mean that economists are ready to abandon their historical hierarchical structure where the AEA garner most of the institutional power (Fourcade et al., 2015; Heckman and Moktan, 2020) towards a more generalist approach that would give more power to outsiders from physics, biology or environmental sciences. Finally, by opening themselves to natural sciences, economists also risk of losing the control they have over the definition and frontiers of the disciplines. For example, in economics, the name of authors are, more often than not, put in alphabetical order, following the tradition of mathematics (Stubbs, 1997), in natural sciences and psychology the ordering is often non-alphabetical and represents contribution. As such, economists with a name starting with the letter A publish more papers, get more visibility, and have an easier time getting recruited or promoted which in turn encourage articles with a low number of co-authors (Van Praag and Van Praag, 2008). At the opposite, in the natural sciences articles can have hundreds of authors as illustrated by (Rietveld et al., 2013), an article with slightly more than 200 authors in which Laibson figures as a co-author. The collaboration with (sometimes many) other researchers from different disciplines is one

important explanation for why publications outside of economics tend to be increasingly different from publication in economics (Figure 8). The role of economics is minored when economists publish in generalist or non-economics journals. Thus collaboration with other disciplines in generalist journals might lead economist to lose control over the disciplines. This is particularly dangerous as historically, economists “found it more difficult not to be in the driver’s seat” (Backhouse and Fontaine, 2010a, p.221).

Fehr, Laibson, Loewenstein and Camerer have mimicked the practices of Kahneman. As we have shown with some examples of their research programs, publishing in other disciplines provides a way for these behavioral economists to avoid some of the normative and theoretical foundations of economics. However, this mobility differs from Kahneman as it is one away from economics where the role of the disciplines becomes decreasingly important as the interaction with other disciplines increases. Like econophysics, these economists run the risk of being simply ignored by most of economics if their work is to be deemed disciplinary irrelevant. Beyond the epistemological elements that are challenged by these behavioral economists, it is more generally a particular definition of economics that is challenged with all it encompasses (e.g., journal ranking). These behavioral economists want to move the frontiers of economics with them and bring economics closer to other disciplines. In the words of Camerer (2008a, p.59): “Drawing sharp boundaries between fields is difficult and, fortunately, is not necessary.” However, wishing for boundaries to be unnecessary does not make it so. Despite all the talks of interdisciplinarity in the last few decades, disciplines remain resilient structural forces (Heilbron and Gingras, 2015; MacLeod, 2018), and in economics even more so than anywhere in the social sciences (Truc et al., 2020).

6 Conclusion

To successfully influence economics with their ideas, psychologists Kahneman and Tversky learned how to publish in economics (Heukelom, 2014, p.119). With the help of economists

such as Thaler and members the Sloan-Sage Foundations, Kahneman and Tversky overcame some of the institutional and cognitive obstacles that often hinder disciplinary mobility. By adopting some of the values and norms of economists (Kahneman, 2011, p.2087), they built a research program that was influenced by psychology but oriented towards changing economics. In the early 1980s, Kahneman and Tversky found themselves in a particularly hostile context, in which interdisciplinarity was not viewed as a positive component of economics research (Fourcade et al., 2015; Truc et al., 2020). Thus, one of the biggest goal and achievement of their approach was to make psychology methods and concepts more acceptable.

By the early 2000s, the situation had changed substantially. BE was by then a recognized and prestigious research program, and new generations of behavioral economists had emerged as the direct heirs of the Sloan-Sage BE program. Some of these behavioral economists have followed the inward-oriented strategy favored by Thaler. For Rabin for example, BE is clearly an economics research program with importations from psychology. For others such as Loewenstein, Camerer, Fehr, and Laibson, the program is situated at the frontiers of multiple disciplines. For them, the legacy left by Kahneman and Tversky is not comprised only of methodological or theoretical contributions. It is also about scientific practices. To build a program at the frontiers of cognitive sciences and economics, researchers must learn how to become mobile and contribute to other relevant disciplines. Following that tradition of disciplinary mobility, researchers who were originally economists have changed and learned how to publish in other disciplines. This transformation has even led some of them to make economics their secondary discipline in terms of publications and references.

