The Interplay between Theory and Experiments

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Abstract. This chapter discusses the parallel progress of theory and experiments over the past decade. Focusing on three representative years, I find that the volume of experimental and theoretical publications has remained fairly constant in the top five journals, but that experimental work has been increasingly successful within the top field journals. On the authors' side, theorists and experimentalists have similar profiles, though well-published theorists are slightly better placed and experimentalists are slightly more connected in the coauthorship network. Last, I find a dramatic increase in the recent number of theorists dabbling in experiments, particularly at the very best ranked institutions.

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1. Introduction

When experimentalists who are theory oriented or theorists who frequently run experiments discuss the interplay between theory and experiments there is great danger for an optimism bias. Such scholars are often friendly to both theory and experiments and hold a desire to see theory and experiments flourish hand in hand. They also tend to self select into conferences and seminar series that are friendly to both these fields. Admitting to this potential bias, my goal is to inspect some meta data on the recent evolution of the fields of theory and experiments in order to get an empirically sound impression.

I report observations regarding publications in the top general interest and field journals during 1998, 2003, and 2008. I also use data on the faculty coauthoring these papers, documenting the rank of the schools they are affiliated with (top 15 or below top 15), and their fields of interest (pure theory, pure experiments, theory and experiments).

There are two realms of results the data point to. With respect to papers, there do not seem to be significant increases in the volume of experimental work that is being published, be it with or without a theoretical spin. Field journals, however, do exhibit some significant time trends, with more experimental publications over time.

With respect to authors, I find that theorists and experimentalists publishing at the leading journals have rather similar profiles, with two exceptions. First, well-published theorists are slightly better placed than their experimental counterparts. Second, when looking at the coauthorship networks, experimentalists are slightly more connected than theorists. In addition, there is a substantial time trend in terms of theorists who dabble in experimental work, who are significantly increasing in volume over the time period the data is from, particularly for faculty in top-ranked institutions.

2. The Data

Data was collected on microeconomics publications in 1998, 2003, and 2008 in the top general interest economics journals: *American Economic Review* (*AER*), *Econometrica* (*EMA*), *Journal of Political Economy* (*JPE*), *Quarterly Journal of Economics* (*QJE*), and *Review of Economic Studies* (*ReSTUD*), as well as the leading field journals in microeconomics (in existence since 1998): *Games and Economic*

	Year	Overall	Theory	Experiments	Theory based Experiments
Top	**1998**	242	60	10	8
Journals	**2003**	279	62	7	1
	2008	240	61	11	6
Field	**1998**	140	133	7 (1 JET, 6 GEB)	6
Journals	**2003**	171	159	12 (2 JET, 10 GEB)	7
	2008	160	144	16 (all GEB)	14

Table 1: Publication Time Trends

Behavior (*GEB*) and *Journal of Economic Theory* (*JET*).[1] Each paper was classified into one of three categories: theory, experiments, or theory and experiments.

In addition, data were collected on the publication records, specific fields of interest, and school rankings of microeconomics faculty as of 2008. Publication records and fields of interest were harvested from faculty web-pages. School rankings were categorized coarsely into top 15 and below top 15.[2]

3. Publication Trends

3.1. The Papers. The first place to look for general time trends is the dynamics of the publication process. Table 1 contains the split between papers classified as theoretical (absent any use of newly collected laboratory data), experimental (absent any suggested theoretical model), and experimental based on some theoretical modeling.[3]

The top panel of Table 1 suggests very limited time trends, in terms of both absolute and relative volumes of published experimental work. The fraction of experimental papers accounts for less than 5% of all published papers in the top general interest journals, and around 15% of the published microeconomics papers (using either theoretical or experimental methodologies). In fact, most experimental

[1] Several recent journals focusing on microeconomics work have emerged over the past decade that are clearly perceived as leading outlets. For the sake of the dynamic analysis performed in this paper, only journals that were in existence since 1998 were considered.

[2] The ranking of the top 15 economics units world-wide was taken as 1. Harvard, 2. Massachusetts Institute of Technology, 3. Stanford, 4. Princeton, 5. University of Chicago, 6. University of Pennsylvania, 7. Northwestern, 8. New York University, 9. Yale, 10. London School of Economics, 11. University of California, Los Angeles, 12. University of Califonia, Berkeley, 13. Minnesota, 14. Rochester, 15. University of Michigan. Faculty affiliated with any of these universities (from any department or professional school) were classified as belonging to a "top 15" school. This ranking is taken as an interpolation of an array of available rankings (see Amir and Knauff, 2005 and Einav and Yariv, 2006).

