Ethical ambiguity in the academic periphery: Global versus local science in explaining plagiarism

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The past decade has seen extensive research carried out on the systematic causes of academic misconduct. Simultaneously, less attention has been paid to the variation in academic pathologies between research fields, as most empirical studies focus on one particular discipline. We propose that academic discipline is one of several systematic factors that might contribute to academic misbehavior. Drawing on a neo-institutional approach, we argue that on the academic periphery, the norm of textual originality has not drawn equal support across different research fields depending on its level of internationalization. Using plagiarism detection software, we analyzed 2,405 doctoral dissertations randomly selected from all dissertations defended in Russia between 2006 and 2016. We measured the globalization of each academic discipline by calculating the share of publications indexed in the global citation database in relation to overall output. Our results showed that, with an average share of detected borrowings of over 19%, the incidence of plagiarism on the academic periphery is remarkably higher than in Western countries. Overall, disciplines closely follow the pattern of higher globalization associated with a lower percentage of borrowed text. We also found that unauthorized borrowing is less prevalent at research-oriented institutions supporting global ethical standards. Our findings suggest that it might be misleading to measure the prevalence of academic misconduct on the academic periphery without paying attention to variations at the disciplinary level.

Key words: Academic plagiarism, academic misconduct, academic culture

1. Introduction

Recently, there has been renewed interest in academic misconduct as a result of switching attention from clearly forbidden forms (e.g., fabrication, falsification, and plagiarism) to questionable research practices (Biagioli et al., 2019). Researchers have documented how universities manipulate figures to improve their positions in international rankings (Espeland and Sauder, 2007), publishers launch predatory journals ready to publish virtually all submissions (Bagues et al., 2019), and individuals resort to gaming strategies like text-recycling (Horbach and Halffman, 2019) and self-citations (Seeber et al., 2019) to enhance their chances for promotion. Research on less severe forms of gaming has produced a shift from descriptive studies conducted by social scientists concerned with such misbehavior in their communities (Biagioli et al., 2019) to the development of explanatory

frameworks. As such, studies reveal the fruitfulness of employing different theoretical perspectives from organizational science (Berggren and Karabag, 2019; Hall and Martin, 2019; Walsh et al., 2019), game theory (Gall and Maniadis, 2019), and sociology (Hussinger and Pellens, 2019) to understand academic misconduct. These new theoretical accomplishments provide us with tools to refocus on studying severe forms of academic misconduct, including, particularly, plagiarism.

Why do academics engage in misconduct? In studying the causes, researchers have embraced not only individual but also systematic factors—among them, organizational influence has been of primary concern (Walsh et al., 2019). Although extensive research has been carried out on systematic causes (Bonn and Pinxtern, 2019), less attention has been paid to the variation in academic pathologies between research fields as most empirical studies focus on one particular discipline. Hence, relatively little is known about how the rate of plagiarism varies across different disciplines, especially in non-Western academia. We propose that discipline is only one of several systematic factors that might contribute to the presence of academic misbehavior. Because few writers have empirically presented the variation in academic misconduct between disciplines, the role of disciplines has not been considered. We suggest a neo-institutional approach to conceptualize the differences in academic plagiarism at the disciplinary level.

From a theoretical standpoint, we follow Honig and Bedi (2012), who have suggested that neo-institutional theory may support a hypothesis that predicts where and when the norm of textual originality may be less espoused by academics. Recent developments in the world society perspective show that global pressure to choose legitimate standards results only in a partial convergence due to strong local traditions and institutional memory (Dobbins and Knill, 2009; Hütther and Krücken, 2016; Paradeise and Thoenig, 2013; Stage, 2020). Applied to science, the center–periphery model demonstrates how the choice of legitimate research questions, theories, and methods are determined by national localities and institutional arrangements (Abend, 2006; Vanderstraeten and Koch, 2018). We develop the center–periphery perspective further in relation to scientific ethos, suggesting that on the academic periphery, the norm of textual originality has not been supported equally across different research fields. Plagiarism especially would be evident for less globalized disciplines since their researchers are less committed to a scientific ethos. This may result from a lack of proper socialization and enforcement actions compared with more globalized academic fields. Our focus on plagiarism in doctoral dissertations provides the opportunity to answer the following question: What level of plagiarism can be observed in texts by Russian scholars that will not be peer-reviewed externally in countries where the norm of originality is prized most highly?

