STEM colonization: Applying hard sciences' socio-organisational patterns and evaluation procedures to the soft sciences in Croatia

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Abstract
Academic systems are undergoing changes in which the social organisation of research as well as patterns of scientific productivity in the humanities and social sciences progressively resemble those in hard sciences. The hard and soft sciences are increasingly converging. This development can be observed in (1) publishing patterns, (2) the division of research, and (3) the internationalisation of research. This study explored the extent to which these changes occurring in academic systems in terms of a transformation of disciplinary practices are also becoming a trend in transitional post-socialist countries. We used Croatia as a case of a post socialist transitional context and compared it to Slovenia, a country with a similar past but somewhat different science policies and strategies. The results point to increasing convergence in some soft disciplines, visible in projectification and internationalisation of academic work as well as a significant change in the publishing patterns.

KEYWORDS: social sciences, humanities, STEM, publishing patterns, internationalisation, projectification, convergence, research practices, Croatia

1 INTRODUCTION

This article addresses the socio-organisational patterns and everyday functioning of disciplines in the Croatian academic system, as well as in the international context. In his influential work, Whitley (1984) observed that there was increasing convergence in the development of publishing practices and knowledge creation in all disciplines in a relatively short time span, which he interpreted as an intra-scientific development process of social and cognitive standardization. Changes are heavily influenced by science policies. In the last two decades, there has been a growing concern about a culture of speed that produces growing heaps of publications, at the same time marginalizing slow and creative thought and reflection (Müller, 2014). Central to all of the changes summarised by the term "new public management", are the market-oriented management techniques that introduced focus on efficiency and competition into almost all areas of academic work (Ferlie, Musselin & Andresani, 2008). These changes are evident in increasing time

pressures, the fragmentation of time into projects and work-packages and metric-oriented evaluation. Projectification changed academic work in a way in which the project format has become a standard, a self-evident way to organize research (Ylijoki, 2016). Therefore, research work is project work, involving writing research applications, finding project partners, competing for project funding, recruiting project researchers, running project management, meeting project deadlines and reaching the goals defined in the project contract. This type of task stratification further affirms instrumentalization and precarisation of academic work in an unprecedented way (Müller, 2014). The key insight is that the project format of academic work is not a mere technical or organisational tool because it shapes, alters and rebuilds research practices and working conditions (Ylijoki, 2016).

An evident change, central to our research, has been occurring in publishing practices. Due to pressures for promotion and tenure (Sabharwal, 2013), researchers in the humanities and social sciences are expected to publish journal articles, in contrast to the traditionally discipline specific preference for books and book chapters (Nygaard, 2017). Opting for "quick" and "safe" publications leads to changes in the publishing patterns in a variety of disciplines (Leišytė, 2016). Jung, Seo, Kim and Kim (2017) conclude that the pressure to publish in top journals has increased for all academics. Even when there is not an evident pressure to publish quickly in some fields, government funding may depend on publication frequency (Jung et al., 2017, p.465). Convergence is also visible in terms of collaboration patterns. Whilst common in the hard sciences, collaborations are quite new in the social sciences and humanities; however, performance pressures have influenced academics in all disciplines to collaborate more and publish faster (Leišytė , 2016). In terms of academic systems in the European Union, it is worth mentioning the research of Engels, Istenič Starčič, Kulczycki, Pölönen and Sivertsen (2018) on databases documenting outcomes of social sciences and humanities scholarship. Engels et al. (2018) show that increased evaluation of academic output has resulted, in the period from 2009 to 2015, in a significantly smaller share of books and book chapters in the social sciences and humanities in Poland. On the other hand, they established a larger share of the mentioned publications in Flanders where evaluation is organised by peer assessment, and they found no significant change in Finland, Norway, and Slovenia. Engels et al. (2018) conclude that it is possible that there is a negative impact of the evaluation systems on book publishing, an effect that "appears to be less likely in mature evaluation systems" (p. 603).

The extent of convergence of the academic disciplines in terms of how research and scholarship is in practice carried out and organised, as well as attitudes towards productivity in Croatia, are interesting topics of research for at least two reasons. Firstly, because of the concern over increasing loss of sociological, disciplinary and epistemic pluralism in the sciences, which significantly affects (some of) the disciplines among social sciences and humanities due to evaluation and promotion systems in the sciences (Viola, 2017). Secondly, smaller disciplinary communities (such as Croatia) which have comparatively recently been exposed to internationalisation and changes in public management—after having been partly isolated in their own trajectories for decades—are an interesting case for observation because of their hybrid developmental paths which can give us insights into specific disciplinary cultures. These insights enable us to discover more about the workings and the consequences brought about by the previously mentioned profound changes.