[3] A a paper was classified into the last category (theory based expeirments) whenever there was an explicit mention of theoretical analysis.

papers are published in *EMA* and *AER*: 8 of 10 in 1998, 4 of 7 in 2003, and 8 of 11 in 2008.[4]

The trends pertaining to the top field journals are reported in the bottom panel of Table 1 and exhibit somewhat different features. In both absolute and relative terms, the number of experimental paper published in these two journals has increased, particularly in *GEB*. Of these, both the number and the fraction of theory-based experiments have risen.

There are different interpretations one can give to these observations. It might be that a new field first gains acceptance in the top journals, which may have occurred for the experimental literature by the mid-90's, and then *trickles down* to the more specialized journals. Alternatively, it might be that a field gets established through publications in specialized journals first, so that what we are observing is a *trickling up* through the journal rankings of experimental work. Of course, it may also be that the three years reported in this chapter are not fully representative. Further data collection as well as historical analyses of other fields' emergence would be useful in assessing the likelihood of each of these theories.

3.2. The Authors. Another dimension by which to inspect the time trends of the publication process is through the affiliation of the authors. It is conceivable that papers in emerging fields require authors to have some stamps of quality (say, an affiliation to a highly ranked school) in order to get published. Figure 1 illustrates two ways by which to inspect these effects.

In the top panel of Figure 1, the percentage of authors in top 15 schools publishing in the top general interest and field journals are reported for the three time periods inspected. The bottom panel considers the percentage of papers with at least one author in a top 15 school in the two classes of journals considered (there are too few data points to be reported for the set of theory-based experimental papers).

The figure suggests several trends. First, the percentage of authors coming from the very top institutions and writing theory oriented papers has risen within the general interest journals, but decreased for experimental publications and for all types of papers in the field journals. Second, this image is reversed when looking at the need to have at least one author from one of the very

[4] The reported figures pertain to full papers only. In fact, over the three inspected years, only one experimental piece was published as a note in *AER*.

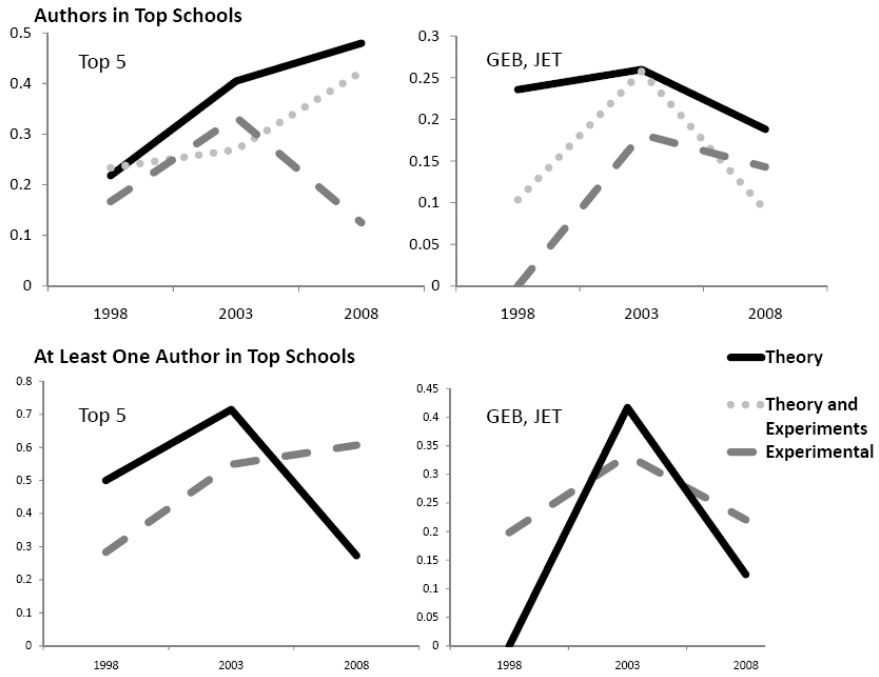

Figure 1: Author Time Trends

top institutions in the general interest journals. In these journals, experimental papers appear to increasingly be associated with at least one author from a top 15 school, while for theory papers the opposite trend is observed. For the field journals, the general trend remains, though the decreases are more pronounced when looking at the need for one author in a top school.