Disciplinary mobility has enabled some behavioral economists to develop research programs outside of economics, thus escaping some of the normative and theoretical traditions of the discipline, but also the traditional sociological hierarchy of economics. By publishing in some of the most prestigious journals of natural sciences, such as *Nature* and *Science*, these behavioral economists have found a new source of legitimacy away from the “tyranny

of the top five” (Heckman and Moktan, 2020) that is inaccessible to more traditional and mono-disciplinary economists.

Disciplinary mobility is difficult to achieve, and probably not achievable for most economists given the barriers to move to and from economics (MacLeod, 2018). It is a risky career move (Prud’homme and Gingras, 2015), it requires a strong network beyond economics, and it implies that one is able to publish in top journals inside and outside of one’s discipline of origin.

Some of the core members BE are both mobile and interdisciplinary. They have adhered, in their publication and citation practices, to the model of BE as a frontier-program between economics and cognitive sciences. Because they are influential behavioral economists, this outward movement is important for understanding the history of the field and some of the more recent naturalistic inclinations that we find in BE. However, it is also important to put this disciplinary mobility in perspective. Like Rabin, most economists are not mobile, and most probably do not wish for microeconomics to become a multidisciplinary field.

The disciplinary mobility developed by Fehr or Laibson even suggests a decreasing interest in economics, as they conduct research further and further from most economists’ concerns. This might mean that the disciplinary mobility observed among some second- and third-generation behavioral economists is not a sign that BE is becoming increasingly interdisciplinary, but rather a sign that some behavioral economists are partly migrating away from economics whether from their own volition or as the results of economists rejecting these new directions.

The second generation of behavioral economists are developing research programs at the frontiers of multiple disciplines, but it is yet unclear if this new source of legitimacy imported from natural sciences will be as successful as the original mobility of Kahneman and Tversky in economics.