Our purpose is to examine the level of plagiarism by Russian scientists empirically and to show the role of academic disciplines in addition to individual and organizational factors. Our study contributes

to the existing literature on plagiarism that addresses the systemic factors of academic misconduct. While most research is conducted on Western countries, such as the US, UK, Australia, and Canada (Bonn and Pinxtern, 2019), we collected data from the academic periphery. Switching focus from Western countries to the academic periphery allows us to demonstrate the relative character of scientific ethos. Specifically, we hypothesize that non-Western academics might have alternative views on academic misconduct. Previous studies of the academic periphery have revealed that the level of plagiarism in academia is higher when compared with Western countries (Davis, 2003; Hodges et al., 2017; Lewellyn et al., 2017; Thomas and Bruin, 2015; Vrana, 2018). These findings confirm Clark's (1986) statement that an attachment to a global standard without borders is less evident in non-European and non-North American contexts. However, the focus on nation hides the variations that might exist at the disciplinary level. The academic periphery is a label that includes all national disciplines even if they differ in their attachment to global standards, norms, and practices. In this paper, we not only examine plagiarism across a range of different disciplines but also implement a neo-institutional approach to conceptualize the differences in academic plagiarism at the disciplinary level.

From an empirical and methodological perspective, our contribution is the first representative study of academic plagiarism in Russia to use undirected methods in data collection. In fact, much of what has been written about plagiarism is based on direct methods when respondents are asked whether they have known colleagues who engaged in plagiarism, or editors could be asked whether they have uncovered plagiarism among submitted papers. However, the sensitivity of the topic is a critical limitation in self-reported evidence regarding misconduct (Biagioli et al. 2019). As an alternative, measuring unethical behavior by analyzing publications has the potential to overcome this limitation. However, systematic empirical research based on the direct detection of plagiarism is still rare (Bonn and Pinxtern, 2019). The employed data collection strategy is an essential contribution because empirical research based on the direct detection of plagiarism in the entire population of scientists in a given country is rare (Bonn and Pinxtern, 2019).

This paper proceeds as follows. In Section 2, we review the literature on the prevalence of academic plagiarism and develop hypotheses that emphasize discipline variance in the rate of plagiarism. Next, we present the data and methods, followed by an empirical analysis. In conclusion, we discuss the main findings and their implications for future research.

2. Academic plagiarism

2.1. *Prevalence and systematic variation*

Merton has argued that academia is characterized by the norms of originality and communality, obliging scientists to place their research in the public domain (Merton, 1973). Merton also emphasized the symbolic function of citations, suggesting that “they maintain intellectual traditions and provide the peer recognition required for the effective working of science as a social activity” (Merton, 1988, p.621). Following Merton, Biagioli stated that by publishing, a scientist places their claims in the public domain and receives professional recognition in return, first by adding the publication to their curriculum vitae and, second, by receiving citations from peers (Biagioli, 2012). From this point, copying other’s texts verbatim is a violation of intellectual property rights that jeopardizes institutions of science, which consider intellectual property to be a core element.

How often do researchers plagiarize each other’s work? Empirical research on plagiarism does not dominate the field of academic integrity: a systematic review of all publications that appeared between 2005 and 2015 demonstrates that only one-third were based on empirical work (Bonn and Pinxtern, 2019). One strategy researchers have used to track misconduct is to rely on self-reported or “observed” misconduct (Enders and Hoover, 2006) when respondents asked whether they have plagiarized others or have known colleagues who engaged in plagiarism. Additionally, editors could be asked whether they have faced plagiarism among submitted papers. Pupovac and Fanelli (2015), in their meta-analysis of such surveys, found that, on average, 2% of respondents admitted to having committed plagiarism at least once, while almost 30% of respondents admitted to knowing at least one colleague engaged in plagiarism. Martinson et al. (2005) surveyed several thousand scientists and asked them to report their own behavior. For plagiarism, the reported frequencies were under 2%. These data correspond to results about committed or observed violations of academic norms regarding the fabrication or falsification of research (Fanelli, 2009).