This article is structured as follows. First, the theoretical and contextual underpinnings and research methodology are explained. Subsequently, we analyse data related to the patterns of research output and collaborations for different disciplines in Croatia. A few comparative points in relationship to data from Slovenia—from the same international survey (APIKS)—are noted. In the following discussion, we concentrate on the occurrence of convergences between the sciences and their patterns, with a focus on changes in the soft disciplines (social sciences and humanities). We discuss our findings within the socio-historical context of the academic system and current evaluation and promotion policies, and conclude with policy recommendations. Notably, that the evaluation of research in Croatia should be structured using peer-review practices and in a way that recognises differences that characterise different fields of research.

2 COGNITIVE AND SOCIAL ORGANIZATION OF THE DISCIPLINES

In a multitude of different approaches to socio-cognitive and socio-organisational differences across disciplines, Biglan's typology (1973a; 1973b) is the most influential. The author divided sciences into soft and hard, applied and theoretical while also noting the third dimension of science, which regards living and inanimate systems. Related are the disciplinary groupings by Becher (1989), commonly used as a theoretical framework in research on the social organisation of the sciences. Based on anthropological research in academia across disciplines, Becher (1989) developed the ideal typology of disciplinary communities by categorizing disciplines into four broad groups. The first group denotes the *pure hard sciences* or natural sciences (for example physics) whose nature of the knowledge base is described as cumulative and atomistic. Researchers are interested in universal laws, quantities and simplifications, while research often results in discoveries or explanations. The second group are the *pure soft sciences*, humanities, such as history, and social sciences, such as anthropology. They are described as repetitive, holistic and interested in details, quality, and the complex, characterised by research that often results in interpretations and understanding. The third group consists of *applied hard sciences,* specifically technical sciences, such as mechanical engineering, described as purposeful and pragmatic disciplines, which provide expertise through solid knowledge. Finally, there are *applied soft sciences,* specifically, social sciences such as business studies, education or social work. They are functionalist, utilitarian disciplines, which provide expertise through soft knowledge. In sum, the cultures of disciplines differ in: traditions and taboos, intellectual territories, internal and external boundaries of disciplines, competitiveness and the nature of hierarchies, intellectual manners, the nature and various examples of myths, disguised assumptions, processes of initiation and the nature of relationships with the laity, patterns of communication and publication as well as conventions and ethics in the production and reproduction of knowledge (Becher 1989). It is Becher's cultural approach that we consider a useful starting point in this paper.

3 ACADEMIC DISCIPLINES IN CROATIA

Thinking and writing about post-socialist countries inevitably leads us to the concepts of semi-periphery and post-socialist structure of societies. Semi-periphery is a term for countries that mix both core and peripheral forms of organisation (Wallerstein, 1997). By saying that Croatia is semi-peripheral we mean that regardless of achieving significant levels of "westernisation" it remains dependent on the core (most wealthy) societies, with higher unemployment and poverty rates. In terms of its academic system, we often witness copying the policies implemented in the western

(especially EU) academic systems resulting in mixed modes of governance as well as a mixed quality of outcomes.

There has been a permanent crisis in investing in the research and development sector[1], as well as in the quantity and quality of research productivity in Croatia, since its independence in 1991 (Švarc, Čengić, Poljanec-Borić & Lažnjak, 2019). One of the main problems regarding competitiveness and quality is that, despite recent reforms, research funding remains centralised, while quality evaluation and accreditation are irrelevant in terms of financing the academic institutions (Izsak and Radošević, 2017; Švarc et al., 2019). It is noteworthy that the organisation of work and knowledge production in natural and social sciences in Croatia is still following historically well-established disciplinary differences. However, the system is undergoing some changes in disciplinary practices whereby studies imply that, for instance in the professional socialization of junior researchers in the social sciences, group studies and teamwork are becoming particularly important, resembling more and more practices in the hard sciences (Brajdić Vuković, 2014). Implementing the Bologna process in the Croatian higher education system in 2006 brought about different opportunities for collaboration, while the accession to the EU in 2013 fostered internationalisation of academic work. However, it seems that Central and Eastern European countries are still lagging behind in terms of internationalisation of their academic work, mostly due to unresolved issues from the past (Mali, Pustovrh, Platinovšek, Kronegger & Ferligoj, 2017). Currently, of all the articles published by Croatian researchers, only 4.2% are widely cited (in the top 10% in 2015), while the EU average is 11.1% (RIO, 2018). The international dimension seems to play a greater role for research biographies in the natural sciences than those in the social sciences and humanities, whereby researchers from natural sciences more commonly cooperate with their international colleagues than researchers from technical sciences, the humanities and social sciences (Rončević & Rafajac, 2010.)