7 Appendix

7.1 Disciplinary Mobility (continuous x-axis)

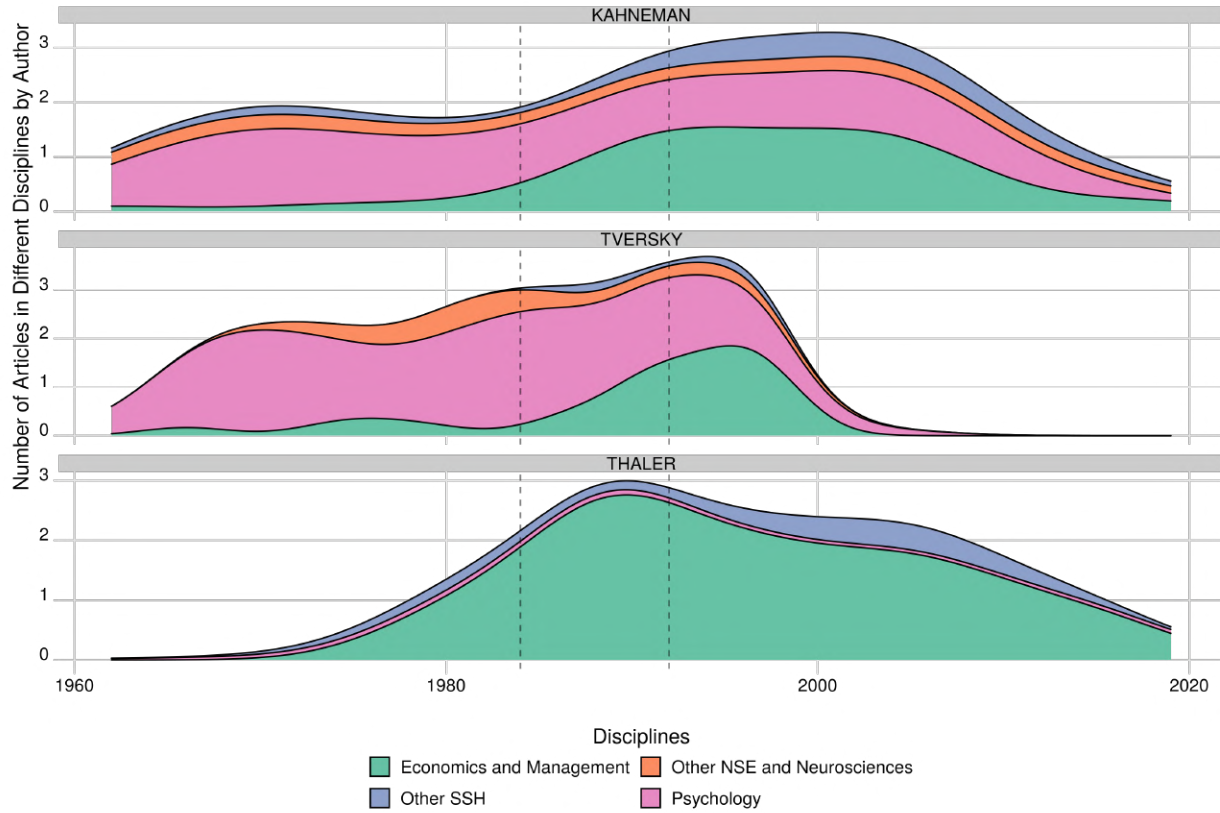


Figure 10: Kahneman, Tversky, and Thaler's publications by discipline. The two dotted lines mark the beginning and end of the Sloan-Sage program.



Figure 11: Second- and third-generation core behavioral economists' publications by discipline. The two dotted lines mark the beginning and end of the Sloan-Sage program.

7.2 Disciplinary Mobility (Generalist Journals Separated)

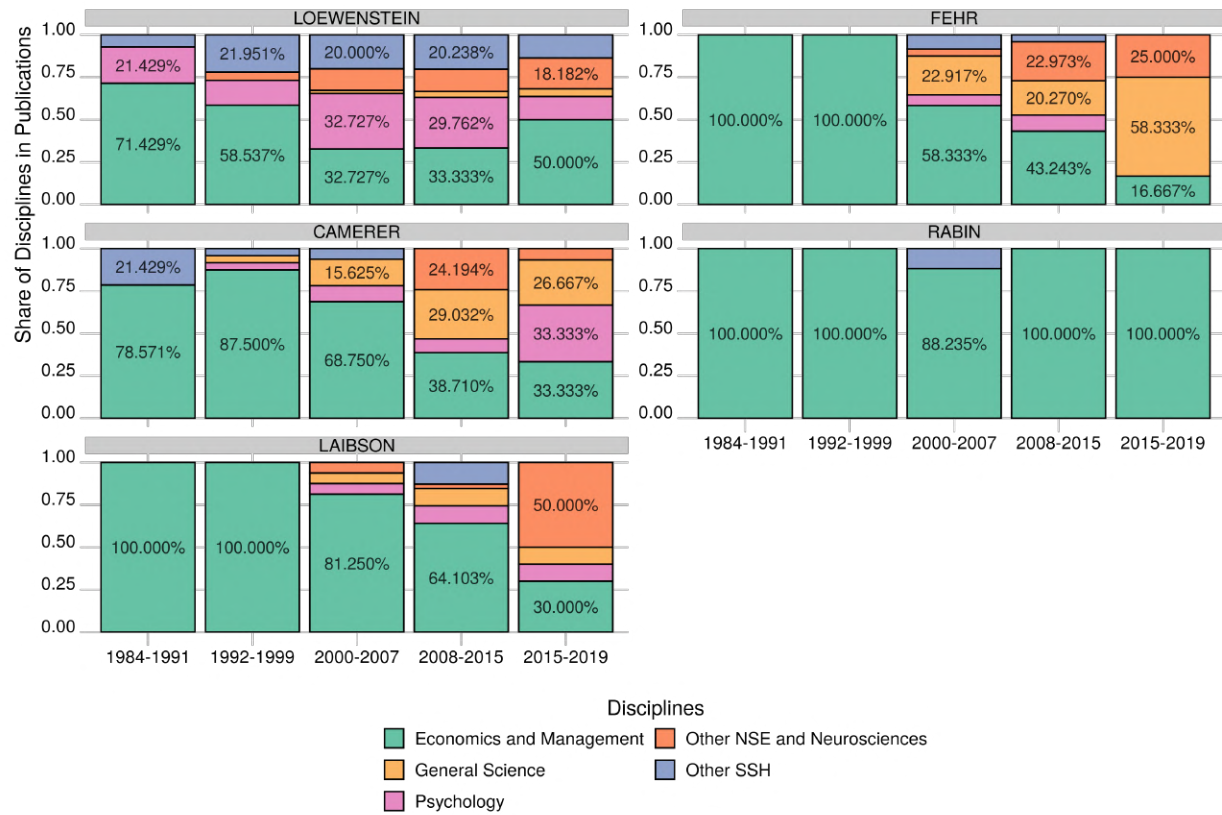


Figure 12: Second-generation behavioral economists publications by discipline with generalist journals separated. The two dotted lines mark the beginning and end of the Sloan-Sage program.

