The Citation Pattern for Business and Statistics Journals: Changes in the 21st Century

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Abstract

This paper uses citation analysis to examine the cross pollination in the 21st century between academic top tier business journals and highly cited statistics journals. This changing relationship is important as business leaders are concluding that they can "make better decisions" with tools of analytics and big data sets. Three time periods are observed: 2000, 2005, and 2010.

The top business journals examined are among those scoured by Bloomberg Business to determine the 'Intellectual capital score' for business schools in *Bloomberg Business Week's* MBA rankings. The statistics journals cited are compiled from the top of three lists: those with the most citations in Eakin, Whiteside, and Reyes, (2005), "Statistics Journals: How Schools of Business Use Them", those most frequently mentioned in Theoharakis, V. and Skordia, M. (2003), "How Do Statisticians Perceive Statistics Journals?", and those with the most impact in Van Nierop, E. (2009), "Why do statistics journals have low impact factors?" The patterns of citation among the journal clusters are compared for the three years in order to capture the changes and trends.

Key Words: Cluster, big data, analytics

1. Introduction

Business leaders and academics in colleges of business increasingly advocate data driven discovery for making better strategic business decisions and bringing increased value to their enterprise. Although statistical theory and methods clearly underpin business analytics, it is not entirely clear that business students and faculty appreciate and acknowledge this contribution. In a broader context, the most prestigious business journals for many years have published articles with complex statistical technology but very few references to publications in statistics journals (Eakin, Whiteside, and Reyes 2002). The research question for this paper is *"What is the pattern of cross pollination in the 21st century between academic top tier business journals and highly cited statistics journals?"* This relationship is (or at least should be) important as business leaders are concluding that they can "make better decisions" with tools of analytics and big data sets.

2. Methodology

2.1 Data collection

The years 2000, 2005, and 2010 were selected to identify any 21st century trends in cross citations of business and statistics journals coinciding with the emergence of Big Data and business analytics. Three years were selected in order to observe any changing or non-linear rates of interaction over the ten year period at the beginning of the 21st century.

2.1.1 Business Journals

The business journals we examine are among those those scoured by Bloomberg Business to determine the 'Intellectual capital score' for business schools in *Bloomberg Business Week's* MBA rankings. The business journals appear in Table 1 below along with the abbreviations used in the subsequent figures.

Table 1: Business Journal Names and their Respective Abbreviations

	Journal Names	Abbreviation
	Business Journals	
1	**Academy of Management Journal**	**AMJ**
2	**Academy of Management Review**	**AMR**
3	**Accounting Review**	**ACR**
4	**Administrative Science Quarterly**	**ASQ**
5	**American Economic Review**	**AER**
6	**Information Systems Research**	**ISR**
7	**Journal of Accounting Research**	**JAR**
8	**Journal of Consumer Research**	**JCR**
9	**Journal of Finance**	**JFN**
10	**Journal of Financial Economics**	**JFE**
11	**Journal of Marketing**	**JOM**
12	**Journal of Marketing Research**	**JMR**
13	**Management Science**	**MGS**
14	**Marketing Science**	**MKS**
15	**Operations Research**	**OPR**
16	**Production and Operations Management**	**POM**
17	**Review of Financial Studies**	**RFS**
18	**Strategic Management Journal**	**SMJ**

2.1.2 Statistics Journals

The statistics journals cited are compiled from the top of three lists: those with the most citations in Eakin, Whiteside, and Reyes, (2005), "Statistics Journals: How Schools of Business Use Them", those most frequently mentioned in Theoharakis, V. and Skordia, M. (2003), "How Do Statisticians Perceive Statistics Journals?", and those with the most impact in Van Nierop, E. (2009), "Why do statistics journals have low impact factors?" The statistics journals appear in Table 2 along with the abbreviations used in subsequent figures.

Table 2: Statistics Journal Names and their Respective Abbreviations

	Statistics Journals	
1	**American Statistician**	**AMS**
2	**Annals of Probability**	**ANP**
3	**Annals of Statistics [AS]**	**AS**
4	**Biometrics**	**BIO**
5	**Decision Sciences** [DS]**	**DS**
6	**Econometrica [EM]**	**EM**
7	**Journal of Econometrics**	**JOE**
8	**Journal of Business & Economic Statistics**	**BES**
9	**Journal of the American Statistical Association**	**ASA**
10	**Journal of the Royal Statistical Society Series A-Statistics in Society**	**RSSA**
11	**Journal of the Royal Statistical Society Series B Statistical Methodology**	**RSSB**
12	**Journal of the Royal Statistical Society Series C Applied Statistics**	**RSSC**
13	**Review of Economics and Statistics [RES]**	**RES**
14	**Statistical Science**	**SSC**
15	**Technometrics**	**TEM**

2.1.3 Source of citation data

The Journal Citation Reports (JCR) under Web of Science was used to create an N x N, asymmetric matrix with frequencies of citing and being cited to and from journals for the three years of interest. We eliminate the diagonal of self cites.