3.1 Slovenia as a comparable post-socialist academic system

As concluded by different authors, academic systems in all of Central and Eastern Europe are similar in many aspects (Mali et al., 2017). Suffering from similar symptoms at the beginning of the post-socialist transition, Slovenia joined the EU much earlier (2004) than Croatia (2013), and has implemented a centralised research and development evaluation process at the beginning of 2000 (Mali et al., 2017). By comparing the Croatian and Slovenian data from the international APIKS survey, we can observe potential differences in the convergence of scientific disciplines and their internationalisation and relate them to the effects of the European influence and the system of evaluation.

4 RESEARCH PROBLEM AND HYPOTHESES

We expect that the Croatian example will give us insights into the influence of western higher education policies and international trends on vulnerable, less developed academic systems, especially on the local disciplines and their publishing patterns. We hypothesize that there is increasing convergence occurring in the hard and soft sciences in terms of: (1) publishing patterns, (2) organisation of research, (3) internationalisation of research, in a way that the social organisation of research practices as well as patterns of scientific productivity in the humanities and social sciences progressively resemble those in the hard sciences (STEM). We approach this problem on two levels, first by examining the Croatian data, and secondly by comparing the most interesting results with the dataset from Slovenia.

5 METHODS

In order to examine the hypothesis, we analysed the data gathered in the APIKS study in the period from November 2017 to February 2018 in a sample of 1037 academics in Croatia.[2] The analysis aimed at establishing the present situation regarding the influences (colonisation) of hard sciences on the soft sciences in terms of publishing patterns, internationalisation of research, and organisation of research practices.

5.1 Instruments

In 2018, a number of different attitudes, experiences and behaviours related to the academic profession were collected with the APIKS survey. In the following, we elaborate thoroughly on the six variables from the APIKS survey that we have used for our analysis. Each of the variables consist of self-reported estimates by respondents. (1) The variable *sciences* was based on the question "Please identify the academic discipline or field you are working in". For the purpose of the analysis it was recoded following Becher (1989). Life sciences, physical sciences, mathematics and chemistry were coded as *pure hard sciences.* Computer sciences, engineering, manufacturing, construction, architecture, agriculture and forestry, medical and health related sciences were coded as *applied hard sciences*. Social and behavioural sciences and humanities combined were coded as *pure soft sciences*. Legal sciences, business and administration, social work and services were coded as *applied soft sciences*.

(2) A question surveyed in the APIKS study was "How many of the following scholarly contributions have you completed in the past three years: scholarly books you authored or co-authored, scholarly books you edited or co-edited, articles published in an academic book, articles published in an academic journal". Responses contributed to the variable *number of (co)authored scholarly books,* (*co)edited scholarly books, book chapters and articles in journals published in the last three years.*

(3) Responses to the question "What percentage of your publications in the last three years were (percent) solo authored, published in a foreign country, co-authored with colleagues located in the country of your current employment, co-authored with colleagues located in other (foreign) countries" contributed to the variable *percentage of all publications in the last three years that were sole-authorship publications, publications co-authored with domestic researchers, publications co-authored with international researchers, and internationally published publications.*

(4) Respondents were asked about participation in research collaborations using a set of questions to which respondents could answer either "yes" or "no" for different types of collaborations. This contributed to the variable c*ollaborations on projects, collaborations with colleagues within their own institution, with domestic colleagues, and international collaborations*.

(5) "International in orientation or scope" was one of the multiple choices available for respondents for the question "How would you characterize the emphasis of your primary research". The question was answered on a Likert scale that ranged from "1–not at all" to "5–very much". This contributed to the variable *orientation of the research: international in orientation or scope.*

5.2 The Croatian sample

Around 85% of the student population is enrolled in study programmes at public universities in Croatia, and more than 90% of all academic staff in Croatia works at public universities (Croatian Bureau of Statistics, 2018). Only public universities were for this reason included in the APIKS survey. The total of the population of academics working in Croatia, employed at eight Croatian public universities, expressed by full-time equivalent positions (FTEs), is 9777 academics. We sent an invitation to participate to all of them. The response rate for the online-questionnaire was 10.6% (1037 responses). The sample is representative in terms of disciplines because it closely reflects the disciplinary dispersion of the population of Croatian academics working at universities. The representation of social and behavioural sciences was 20%, humanities 20%, engineering, manufacturing, construction, and architecture 17%, medical sciences and health 12%, physical sciences, mathematics and life sciences 10% while forestry and agriculture was 5%. Other disciplines were represented in smaller proportions.