7.3 Networks of Core Behavioral Economists' Publications

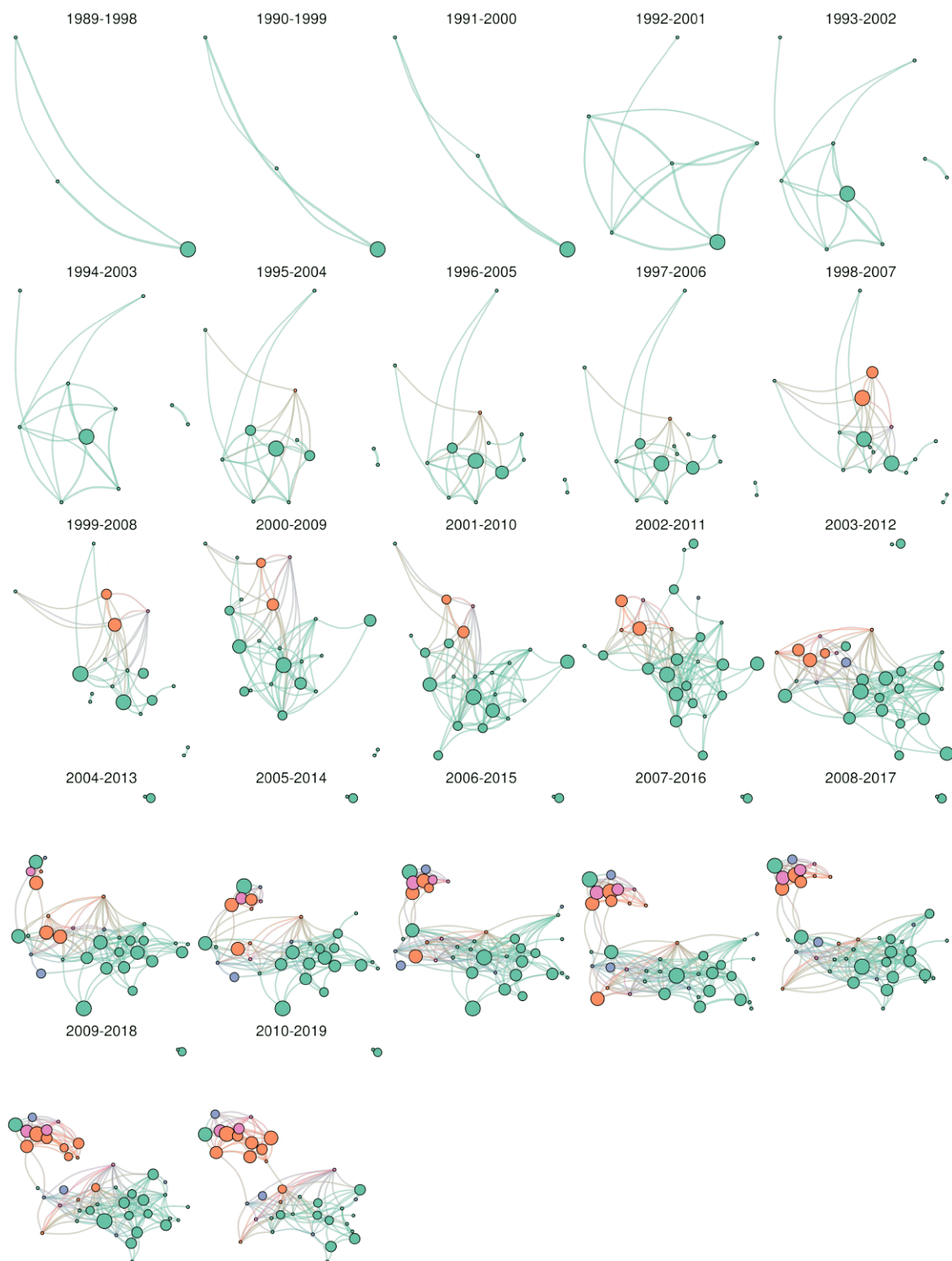


Figure 13: Bibliographic coupling networks of Laibson's publications (green = economics and management, orange = other NSE and neurosciences, pink = psychology, blue = other SSH)