These observations are potentially driven by forces pertaining to both the demand and the supply of papers with different characteristics. On the demand side, journals may have greater tendencies to accept papers with particular profiles of coauthors (that are expected to be associated with papers' quality). For instance, if general interest journals had greater propensity to accept papers with at least one coauthor affiliated with a top 15 school, much of the trends that are observed would be explained.

On the supply side, there is evidence suggesting that the structure of coauthorships has changed over time (see, e.g., Gans, 2001, Ellison, 2002, and Einav and Yariv, 2006, as well as the discussion in the following sections). In particular, there is an acknowledged trend in Economics for fundamental papers to involve an increasing number of coauthors. Furthermore, it is conceivable that theorists coauthor with faculty in their own school more frequently than experimentalists, simply due to the

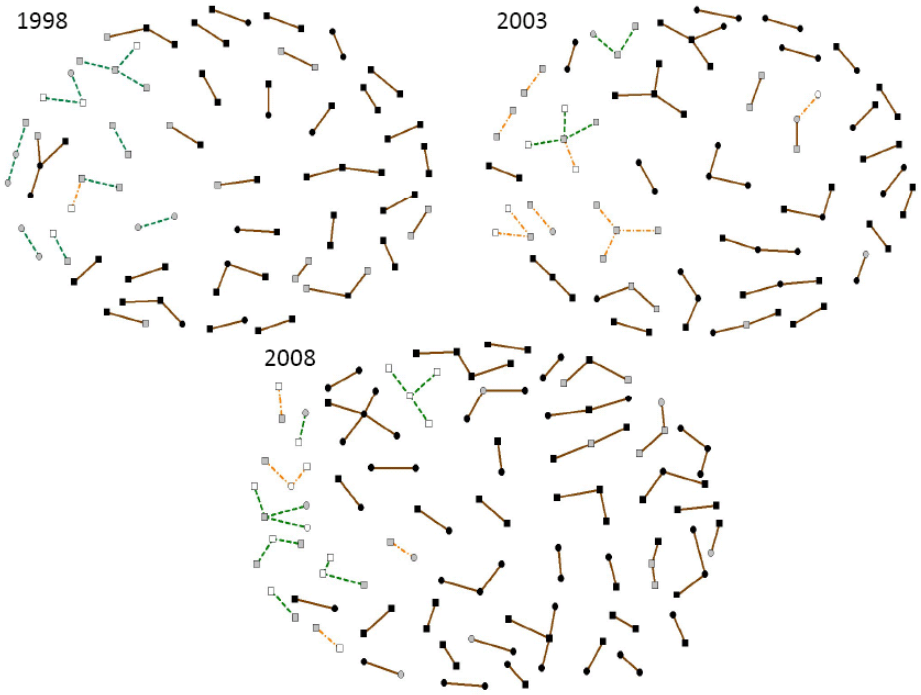

Figure 2: Coauthorships across Time

fact that most of the leading universities do not employ an abundance of experimentalists. These two forces would generate an increasing wedge between the fraction of authors in the very top institutions that collaborate on leading theoretical and experimental work.

In what follows, I discuss some of the attributes corresponding to the coauthorship structures of theorists and experimentalists, the supply side of the market in question.

4. Coauthorship Trends

Over the time period covered in this chapter, looking at authors of papers in the top journals, the percentage of authors who were pure experimentalists increased over time (from 5% in 1998, to 7% in 2003, to 11% in 2008), while the percentage of authors who were pure theorists remained stable (at 69% in 1998 and 70% in 2003 and 2008), thereby implying that the complementary fraction of authors who combined experiments and theory in their work declined.

Figure 2 describes the network of coauthorships within the top general interest journals in the three

years that were inspected.[5] Black nodes correspond to theorists, white nodes to experimentalists, and gray nodes to researchers who engage in a substantial number of both theoretical and experimental projects. A link between two nodes implies that the respective faculty have appeared as coauthors in a published paper. Solid links represent coauthorship on a theoretical paper, dashed links represent coauthorship on an experimental paper and links comprised of dashes and dots correspond to coauthorships on papers that fall within the theory-based experiments category.[6]

Looking at Figure 2, one may notice the increase of the volume of nodes over the years, as well as the rise in the number of connected components, mostly star-shaped, involving three or more authors.