6 RESULTS

6.1 Publishing patterns and internationalisation of research

Reviewing the publishing patterns in the Croatian academic community, we analysed the average number reported by the respondents in terms of publishing productivity in the last three years. Researchers in the applied soft sciences still write (co)authored monographs much more than researchers in the *hard* sciences. In contrast, the *pure soft*, social and behavioural sciences and the humanities combined, do not write monographs as much as expected (Table 1). Researchers in the social and behavioural sciences and the humanities are much more interested in writing (co)edited books, and book chapters, compared to the ones in the *hard sciences*, but those are also high in preference related to the publishing patterns in the *applied soft fields* of legal sciences, education sciences and economics.

(TABLE 1 ABOUT HERE)

Interestingly enough, there is no significant effect for the articles published in journals. The *hard* sciences, STEM fields, have a higher mean of published articles in academic journals with an average of almost seven articles in the last three years (Table 1). On average, social and behavioural sciences and humanities (*pure soft* sciences) published just one article less in the last three years, while *applied soft* sciences have published two articles less than the *hard* sciences.

Reading the co-authorship publishing patterns for exploring further possible convergences between the *soft* and *hard sciences*, we have analysed the percentage of sole-authored publications, internationally published publications, co-authored with domestic researchers, and publications co-authored with researchers from foreign countries, in the last three years (Table 2). We have found significant effects for all of them. With 40% of sole-authorship in publications, the *soft* sciences have produced significantly more, compared to all of the *hard* sciences. The *applied soft sciences* account for 30% of the sole-authored publications, while less than 10% in the natural (*pure hard*) sciences, and even less in the *applied hard* sciences. The largest number of publications published with domestic colleagues, were reported in the *applied hard* sciences, about 77%. The natural sciences also had a large percentage, over 65 %, of publications that were written in co-authorship with domestic researchers. However, researchers in economics, education

sciences and legal sciences combined (*applied soft* sciences) also reported over 56% of publications written in co-authorship with researchers from Croatia, which is not significantly more than the 53% in the *pure soft* sciences.

(TABLE 2 ABOUT HERE)

On average, the natural (*pure hard*) sciences were the most internationally oriented with over 84 % of publications published internationally. The *applied hard* sciences follow closely behind with an average of 77% of internationally published publications. The *soft* sciences publish internationally significantly less. However, those percentages are generally not so small. This is especially true for the economics, education sciences and legal sciences, where almost 57% of the publications have been published internationally. In the *soft pure* sciences the percentage was about 42%. The percentage of publications co-authored with foreign researchers was much lower for all disciplines. The highest, on average, was in the natural (*pure hard*) sciences, about 43%. We found a significantly lower percentage in the *applied hard* sciences, about 20%, and about 10% or less in the *soft* sciences.

6.2 Social organisation and funding of research work

In this part of our analysis, we describe the social organisation of research and teamwork practices, domestic and international research collaborations (not related to co-authorships) (Table 3), and the reported international orientation or scope of research. The mean for the *hard* sciences when reporting whether they collaborate with other colleagues on research projects (1-yes, 2- no) was much lower, indicating a greater average for collaborations in comparison to the *soft* sciences. No significant difference between the *hard* and the *soft* sciences was found in the collaborations with institutional colleagues, domestic colleagues, or international colleagues on research projects. When asked if they collaborate with international colleagues, most researchers across disciplines answered "yes". It seems thereby that collaborations have, as of yet, not yielded mutual publications in all fields of science.

(TABLE 3 ABOUT HERE)

Results indicated that the research in natural (*pure hard*) sciences is perceived significantly more commonly as international in scope or orientation compared to *applied hard* sciences, *pure soft* sciences or *applied soft* sciences. However, the mean for "international in scope or orientation" was high for all the groups of sciences.

6.3 Soft sciences, divisions and convergences

We have found significant differences in the numbers of (co)authored books between social and behavioural sciences and education. The largest number of books were published in education sciences, significantly more than in the social sciences (Table 4). The number of books published in the Humanities was not very different from the social and behavioural sciences, and fairly similar to other soft sciences. Although there were no differences in the co-edited books between the *soft* disciplines, there were significant effects for book chapters and journal articles published. Most of the chapters were published by scholars in legal sciences. This was significantly more than in the humanities and social and behavioural sciences; especially, when compared to scholars in economics who had the least published chapters in all of the *soft* sciences. In the humanities, there was on average about four published journal articles per respondent, which is significantly less than in the social and behavioural sciences where the average was six papers.