Research on the causes of academic misconduct includes individual and systemic explanations that more recently have emphasized national and organizational variations. A recent review showed that almost half of the papers examined systemic factors in misconduct (Bonn and Pinxtern, 2019). On an individual level, young researchers who have spent less time in an academic environment are believed not to have fully internalized the scientific ethos (Fanelli et al., 2015). Honig and Bedi (2012) analyzed all papers presented at the annual meeting of the Academy of Management and found that young researchers are more involved in plagiarism. On the country level, the incidence of plagiarism is higher in the academic periphery (Davis, 2003; Hodges et al., 2017; Lewellyn et al., 2017). Thus, in his 2017 survey, Vrana (2018) demonstrated that plagiarized submissions were the second most significant problem experienced by Croatian editors. According to a survey of health researchers from low- and

middle-income countries, only 2% indicated that they had translated text without proper references, but 37% of respondents indicated that they knew of someone who had (Rohwer et al., 2017).

However, the country level hides the variance within the national academic community; consequently, we focus on discipline as a potential source of influence at the country level. For example, research on the norm of information sharing in the field of genetics demonstrated that the influence of social norms operates at the level of reference groups embedded within professions and disciplines (Haas and Park, 2010). However, the empirical evidence suggesting the discipline differences of academic misconduct is mixed. Hesselmann et al. (2017), in a review of the literature on retracted journal articles, reported that medicine, chemistry, life sciences, and multidisciplinary studies are among the fields with the highest level of retractions; however, additional studies found no disciplinary differences. An analysis of 600 journal articles by Turnitin revealed that the articles from STEM tend to have a significantly higher mean originality score when compared with social sciences (Sun, 2013). Hodges et al. (2017) found that the primary offenders worked in the disciplines of history, philosophy, and sociology, but these numbers should be treated with caution due to the limited number of plagiarized texts surveyed.

It is important to emphasize that in most research on academic pathologies, variations between research fields have not been conceptualized (Horbach and Halffman, 2019, serves as a critical exception). We suggest implementing a neo-institutional approach to conceptualize the differences in academic plagiarism at the disciplinary level.

2.2. Global versus local science in explaining plagiarism

In our main line of argument, we follow Honig and Bedi (2012), suggesting that neo-institutional theory may assist in predicting in which context the norm of textual originality may be less prevalent and, consequently, the incidence of plagiarism may be most significant. The authors studied management as an example discipline that was developed in North America and only later spread to Europe, Asia, Latin America, and Africa. Honig and Bedi (2012) found a link between non-core country and plagiarism, confirming that norms and practices may only be partially reproduced on the periphery. The starting point is the assumption that textual originality on the academic periphery has not been adopted universally across research fields. We further suggest that plagiarism especially would be evident for less globalized disciplines since the commitment to scientific ethos requires time and effort to conform to standards. The local embeddedness of academic disciplines prevents them from absorbing a scientific ethos, which was not immediately adopted in correlation with the opening of borders with the West.

The predominant Western publication standard (Honig and Bedi, 2012) is peer-reviewed scholarship, which is considered the primary task of faculty. For our line of argument, it is essential to emphasize that the core publication standard is a *peer-reviewed* publication. From the start of peer review, this

procedure was perceived as the primary mechanism of gatekeeping through which new knowledge is added to the academic landscape (Crane, 1967), but only recently, researchers have shed light on the role of peer review as an instrument that profoundly affects academic scholarship. Thus, in physics, the usage of external reviews might be the reason behind the citation peak in the period from 1955 to 1965, when articles started to receive a significant number of citations. Editors began to invite reviewers who might point to the literature on the topic and, as a result, authors began to think in advance what list of references should be included in their articles, leading to more numerous citations (Sinatra et al., 2015). In the social sciences, peer-review has contributed to profound changes in the theoretical frame of a paper (Strang and Siler, 2015). Reviewers also influence academic standards related to the style of writing, resulting in the “gradual disappearance of style, imagination, and surprise from academic journals” (Alvesson and Gabriel, 2013, p.246). As enforcers of ethical standards, reviewers and editors are expected to provide an editorial process capable of revealing blatant forms of misconduct, including plagiarism (Horbach and Halfman, 2019).