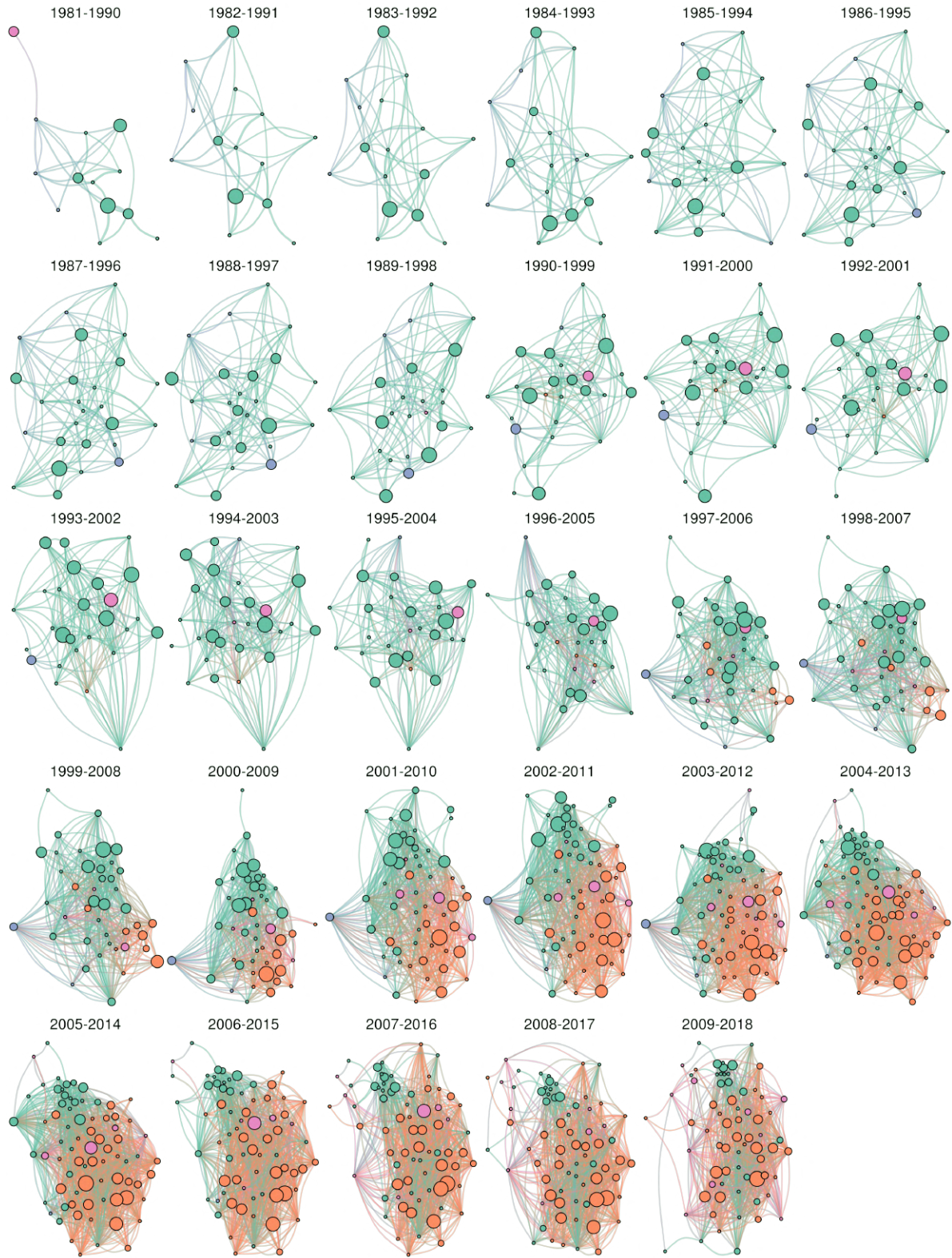


Figure 14: Bibliographic coupling networks of Camerer's publications (green = economics and management, orange = other NSE and neurosciences, pink = psychology, blue = other SSH)