(TABLE ABOUT 4 HERE)

Considerable differences were observed in the *soft* sciences between disciplines. Significant differences were observed in terms of averages in international publications, sole-authorships, and co-authorships (both domestic and international) (Table 5).

(TABLE ABOUT 5 HERE)

The largest international proportions of publications by field, in the last three years, were by researchers in economics, almost 70%. Researchers in the humanities have published internationally about 40% of publications and social and behavioural sciences researchers about 43%. The humanities' scholars have published most sole-authorship publications, more than 60%, followed by legal science researchers with more than 50% (Table 5). Social and behavioural sciences have about 24% sole-authorships, while there are least sole-authorship publications in economics, about 15%. This is evident in significant effects in co-authorships with domestic and foreign researchers. Researchers in economics have the most domestic collaborations, about 84%, social and behavioural sciences have a little bit less than 70%, and education sciences about 60%. Researchers in the humanities have a significantly lower percentage compared to all the other soft disciplines, about 35%. All percentages of foreign co-authorships in *soft* sciences are still quite low. The highest percentage is in the social and behavioural sciences, about 16%. Because of the low share in co-authorships in the humanities in general, foreign co-authorships in the humanities is unexpectedly lower than it is in the social sciences, at only 8%. Researchers in economics, reported about 7%, which is similar to the legal sciences. The lowest percentage of foreign co-authorships was reported in education sciences, at about 6%.

6.4 Comparison with Slovenia

Comparing the APIKS survey data for Croatia with data for Slovenia is interesting in particular with regard to possible convergence within the disciplines of soft sciences. As we can see from the results (Table 6), researchers in social and behavioural sciences at Slovenian universities have published more monographs. Researchers in the humanities have been publishing books within a similar average as in Croatia, obviously showing the same (new, non-traditional in terms of custom preference of monographs in humanities) path resulting in less monographs, and more chapters and articles. In Slovenia, as in Croatia, book chapters have been the most common form of publication in the humanities and the least common in the field of economics.

(TABLE 6 ABOUT HERE)

Similarities are also found with regard to the articles published in journals in the last three years. However, Slovenian researchers reported fewer journal articles in the social and behavioural sciences as well as in economics, compared to their Croatian colleagues (Table 7). In addition, sole authorship was more common in the legal sciences in Slovenia than in Croatia, about 80%, compared to the Croatian average of 53%. There was also a considerable difference within the field of economics with 27% of sole authorships in Slovenia compared to the Croatian average of 15%. This trend is similar in other disciplines as well. When looking at the social and behavioural sciences, there were about 40% sole authorships in the last three years in Slovenia, compared to

the Croatian average of 24%. The proportion of sole authorships in the education sciences was around 40% in Slovenia compared to around 30% in Croatia. In the humanities, there was 38% of sole-authorships in Slovenia compared to the Croatian 30%. It seems that the soft sciences in Slovenia are going through transformation at a somewhat slower pace in terms of teamwork in publications when compared to Croatia. However, the Slovenian researchers in social and behavioural sciences report about 54% of international publications in the last three years, whereas in Croatia, that percentage is considerably smaller—about 40%. Additionally, researchers in the legal sciences in Slovenia have reported, on average, 10% more international publications than their colleagues in Croatia (40% vs. 30%). In the last three years, a larger share of co-authorships with foreign colleagues were reported in the field of economics in Slovenia (25%) when compared to those in Croatia (7%), while all other results are similar in trends.

(TABLE 7 HERE)

7 DISCUSSION

We have observed that Croatian *hard* sciences follow their traditional publishing patterns, preferring journal articles to books and book chapters. However, in the *soft* sciences we find interesting results when comparing them to *hard* sciences on the one hand, but also between *soft* sciences themselves on the other. Although we have found that there is large share of journal articles in *soft* sciences overall, some of the applied sciences continue to publish monographs and books chapters (e.g. legal sciences) while other fields have almost completely abandoned those (e.g. economics). Similar interesting patterns are related to co-authorships, we find the large share of those in the social sciences, and especially economics, while humanities and legal converged less towards teamwork in publishing.

In order to gain a complete picture of some of the aforementioned results, we will compare them with the results from prior research conducted in Croatia in 2004. The first indicative result in the present study is that even though books and book chapters are still a popular means of publishing in the humanities and social sciences, the data shows that there is convergence occurring within the soft sciences. Noticeable convergence to the model of the hard sciences was observed in the field of economics in terms of publishing patterns. Few publications in economics were monographs and book chapters. Also, fewer single author publications were reported in economics than for all other *soft* sciences. In the five years preceding 2004, researchers from the field of economics published about 43% co-authored publications, and the rest were sole-authorships; 43% of publications in economics were international. For the three years preceding 2018 a significant difference can be observed in that economists reported at least 80% co-authored publications, and 70% international publications. Unfortunately, we do not have the data on the share of books and book chapters from 2004, which could help us understand the changes in the type of publishing productivity. Nevertheless, the noted changes, including a larger share of articles and a smaller number of monographs, co-edited books and book chapters indicate significant convergence in the type of publications.