Keeping in mind the world society perspective, we suggest that the standard of a peer-reviewed publication is widely diffused on the academic periphery. This perspective suggests that nation-states are embedded in and influenced by a wider world through the employ of legitimate models (Meyer and Rowan, 1977; Ramirez, 2012). Drori and Moon (2006) cited the collapse of the Soviet bloc as an example of the reorientation of science from the style dominated by the constraints of communist ideology toward the Western core (Dezhina and Graham, 1999). Bodine also related isomorphism with weak states, which often lack the ability to ensure the stability and continuity of institutional life; as a result, individuals look elsewhere for legitimate models to replace the dominant institutional rules and procedures established in a previous era. At the same time, the empirical evidence suggests that, contrary to the thesis of convergence, global models are pragmatically transformed—resulting in dissimilar practices (Hüther and Krücken, 2016; Paradeise and Thoenig, 2013; Stage, 2020). In regard to the academic world, some researchers have claimed that national university systems differ so much historically that they will continue to follow different pathways (Stage, 2010). The concept of “science styles” was developed to acknowledge that different countries have unique patterns of science development (Drori and Moon, 2006; Drori et al., 2003). Drori and Moon (2006) pointed out that, due to country differences in the intensity of scientific work, the level of government commitment and available resources might contribute to divergent tendencies from the global trend.

Neo-institutional theory has focused on organizations, though it is possible to apply this logic to academic disciplines as well. By switching from the level of universities to the level of disciplines, we rely on the classic assumption of Burton Clark (1986) that academic activities are divided by discipline and enterprise. He assumed that “discipline rather than institution tends to become the dominant force in the working lives of academics” (Clark, 1986, p.30). Disciplines are influenced by both convergence

tendencies, since they extend the borders of national systems, and divergence, since they are located in different national and organizational contexts: “Faculty members also specialize within disciplines, teaching specific subjects not shared with many, if any, local colleagues but rather with scholars elsewhere at home and abroad” (Clark, 1986, p.29). This classifies a particular discipline as a nested field, meaning that disciplines as well as organizations are not only embedded in one field but also others, including national and global fields (Hüther and Krücken, 2016).

We propose that nested fields let us understand how global academic standards, including ethical ones, exist on the academic periphery. As Clark (1986) has stated, the attachment to a borderless global standard is less evident for developing countries. The context of the periphery makes the academic center a significant source of influence; however, it is not uniform for all research fields. The center–periphery model was first developed by Shils (1975), who presented the concepts “metropolis” and “province” for academic disciplines at the international level. Üsdiken (2014) reviewed how this concept was further developed within the higher education literature and pointed out several related concepts such as “world knowledge system”, “scientific world system”, “world-system analysis”, and the international “division of labor” between the center and periphery. The common idea among these works is that the center serves as a focus of attention and a source of influence for the periphery regarding research agendas and the theories and methods that are employed. The center affects the periphery both through imitation and resistance (Üsdiken, 2014).

Using an extensive bibliographic database, Mosbah-Natanson and Gingras (2013) examined the social sciences worldwide over a 30-year period to document the center–periphery effect on the production of papers, international collaboration, and citation patterns. They found that North America and Europe account for close to 90% of the global production in the social sciences and humanities. The important obstacle for globalized social sciences is not even linguistic differences that hinder authors from publishing in English, but national traditions and the historical legacy of discipline institutionalization. This means that the role between center and periphery is especially problematic for social sciences and humanities. Indeed, we consider the phrase “Uruguayan physics,” referring to oxymoronic theories and laws (Abend, 2006), while referring to French or German sociology is relatively standard. Researchers have also demonstrated that the selection of research questions, theories, and methods is conditioned by traditions, ideologies, and institutional arrangements (Abend, 2006; Vanderstraeten and Koch, 2018). Abend empirically studied U.S. and Mexican communities of sociologists and found fundamental differences in the criteria through which “they discriminate between true and false claims, their definition of what constitutes knowledge, their understanding of what an acceptable theory should look like” (Abend, 2006, p.2). In general, Mexican sociologists do not rely on empirical data in the development of theories describing the social world.