The increase in volume of nodes is presumably due in big part to the increase in the number of coauthors involved in each paper. Indeed, the fraction of 1998 papers discussed here that were solo-authored was 40%, and the fraction involving two coauthors was 47%; In 2003 these numbers were 38% and 45%, respectively; and in 2008 they were 26% and 47%. This general trend has been documented with more extensive data sets in Gans (2001), Ellison (2002), and Einav and Yariv (2006).

We now turn to the differences between theorists and experimentalists. Figure 3 depicts the cumulative distributions of degrees (number of connections in the network) of theorists and experimentalists across time (where, for the sake of the figure, experimentalists are taken as those engaged in a substantial amount of experimental work, corresponding to either the white or gray nodes in Figure 2).

While the differences between the cumulative distributions corresponding to theorists and experimentalists are small, the distribution corresponding to exeperimentalists consistently first order stochastically dominates that corresponding to theorists. Furthermore, there are not many significant time trends (though the number of solo-authored papers has decreased significantly, which is mirrored by the fraction of degree 1 agents plummeting over time).[7]

[5] Similar qualitative insights to those described in this section emerge when considering field journals as well.

[6] In our data, no two faculty were involved in two papers belonging to different categories and so the classification of links is well defined.

[7] As mentioned before, the observations reported here remain qualitatively similar when looking at the field journals, with one exception. When looking at degree distributions, in 1998, that corresponding to experimentalists was stochastically dominated by that corresponding to theorists within *JET* and *GEB*.

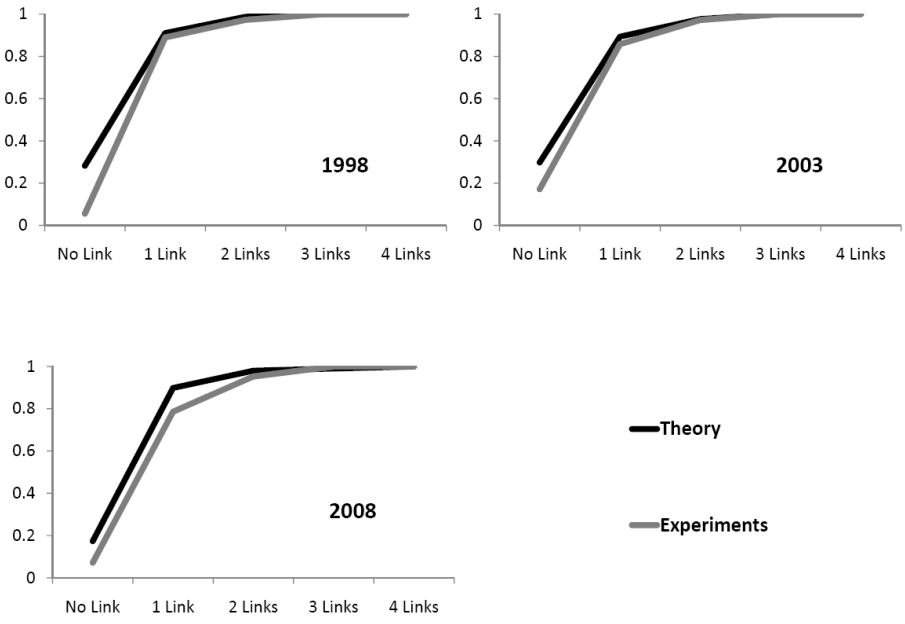

Figure 3: Cumulative Degree Distributions for Theorists and Experimentalists

4.1. Theorists Dabbling in Experiments. I now turn to look at the emergence of theorists who are seriously interested in experimental work so that they have been involved in one or two experimental projects themselves. Focusing on current affiliations, Figure 4 documents the percentage of theorists having dabbled in experiments by each of the years inspected in this chapter.[8] The figure depicts the trends for the top 15 schools and top 5 schools, for senior and junior faculty.[9]

Figure 4 illustrates a substantial increase in the number of theorists dabbling in experiments, particularly among junior faculty in recent years. This trend is noticeably more pronounced for the higher ranked schools.