In terms of co-authorship of publications, the 2004 study noted for a five-year period that there was about 53% co-authorships in the social and behavioural (*pure soft*) sciences, the rest were sole-authorships. Approximately 20% of publications in the social and behavioural sciences were published internationally (Prpić and Brajdić Vuković, 2005, p. 70; 2009, p. 117). Fourteen years

later, in a three-year period, social and behavioural scientists reportedly published at least 70% of their publications with co-authors. 43% of publications in the social and behavioural sciences were published internationally. This denotes a significant and considerable change in the publication patterns in the *pure soft* sciences as well. Again, we have no data on the type of publications from 2004, but it is noteworthy that also in the social and behavioural sciences a rather small share of monographs were reported in 2018, even if the publication of book chapters remains a common practice.

We have closely observed changes in the humanities, a field where we have identified possible convergence. We have observed a diminishing share of monographs and a larger share of journal articles in the humanities. Also, a large share of sole-authorships were reported and share of international publications. Prpic and Brajdic Vukovic (2005, p. 70) show that in 2004 humanities' scholars reported that 12% of their publications in the preceding five-year period were written in co-authorship, and of all publications 30% were published internationally. Compared to the 2018 study, co-authorship practices have changed a lot, they are now at about 35%, and the share of international publications has risen to 40%. The largest share of book chapters were reported in the humanities; also, a small share of monographs and a rather high number of journal articles. These results point to changes in the preferred types of publications in the humanities. As noted in our comparison with Slovenia, the transformation in publishing patterns in the different fields of research is visible, but to a smaller extent than it seems to be occurring in Croatia.

Our findings indicate that the legal sciences in Croatia seemingly have not been affected much by pressures to follow the hard sciences model. We observed a lot of sole-authorships, monographs, and a small share of international publications. In 2004, legal sciences reported for the previous five years about 10% co-authored publications and about 28% international publications (Prpić & Brajdić Vuković, 2009, p. 117). In 2018, as reported for the previous three years, the share of international publications roughly stayed the same as in 2004, about 30% (Prpić & Brajdić Vuković, 2009, p. 117). By 2018, the share of sole-authorships had dramatically fallen even in the legal sciences—from 90% to 50%. We see that practices of co-authorship are changing even in the legal sciences despite a continued preference for the traditional type of publications—monographs and book chapters rather than journal articles.

8 CONCLUSION

Limitations to our findings are mostly related to the fact that in Croatia, most of the public research institutes, both within the hard and soft sciences have been excluded from our sample because they are independent institutions dealing with research, with no students and no teaching duties. However, there is no reason for us to believe that the results would differ a lot in terms of less convergence in the soft disciplines within the institutes that are research intensive, compared to the less research intensive soft sciences at the universities. On the contrary, we would expect them to be even more under the influence of both projectification and internationalisation of research tasks and productivity.

It seems that a form of "academic capitalism" pressuring academics to publish more and faster, has made its way into all disciplines in Croatia, whereby the soft sciences are changing their publication patterns both in terms of types of publications and co-authorship alike (Sabharwal, 2013; Nygaard, 2017). The change that has taken place in the period from 2004 to 2018 can be

seen most clearly in the applied social sciences. Especially in economics, where the reasons for convergence towards the *hard* sciences publishing patterns (many co-authorships and preference for journal articles), can be attributed to the ever-growing connections to business and industry, which also influences changes in research practices (Stern and Barley, 1996). Our analysis shows that Croatia has adopted projectification in research to a greater extent than Slovenia. However, research in Slovenia is comparatively more international. We propose that the effects of projectification draw on local specificities of projects funding, while internationalisation probably has more to do with the earlier accession of Slovenia to EU, and the systems of evaluation that are applied in Slovenia and not in Croatia (Mali et al., 2017). Our findings raise concerns in terms of the influence of projectification on research in Croatia, its disciplines as academic communities. Projectification is in part is due to the increasing number and prolonged status of precarious positions of postdoctoral researchers in the social sciences and humanities—a phenomenon previously reserved to the hard sciences. Postdoctoral researchers have been observed to contribute with often unrecognised work, especially in terms of significant teaching workloads in the social sciences and humanities (Ledić & Brajdić Vuković, 2017). Workload, as well as pressures to publish in a short time span in academic journals, together with concerns over slow and poor quality of peer review processes in the book publishing industry (Engels et al., 2018), can completely divert young scholars from the traditional type of publications such as books and book chapters. Such practices can result in a serious loss of epistemic pluralism in the soft sciences, especially in fields that are more paradigmatically divergent and base their development on argumentation and contestation (Viola, 2017). Therefore, it is of crucial importance, especially in less mature evaluation systems, such as the Croatian one, to follow the lead of those evaluation practices that base their assessment on peer-review (Engels et al., 2018) rather than solely on quantitative indicators and indicators that are insensitive to the differences between disciplines and different fields of research.