The recent trend of internationalization in the social sciences has reinvented the debate on the integration of local communities in global science. Some countries fully absorb the necessity to publish in international outlets. Thus, Finnish sociologists (Hokka, 2018) consider writing in their local language as lacking real academic value since only articles in international peer-reviewed journals meet academic standards. Other communities have divided attitudes towards globalization. For example, in Chile, there are two segments: the segment with a global orientation, with English as its language of publication; and the local segment, with a regional or continental orientation to the Spanish-speaking academic community (Vanderstraeten and Koch, 2018). Gantman and Fernandez (2016) examined what differences exist in articles published in two segments of Spanish-speaking countries in management and organizational studies and found these segments are separated from each other with their own resources, channels of publications, and patterns of esteem. More often than not, authors have to write an entirely new paper using the same data to get through the peer-review process in international journals (López and Hicks, 2014). This international path might lead to the “suppression of certain research styles and the abandoning of important roles sociologists could play in their societies” (Sokolov, 2018, p.5).

Post-Soviet sociology is another example of a discipline divided between “those who identify themselves with international and global science with those who are oriented towards predominantly local debates and audiences” (Sokolov, 2018, p.5). At the time of communist governments, publishing in international journals was virtually nonexistent, especially in the sphere of social sciences and humanities. Following the collapse of the Soviet Union, the policy has changed to increase the number of scientific publications. Western foundations supported the creation of a “global” sociology—they distributed research grants and scholarships, gave money for academic travel, and provided institutional support for Western-style private research centers and universities that espoused an opposite mission than the older public institutions (Sokolov, 2018). However, academic groups oriented toward local traditions are still powerful. They are a result of the rebranding of departments responsible for teaching historical and dialectical materialism, scientific Communism, and the political economy of socialism. Thus, the niche for local variants of the social sciences was created that operates in parallel to those based upon “Western” values.

We propose that socialization in terms of a scientific ethos would be different for those who engage in the international community and those who prefer to stay local and eschew publishing internationally. While enthusiasts might assert the necessity of following global standards, other local groups might implement their own norms and practices as they are able to maintain their resource base. Thus, we propose the first hypothesis.

H1: The incidence of plagiarism will be higher in less internationalized disciplines than those from more globalized scientific fields.

We further suggest that researchers from less globalized disciplines might have alternative views on academic misconduct. Our suggestion is rooted in constructivist theories of culture and science (see Becker, 1982, on cultural conventions in art; Gieryn, 1983, on boundary-drawing in science; and Biagioli and Galison, 2003), according to which the description of certain practices as deviant is largely arbitrary. The norm of textual authenticity requires any academic text to be completely original, with every word written from beginning to end by the author or authors listed on the title page. However, the definition “written from the first to the last word” is ambiguous. It is possible that plagiarism might be perceived as a culturally appropriate practice, so it is crucial to keep in mind the existence of different perspectives on academic misconduct (Clarke, 2006).

Contrary to the universalistic view of scientific values, Biagioli (2012) emphasized the relational character of academic misconduct—what is considered plagiarism in one situation might not be perceived as a violation of norms in another situation. Authors might argue that the production of substantive results is more important than the authenticity of the entire text and that borrowing certain parts (literature reviews or methodology) does not diminish the originality of the research results: “Copying [words] creates a witness to a crime, but is not necessarily crime itself” (Bouville, 2008, p.317). Researchers have provided some evidence that academics might have different views on the norm of text originality. According to a study conducted by Enders and Hoover (2006), approximately 80% consider unattributed sentences plagiarism; however, 2.8% defined it as “not at all” plagiarism, and 16.6% marked it “not likely.” Their view on the local embeddedness of social norms is consistent with ethnographic studies in the sociology of science that focus on the everyday practices through which local groups adapt global professional norms (Haas and Park, 2010).