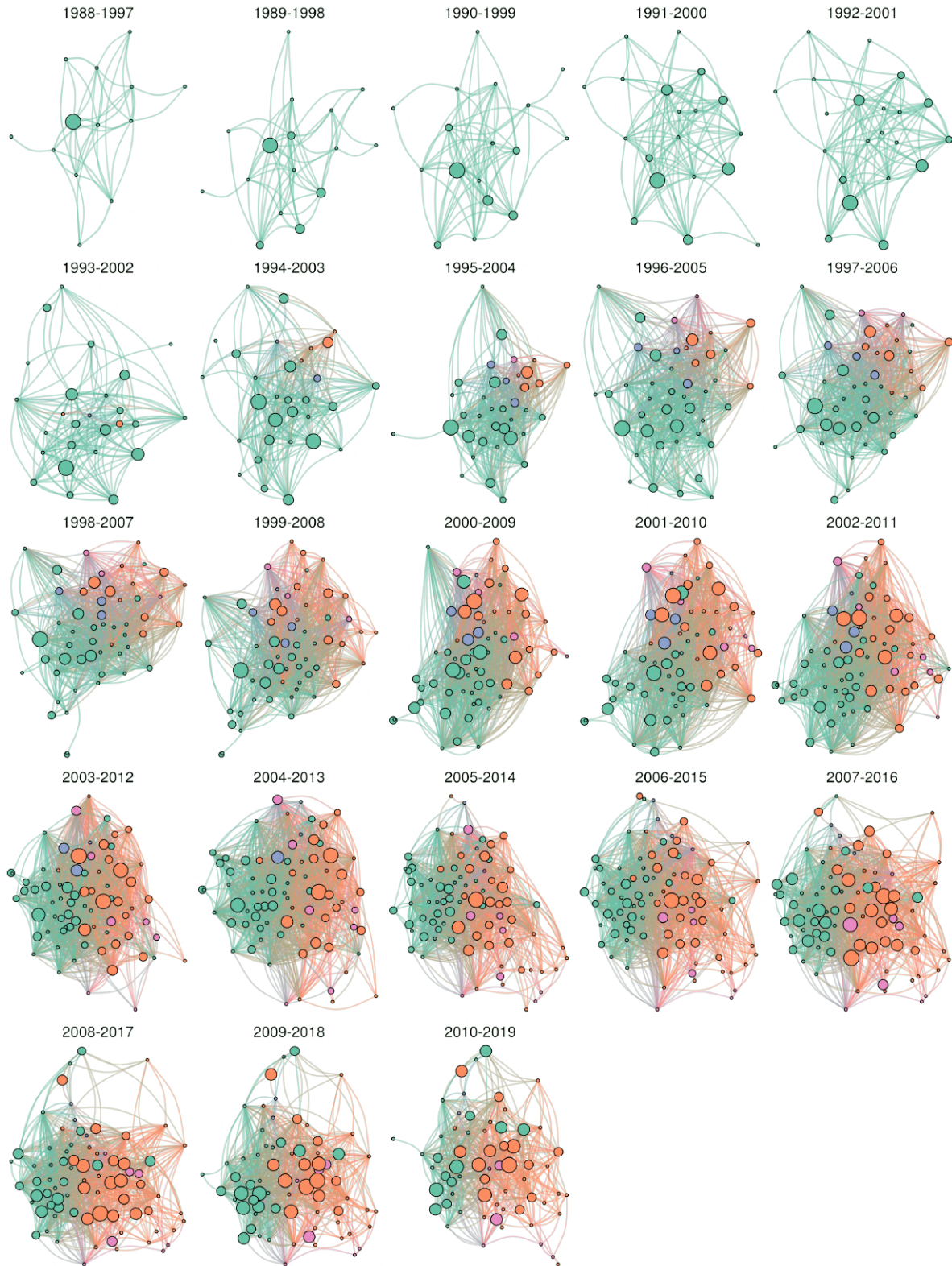


Figure 15: Bibliographic coupling networks of Fehr's publications (green = economics and management, orange = other NSE and neurosciences, pink = psychology, blue = other SSH)