ENDNOTES

[1] In 2018 investment was only 0.97% of gross domestic product (GDP), the highest investment was in 2004, 1.03% and Croatia aims at 1.4% by 2020, which seem out of reach at this point.

[2] The data has been collected within the international collaborative project Academic Profession in Knowledge Society through initial support for young researchers at the University of Rijeka (funding from the year 2016).

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Table 1. Number of scholarly books (co)authored, (co)edited, book chapters, and articles in journals in the last three years (ANOVA)

		Books authored or co-authored [F(3,585)=7.38, p<0.000]	Books edited or co-edited [F(3,537)=8.89, p<0.000]	Articles published in an academic book [F(3,613)=14.64, p<0.000]	Articles published in an academic journal [F(3,790)=2.53, p<0.056]
Pure hard sciences	Mean	,35*	,21*	,51*	6,45
	SD	,87	,53	,88	7,92
Pure soft sciences	Mean	,69*	,80	2,18*	5,30
	SD	,80	1,26*	2,27	4,97
Applied hard sciences	Mean	,88*	,39*	1,14*	6,52
	SD	1,25	,89	2,80	8,02
Applied soft sciences	Mean	1,10*	,76*	1,98	4,81

	SD	1,09	,87	1,77	4,43
Total	Mean	,76	,58	1,60	5,90
	SD	1,04	1,06	2,40	6,72

* Significant effect by Tukey's HSD test of significance

Source: Authors

Table 2. Percentage of solo-authored, co-authored (domestic and international), and internationally published publications in the last three years (ANOVA)

		% Solo authored publications [F(3,712)=70.98, p<0.000]	% Publications published in a foreign country [F(3,759)=50.87, p<0.000]	% Publications co-authored with domestic colleagues [F(3,772)=24.81, p<0.000]	% Publications Co-authored with international colleagues [F(3,685)=38.70, p<0.000]
Pure hard sciences	Mean	9,60*	65,17*	65,17*	43,92

	SD	23,81	38,41	38,41	37,95
Pure soft sciences	Mean	42,43	53,15*	53,15*	12,75*
	SD	37,86	36,15	36,15	20,93
Applied hard sciences	Mean	7,39*	77,33*	77,33*	20,99*
	SD	20,29	32,95	32,95	27,82
Applied soft sciences	Mean	31,97*	56,98*	56,98	5,82*
	SD	35,14	35,29	35,30	12,49
Total	Mean	24,45	64,71	64,71	20,04
	SD	34,68	36,79	65,17	28,48

* Significant effect by Tukey's HSD test of significance

Source: authors

Table 3. Collaborators on research projects, collaborations with scholars at own institution/other domestic scholars/international colleagues (ANOVA)

		Collaborators on research projects (Y/N) [F(3,848)=9.38, p<0.000]	Collaborations with researchers at own institution (Y/N) [F(3,848)=1.89, p<0.129]	Collaborations with domestic colleagues (Y/N) [F(3,848)=.51, p<0.673]	Collaborations with international colleagues (Y/N) [F(3,848)=1.22, p<0.300]
Pure hard sciences	Mean	1,04*	1,12	1,14	1,15
	SD	,201	,324	,351	,360
Pure soft sciences	Mean	1,17*	1,05	1,17	1,21
	SD	,376	,228	,376	,410
Applied hard sciences	Mean	1,06*	1,07	1,19	1,24
	SD	,237	,248	,394	,425
Applied soft sciences	Mean	1,12	1,06	1,16	1,22
	SD	,327	,239	,373	,420
Total	Mean	1,11	1,07	1,17	1,21
	SD	,309	,252	,379	,410

* Significant effect by Tukey's HSD test of significance

Source: authors

Table 4. Number of scholarly books (co)authored, (co)edited, book chapters, and articles in journals in the last three years (ANOVA)