We suggest that scholarly communities differ in how they draw a boundary between appropriate and deviant behavior. It is possible to hypothesize that the degree of contact with Western academia and its normative standards leads to a standard view on misconduct, while researchers from local communities have more arbitrary views. We propose to measure the arbitrariness of following the norm of originality through the measure of dispersion of plagiarized text. In this regard, researchers from less globalized disciplines might have rationalizations that keep them from strictly following the norm. As a result, in such disciplines, we will observe less dispersion since many dissertations contain some plagiarized text, and it is not considered as a big deal. Contrary to local disciplines, in internationalized research fields, authors are aware of ethical standards, which they choose to follow or contravene. So we should observe more dispersion in plagiarism distribution as such disciplines are characterized by researchers who do not borrow unauthorized texts or borrow considerable amounts.

H2: The less globalized the discipline, the less dispersion in plagiarized text we will observe.

While the main focus of the paper is variance at the disciplinary level, we recognize that other structural factors might be relevant. We further suggest including organization-oriented factors to bring attention to the idea that misconduct emerges as a result of organizational or institutional incentives (Greve et al., 2010). Following Greve et al. (2010), we propose that less unauthorized borrowing is expected at institutions that possess a concentration of the top researchers in their field. First, those institutions enjoy stronger faculty members and likely more effective oversight, and they have more to lose (Greve et al., 2010, p.64). On the other hand, research institutions support “publish-or-perish” pressure that might stimulate authors to cut corners to satisfy increased requirements (Davis et al., 2007; Fanelli et al., 2018; Warren, 2018). The latter hypothesis was tested empirically, demonstrating that only blatant cash incentives influence the risk of scientific misconduct (Fanelli et al., 2015, 2018). Thus, we hypothesize that universities engaged in global competition should demonstrate a convergence with the model of world-class universities, including supporting global standards in their academic ethos. Based on this line of research, we propose:

H3: The incidence of plagiarism will be less evident for scholars whose defense was held at research-oriented organizations.

3. Data and methods

3.1. Sample

We focus on plagiarism in doctoral dissertations (a higher degree that may be awarded after receiving the Candidate of Sciences). In Russian context, before submitting a dissertation for a doctoral degree, a scientist has to publish at least 15 journal papers in social science and humanities discipline and at least ten papers in other sciences. Our data were constructed in the following steps. First, we retrieved the list of all doctorate degrees (27,735) awarded in Russia between 2005 and 2015 from the official site of the national state agency responsible for overseeing academic degrees. Then we randomly selected 2,600 doctoral dissertations from the pool of all dissertations defended to be searched for available text. We found 2,468 texts of dissertations, which is 8.9% of all dissertations defended at that time. As a final step, we tested if missing dissertations were related to a specific discipline or the year of defense and did not find any statistically significant results. For further analysis, we excluded a small number of dissertations that were awarded in cultural studies and art history as their number was too low for any reliable analysis. The final sample contains 2,405 dissertations.

3.2. Variables

3.2.1. Dependent variable

We used Russian plagiarism detection software (“Antiplagiat”), a tool allowing for the comparison of selected texts with extensive text collections, particularly dissertations and academic publications. Honig and Bedi (2012), reviewing different definitions of plagiarism, concluded that there is no agreement on its conceptualization. In our research, we treat plagiarism of any part of a text equally; however, some scientists might consider giving some texts greater value. We followed Horbach and Halfman (2019) and decided to use the percentage of borrowed text as the dependent variable. Figure 1 presents the overall distribution of borrowed text for all dissertations in our final sample. Looking at the overall shape of the distributions (Figure 1), we conclude that the incorrect borrowing is universal, but cases of entire copy-paste works are rare.

Fig. 1. Distribution of borrowed text.