It is often believed that junior faculty can take less risks in the choice of topics they work on, having impending tenure decisions in sight. In that respect, the comparison between junior and senior theorists is interesting. In 1998 and 2003, junior theorists were less likely to engage in one-time experiments than senior theorists. Nonetheless, in 2008, this observation is reversed. To the extent

[8] This should be interpreted with care, as some of these faculty may have changed affiliations over the years. Furthermore, dabbling in experiments often turns into a career pursuit, and while those theorists who turned experimentalists in the late 90s are not counted as "dabblers," those who will become experimentalists after their experimentation in 2008 are counted as such.

[9] Following the ranking used throughout the chapter, the top 5 schools are taken to be: 1. Harvard, 2. Massachusetts Institute of Technology, 3. Stanford, 4. Princeton, and 5. University of Chicago.

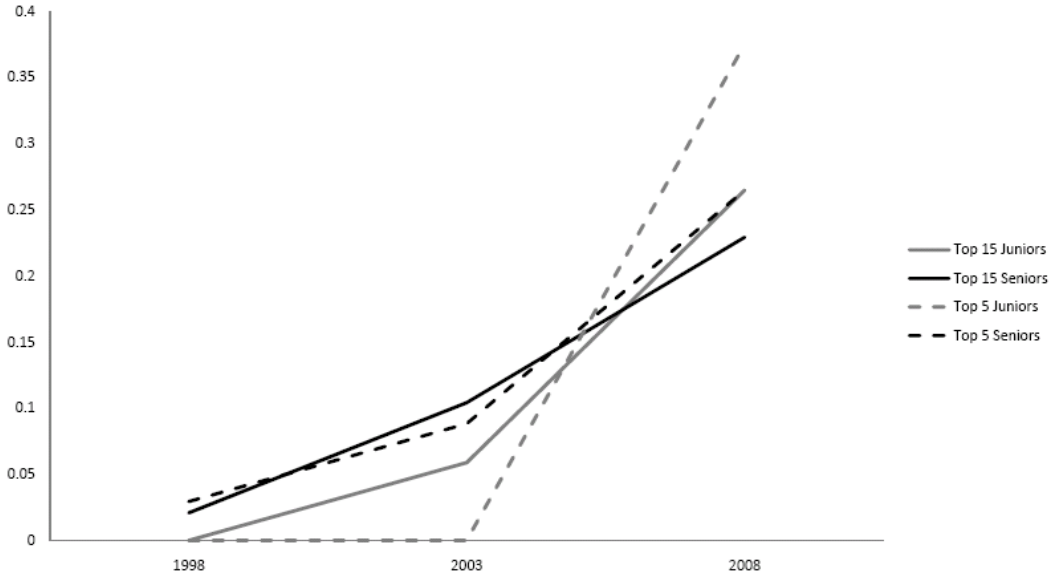

Figure 4: Dabbling Theorists across Time

that juniors' field choices are suggestive of how risky these fields are perceived to be, experiments may be thought of as more main-stream by theorists nowadays.

5. Conclusions

In order to assess the interplay between theory and experiments I used data on publications and microeconomics faculty in three years representing the last decade: 1998, 2003, and 2008.

There are several important messages that one can take from this analysis. Regarding publications, the percentage of experimental papers have not changed significantly at the top general interest journals, but increased substantially within the top field journals. Regarding the researchers' profiles, experimentalists and theorists have similar characteristics. Experimentalists do seem slightly more connected and well-published theorists (namely, those publishing in the top journals) are slightly better placed in terms of the ranking of the school they are affiliated with. Theorists and experimentalists do interact. In fact, there is a dramatic increase in the recent volume of theorists dabbling in experiments.

These observations are impressionistic in that they are based on limited observations from only three years. It will be interesting to continue following these trends as years go by.

6. References

Amir, Rabah and Malgorzata Knauff (2005), "Ranking Economics Departments Worldwide on the Basis of PhD Placement," *CORE Discussion Paper 2005/51.*

Einav, Liran and Leeat Yariv (2006), "What's in a Surname? The Effects of Surname Initials on Academic Success," *The Journal of Economic Perspectives*, **20(1)**, 175-188.

Ellison, Glenn (2002), "The Slowdown of the Economics Publishing Process," *Journal of Political Economy*, **105(5)**, 947-993.

Gans, Joshua S., ed. (2001), *Publishing Economics: Analyses of the Academic Journal Market in Economics*, Cheltenham, UK Edward Elgar Publishing.