		Books authored or co-authored [F(4,290)=6.05, p<0.000]	Books edited or co-edited [F(4,272)=1.02, p<0.397]	Articles published in an academic book [F(4,322)=5.86, p<0.000]	Articles published in an academic journal [F(4,368)=4.31, p<0.002]
Educational sciences	Mean	1,31*	,91	2,07*	4,43
	SD	1,01	,94	1,77	3,15
Humanities	Mean	,85	,95	2,76*	4,07*
	SD	,82	1,20	2,63	3,15
Social and behavioural sciences	Mean	,57*	,68	1,72*	6,22*
	SD	,77	1,29	1,82	5,82
Economics	Mean	,56	,38	,44*	6,21
	SD	,73	,74	,73	7,45
Legal sciences	Mean	1,27	,92	2,86*	4,40
	SD	1,42	,79	1,66	3,25
Total	Mean	,76	,80	2,15	5,23

	SD	,87	1,21	2,22	4,90

* Significant effect by Tukey's HSD test of significance
Source: atuhors

Table 5. Percentage of solo-authored, co-authored (domestic and international), and internationally published publications in the last three years - *soft* sciences (ANOVA)

		% Solo authored publications [F(4,352)=30.49, p<0.000]	% Publications published internationally [F(4,350)=4.48, p<0.002]	% Publications co-authored with domestic colleagues [F(4,350)=20.09, p<0.000]	% Publications Co-authored with international colleagues [F(3,304)=3.45, p<0.009]
Educational sciences	Mean	30,06*	25,82*	57,00*	5,62
	SD	36,55	26,73	35,35	13,29
Humanities	Mean	63,30*	40,53*	35,60*	8,33*
	SD	35,01	35,09	32,82	15,47
Social and behavioural sciences	Mean	23,90*	43,84	66,11*	15,86*
	SD	29,87	32,50	32,96	23,61

Economics	Mean	15,91*	69,17*	83,93*	7,08
	SD	23,86	29,61	22,46	15,44
Legal sciences	Mean	52,77	29,57*	35,43*	6,42
	SD	34,49	19,76	30,69	9,44
Total	Mean	40,74	41,39	53,78	11,62
	SD	37,59	33,20	35,99	19,95

* Significant effect by Tukey's HSD test of significance
Source: authors

Table 6. Number of scholarly books (co)authored, (co)edited, book chapters, and articles in journals in the last three years - *soft* sciences (ANOVA) - Slovenia

		Books authored or co-authored [F(4,405)=1.39, p<0.290]	Books edited or co-edited [F(4,400)=1.02, p<0.290]	Articles published in an academic book [F(4,405)=2.24, p<0.049]	Articles published in an academic journal [F(4,405)=1.75, p<0.121]
Educational sciences	Mean	,95	0,65	2,16	4,37
	SD	1,21	0,95	2,39	4,97
Humanities	Mean	,78	0,70	2,53	3,38

	SD	1,22	1,12	2,62	2,75
Social and behavioural sciences	Mean	1,06	0,49	1,84	4,39
	SD	1,42	1,06	2,89	3,58
Economics	Mean	,72	0,37	0,89	3,63
	SD	,98	0,80	1,23	2,30
Legal sciences	Mean	1,11	0,37	3,11	4,26
	SD	1,37	0,83	3,53	2,77
Total	Mean	,88	0,57	2,09	3,83
	SD	1,26	1,03	2,64	3,28

* Significant effect by Tukey's HSD test of significance

Source: authors

Table 7. Percentage of solo-authored, co-authored (domestic and international), and internationally published publications in the last three years - *soft* sciences (ANOVA)

		% Solo authored publications [F(4,380)=20.04, p<0.000]	% Publications published in a foreign country [F(4,380)=3.84, p<0.002]	% Publications Co-authored with domestic colleagues [F(4,480)=21.08, p<0.000]	% Publications Co-authored with international colleagues [F(4,380)=5.69, p<0.000]
Educational sciences	Mean	38,02*	52,24	49,51*	18,29
	SD	29,69	33,43	29,57	22,98
Humanities	Mean	67,01*	42,97*	24,56*	9,12*
	SD	34,79	34,16	29,19	19,77
Social and behavioural sciences	Mean	39,03*	54,11	50,34*	18,07*
	SD	33,08	32,24	33,02	25,02
Economics	Mean	26,80*	61,59*	66,52*	24,59*
	SD	28,79	34,10	35,01	26,45
Legal sciences	Mean	79,44*	39,78	16,78*	5,33
	SD	21,35	24,64	16,13	8,60
Total	Mean	51,11	48,91	40,09	14,21

	SD	36,38	33,91	34,47	22,76

* Significant effect by Tukey's HSD test of significance

Source: authors