3.2.2. Globalization of academic disciplines

For the analysis of our hypotheses, we relied on Scopus and the Russian Index of Science Citations (RISC) to collect data on the level of internationalization of academic disciplines. RISC, launched in 2005, is integrated with a full-text platform, the Scientific Electronic Library, which indexes more periodicals than RISC (Moskaleva et al., 2018). Reliance on a national source of bibliometric data is

critical given that we study the non-Western higher education system, where the research is not always indexed by Web of Science or Scopus (Mongeon and Paul-Hus, 2016; Paasi, 2005).

From different strategies to measure the globalization of academic disciplines, we chose to calculate the share of publications indexed in the global citation database in the overall output of academic disciplines. To calculate the number of publications produced in the global context, we queried Scopus for articles written in English with Russian affiliation in 2018 that correspond to academic disciplines in Russia (we grouped subject areas when needed and also used sub-subject areas to meet this condition). As for the number of publications produced in the local context, we relied on RISC, which covers the output of Russian journals, grouped by academic disciplines. We queried publications in Russian journals written in Russian in 2018. We limited our search to 2018, as earlier coverage of publications is known to be of less satisfying quality. Globalization was calculated as:

$$globalization_i = \frac{n_i^{Scopus}}{n_i^{Scopus} + n_i^{RISC}} \cdot 100\% , \quad i = \overline{1, m} , \quad (1)$$

where m is the number of disciplines (in our case, we considered 16), n_i^{Scopus} is the number of publications in Scopus i -th discipline, and n_i^{RISC} is the number of publications in RISC i -th discipline.

We calculated the value of globalization as highest for physics and math, with 45.5%, and lowest for the legal field, with only 0.2% (Table 1). The ordering of the academic disciplines by globalization can be considered as supporting the divide between the natural and social sciences.

Table 1. Globalization by disciplines

Discipline	Globalization, %
physics and math	45.54
chemistry	29.32
biology	13.22
earth science	11.48
technical	9.75
agriculture	4.79
medicine	2.71
economics	1.82
philosophy	1.59
psychology	1.11
history	1.08
sociology	0.89

political science	0.89
pedagogy	0.58
philology	0.51
law	0.21

3.2.3. Organization type

Further, we collected information on the type of institution where the defense was held. Less unauthorized borrowing is expected at institutions such as the Academy of Sciences and research universities, including participants of the Russian Excellence Program “Project 5-100.” Historically, research has been concentrated at the Academy of Sciences and not in universities (Froumin and Lisyutkin, 2018). Project 5–100 was launched in 2012 to improve the international competitiveness of a handful of Russian universities. As such, universities were encouraged by financial incentives to implement the model of a world-class research university. Consequently, we coded them as research-oriented “strong” organizations and others as “weak.” There are 26.9% dissertations in our sample that were defended at strong organizations (Table 2).

3.2.4. Controls

It is also proposed that gender might be a relevant factor since “males are more prone to taking risks and are more status-oriented than females, and might therefore be more likely to engage in scientific misconduct” (Fanelli et al., 2018). Honig and Bedi (2012, p.103) tested a hypothesis on gender differences that is based on the sex-role socialization theory, “which argues that women are more socialized to obey rules and regulations and are, therefore, less likely to engage in dishonest behaviors.” Gender was coded as a binary variable based on family names, which vary according to gender in the Russian language.

We also included the defense year of a dissertation as, over the years, greater attention has been drawn by several scandals in relation to the plagiarized works of high-ranking figures in politics (Kassian and Melikhova, 2019). Some reformation of the system has occurred during a ten-year span in regards to the process of obtaining the doctoral degree, making it more difficult to falsify works and raising the quality of defended theses as guiding principles. Defense year varies between 2007 and 2015.

Table 2 presents the demographics of doctorate holders in our sample. There are more male authors (55.3%) than female ones. More than half of dissertations were defended at universities (59.4%); other organizations have a roughly equal number of defenses. Concerning the distribution of dissertations by defense year, the lowest numbers appear in 2007 and 2015, as can be expected from statistics at the endpoints of the time interval.