2.2 Data analysis

The citation analysis used follows the general pattern of that in Peterson et al. (2011), Pieters and Baumgarten (2002), and Starbuck (2005). See also Stigler (1994).We used UCINET6, software for analyzing social networks. Correlations between journals constructed from the citation frequencies served as the input for multidimensional scaling, cluster analysis and factor analysis. CONCOR (CONvergence of iterated

CORrelations) was used to obtain groups ("blocks") and the density of citations between them.

3. Results

Multidimensional scaling (MDS) shows proximity of journals in two dimensional space in Figure 1 for the year 2000. We identify the horizontal axes for all three years as a quantitative scale, from least on the left to most mathematical disciplines on the right for 2000. The vertical axis possibly reflects the extent to which a discipline draws on the conceptual foundations of other disciplines, moving from marketing at the lowest point to accounting, finance and economics at the highest. A factor analysis shows the journals belonging to specific disciplines. These factor groups are drawn on the MDS map for the year 2000. The factor loadings for year 2010 appear in Table 3. Cluster analysis shows the relationships among the disciplines and the distances at which they link. The dendrogram obtained from the cluster analysis reveals the progressive grouping of journals into topic areas. Finally, block modeling was used to derive groups of related journals and the density of citations among the groups. The blocked matrix shows very little interaction between business and statistics journals and slight changes in groupings within business from 2000 to 2010.

4. Conclusions

Surprisingly, we found no major changes in the patterns of citations between statistics and business journals from the year 2000 to the year 2010. Perhaps increased cross pollination will appear for the year 2015 as more and more ideas from statistics are adopted in business analytics research and business decision making. *Management Science* did move away from information systems and operations management from 2000 to 2010 (factors 9 and 5 respectively in Table 3) with *Operations Research* serving as a bridge between the two factor groups. On the other hand, statistics (Statistics 1, factor 1 in Table 3) and probability (Statistics 2, factor 7 in Table 3) appear to have interacted with greater mutual citations over the same period.

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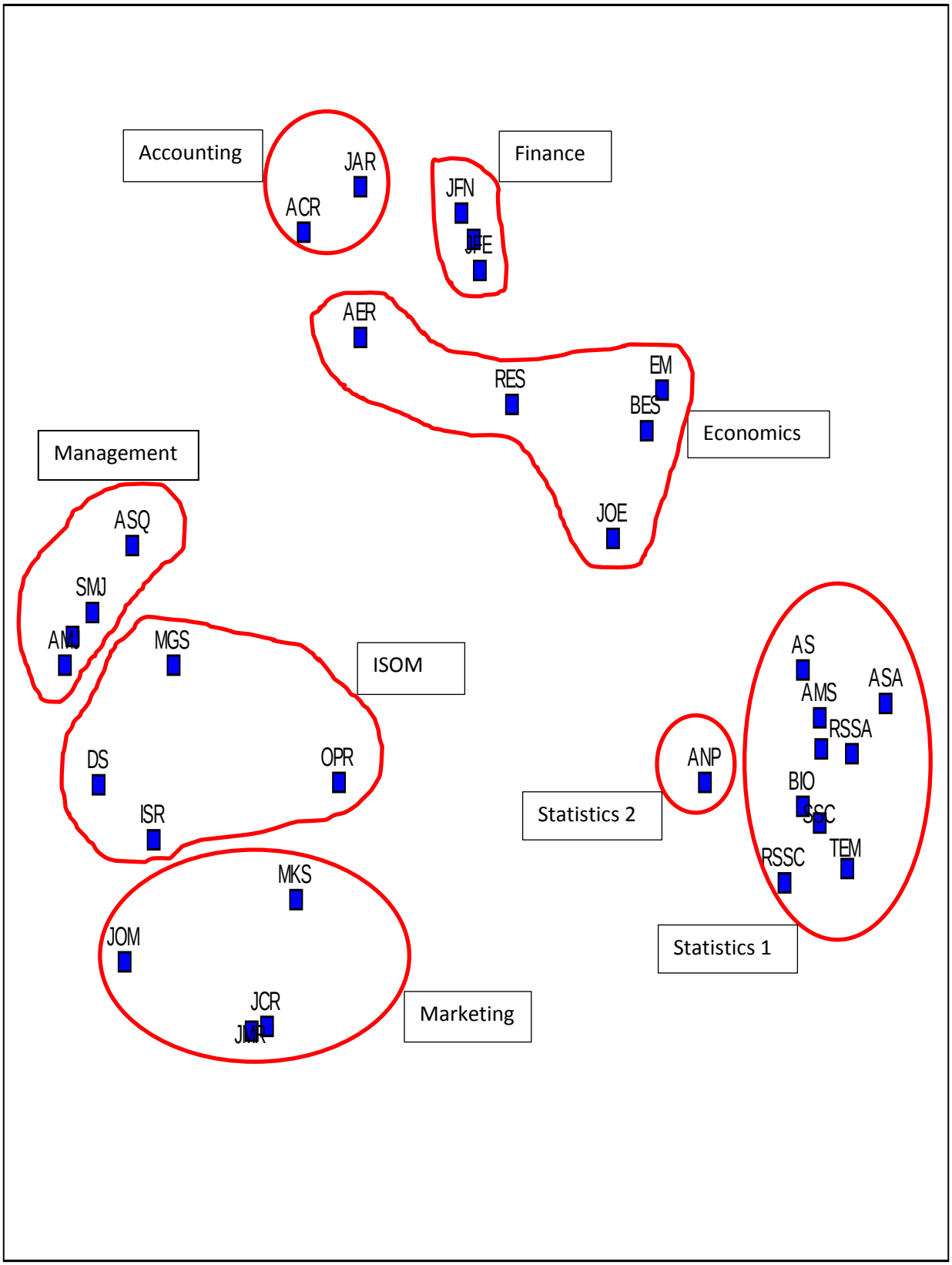
Table 3 Year 2010 Rotated Factor Loadings