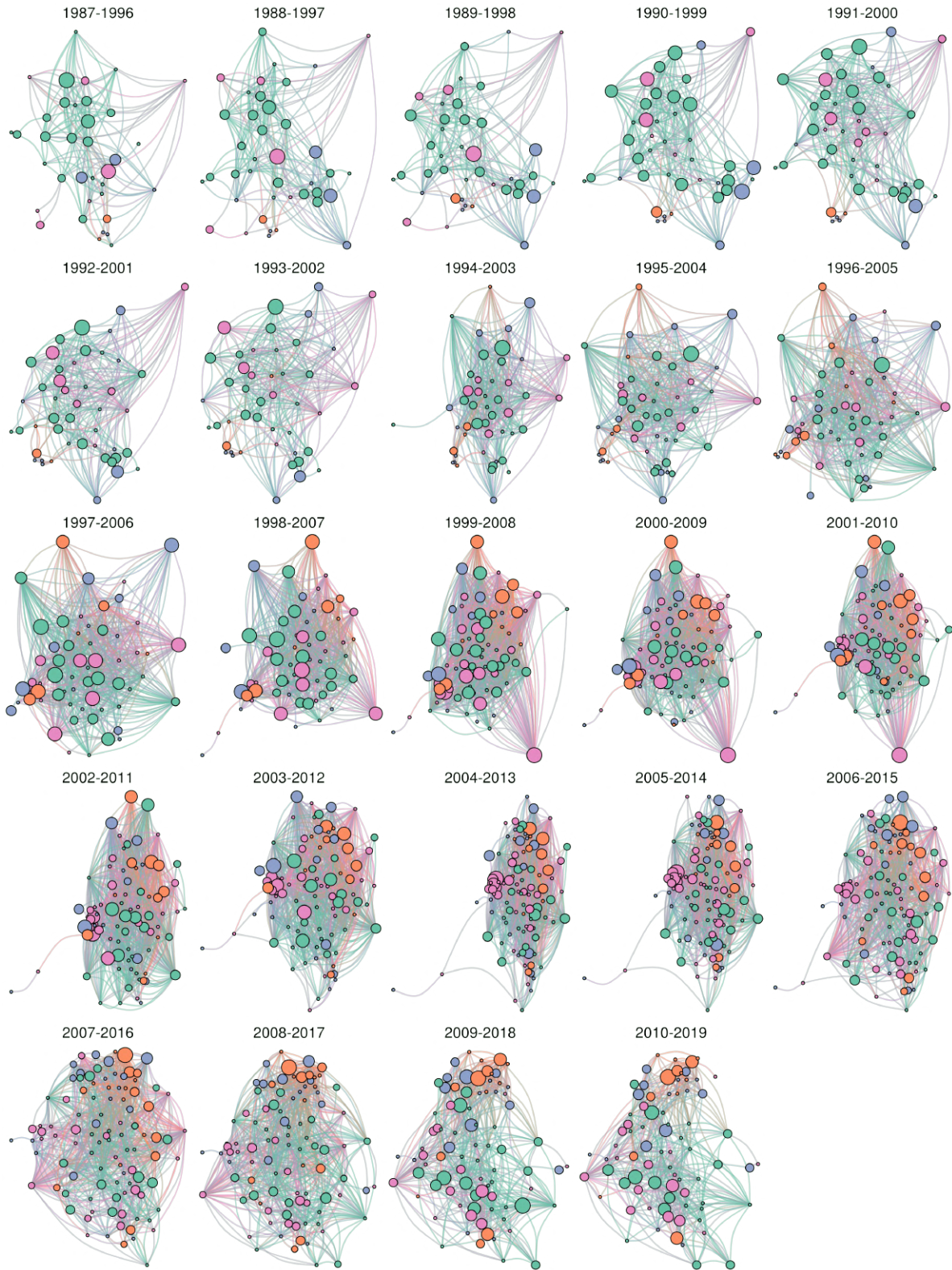


Figure 16: Bibliographic coupling networks of Loewenstein's publications (green = economics and management, prange = other NSE and neurosciences, pink = psychology, blue = other SSH)

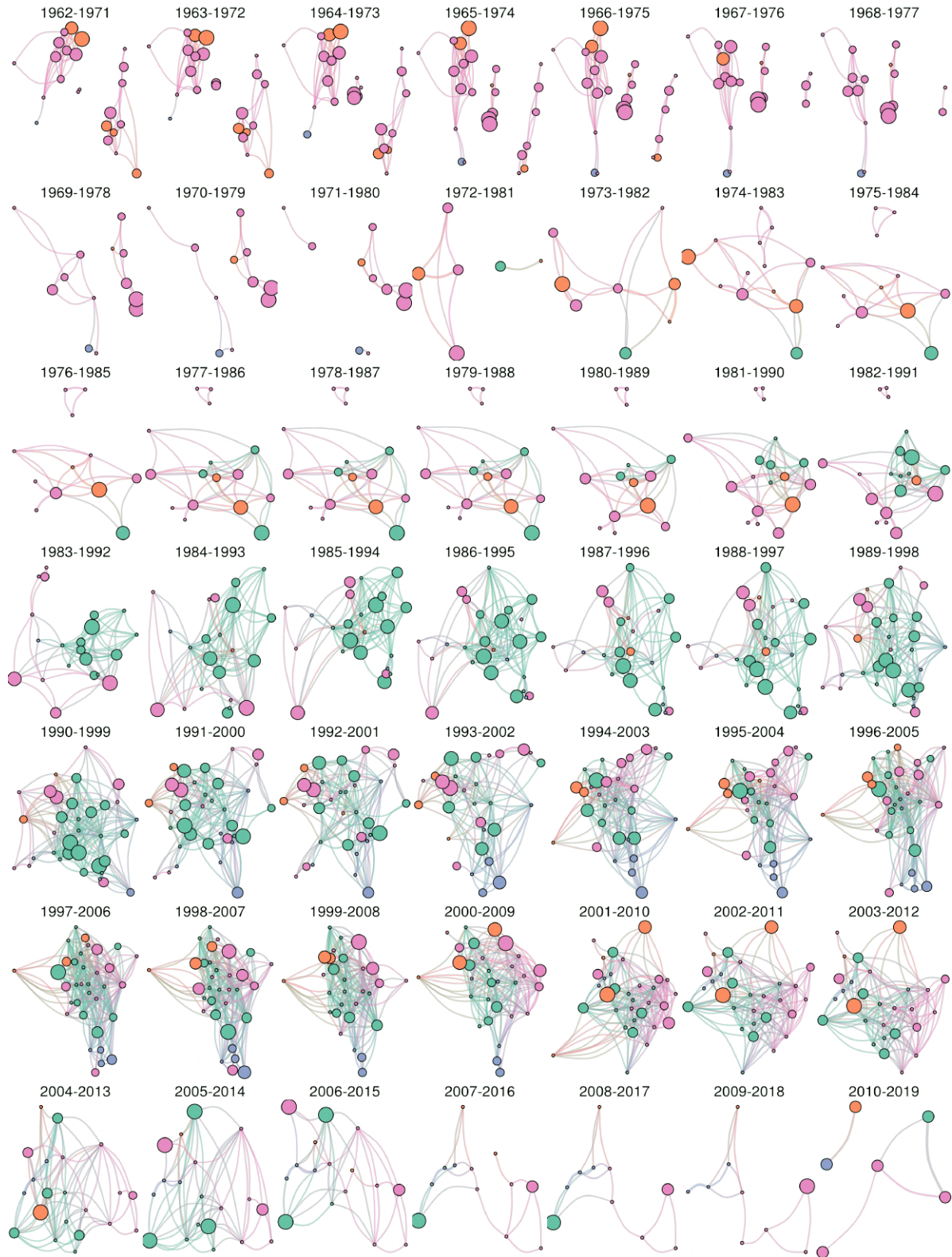


Figure 17: Bibliographic coupling networks of Kahneman's publications (green = economics and management, prange = other NSE and neurosciences, pink = psychology, blue = other SSH)

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