		1	2	3	4	5	6	7	8	9
1	AMJ	0.096	-0.028	-0.030	0.962	-0.136	-0.018	-0.052	-0.012	0.010
2	AMR	0.103	-0.007	-0.046	0.995	-0.024	-0.040	-0.032	-0.030	-0.079
3	ACR	0.075	-0.043	0.019	-0.026	0.025	0.151	-0.047	0.965	-0.023
4	ASQ	0.089	-0.029	-0.020	0.889	0.153	-0.026	-0.015	-0.044	-0.205
5	AER	0.190	-0.027	0.686	0.042	0.087	0.418	0.021	-0.073	-0.082
6	ISR	0.088	0.113	-0.016	0.271	-0.903	-0.032	-0.067	-0.021	0.184
7	JAR	0.090	-0.058	0.006	-0.029	0.057	0.199	-0.014	0.933	0.020
8	JCR	0.071	0.946	-0.037	-0.013	0.077	-0.017	-0.000	-0.013	-0.025
9	JFN	0.112	-0.060	0.136	-0.039	0.044	0.930	0.015	0.009	0.097
10	JFE	0.058	-0.051	0.127	-0.015	0.040	0.995	-0.039	0.146	-0.039
11	JOM	0.099	0.968	-0.068	0.035	-0.086	-0.051	-0.045	-0.037	-0.002
12	JMR	0.082	0.906	-0.041	-0.040	-0.090	-0.044	-0.071	-0.042	-0.006
13	MGS	0.168	0.139	0.130	0.189	-0.264	0.063	-0.086	0.011	-0.847
14	MKS	0.066	0.895	0.076	-0.038	-0.237	-0.037	-0.031	-0.017	-0.102
15	OPR	0.008	0.048	0.106	-0.057	-0.859	-0.001	0.006	-0.008	-0.461
16	POM	0.055	0.045	-0.034	-0.054	-0.894	-0.028	-0.006	-0.032	-0.307
17	RFS	-0.004	-0.038	0.105	-0.018	0.002	0.863	-0.078	0.269	-0.114
18	SMJ	0.095	-0.005	-0.013	0.865	-0.383	0.014	-0.071	0.033	0.126
19	AMS	-0.956	-0.041	0.026	-0.073	0.069	-0.064	-0.002	-0.060	0.057
20	ANP	-0.081	-0.054	0.041	-0.044	0.030	-0.052	0.862	-0.003	0.009
21	AS	-0.712	-0.060	0.144	-0.061	0.035	-0.050	0.630	-0.028	0.058
22	BIO	-0.976	-0.036	0.001	-0.036	0.038	-0.045	0.120	-0.031	0.039
23	DS	0.130	0.155	-0.122	0.157	-0.913	-0.064	-0.056	-0.043	0.097
24	EM	0.135	-0.034	0.615	-0.050	0.048	0.088	0.525	-0.071	0.125
25	JOE	-0.288	-0.001	0.861	-0.064	-0.014	-0.048	-0.105	0.080	-0.027
26	BES	-0.247	-0.005	0.881	-0.085	-0.023	0.002	0.017	0.090	0.004
27	ASA	-0.714	-0.080	0.014	-0.098	0.094	-0.063	0.599	-0.067	0.037
28	RSSA	-0.883	-0.088	0.126	-0.088	0.031	0.099	-0.076	0.071	-0.070
29	RSSB	-0.641	-0.066	-0.030	-0.072	0.071	-0.052	0.652	-0.047	0.017
30	RSSC	-0.956	-0.066	-0.044	-0.066	0.056	-0.063	0.004	-0.059	0.044
31	RES	0.134	-0.031	0.763	0.026	0.030	0.197	0.091	-0.041	-0.110
32	SSC	-0.961	-0.036	0.030	-0.052	0.038	-0.056	-0.027	-0.048	0.045
33	TEM	-0.928	-0.071	-0.017	-0.070	0.030	-0.077	0.174	-0.049	0.058

Figure 1 Year 2000 MDS Map with Factor Groups Enclosed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