3.3. *Methods*

Values of our dependent variable can be expressed as bounded by the interval (0,1). We considered several regression models, which are generally the appropriate choice for proportional data. Our selection suggested that the CDF-quantile model best describes the data, as it out-performed the other ones such as beta and fractional models. This model has additional properties compared to alternatives as it not only distinguishes the effect median difference but also the effect of independent variables on dependent variables in terms of the variability of values, as it has two submodels (location and dispersion). There is a relation between pairs of these distributions. These pairs are “quantile-duals” of one another in the sense that one’s CDF is the other’s quantile, with the appropriate parameterization. Separate submodels may be specified for the location and dispersion parameters, with different or overlapping sets of predictors in each (Smithson et al., 2017).

We present the general equation for the CDF-quantile regression model for random variables on the (0,1) interval (Smithson et al., 2017). Consider a random sample of N independent observations from $(Y, \mathbf{V})$, where Y is a random variable and $\mathbf{V}$ is a vector of predictors. A model for the distribution of Y , conditional on $\mathbf{V}$, has two submodels: the “location submodel” and the “dispersion submodel.” The location submodel has a vector $\mathbf{W}$ of predictors selected from $\mathbf{V}$, and the dispersion model has another vector of predictors $\mathbf{Z}$ of predictors selected from $\mathbf{V}$. The sets of predictors in $\mathbf{W}$ and $\mathbf{Z}$ may not overlap. For the i -th observation, these submodels may be written as:

$$\begin{aligned} L_{\mu}(\hat{\mu}_i) &= \mathbf{w}_i^T \boldsymbol{\beta} \\ L_{\sigma}(\hat{\sigma}_i) &= \mathbf{z}_i^T \boldsymbol{\delta} \end{aligned}, i = \overline{1, N} . \quad (2)$$

For submodels in the CDF-quantile regression, different families of fitted distributions may be chosen. There are no clear criteria for the selection process, but based on the log-likelihood measure, our choice fell on T2-T2 distributions.

Table 2. Summary statistics for variables of interest

Variables	Values	Frequency, N	Percentage, %	% borrowed text				
				Min	Mean	Median	Max	Std. deviation
Gender	Male	1,331	55.3	0.5	19.32	14.18	91.83	16.8
	Female	1,074	44.7	1.39	19.3	14.18	94.38	15.17
Defense year	2007	66	2.7	1.39	20.11	17.16	89.09	15.8
	2008	327	13.6	1.98	19.47	14.28	74.03	15.84
	2009	533	22.2	0.5	20.04	14.03	88.79	17.2
	2010	307	12.8	0.64	20.03	14.93	81.07	16.62
	2011	367	15.3	0.76	19.98	14.35	84.51	17.12
	2012	246	10.2	1.29	20.1	16.03	89.25	15.48
	2013	184	7.6	2.01	19.43	15.61	94.38	15.48
	2014	249	10.3	1.58	17.43	13.47	80.7	13.87
	2015	126	5.2	0.92	13.7	9.59	91.83	12.4
Organization type	strong	648	26.9	0.5	15.14	10.16	89.09	14.03
	weak	1,757	73.1	0.69	20.85	16.16	94.38	16.53
Discipline	agriculture	93	3.9	3.01	31.16	29.12	84.51	18.84
	biology	121	5.0	1.88	19.23	11.96	80.81	16.46
	chemistry	67	2.8	1.02	25.81	20.68	81.07	19.14
	earth science	56	2.3	0.86	11.66	8.69	57.94	11.17
	economics	435	18.1	2.29	22.99	18.26	85.83	16.75
	history	128	5.3	1.43	14.98	10.29	91.83	14.98
	law	106	4.4	4.53	27.86	25.61	67.61	13.51
	medicine	329	13.7	1.98	19.18	15.16	88.79	13.94

	pedagogy	203	8.4	2.54	20.27	15.27	89.25	15.95
	philology	116	4.8	0.84	9.18	6.86	61.04	8.52
	philosophy	91	3.8	1.92	12.18	8.6	47.86	10.06
	physics and math	164	6.8	0.5	12.55	6.2	94.38	15.33
	political science	40	1.7	3.15	16.06	11.93	45.55	11.02
	psychology	52	2.2	3.89	17.53	12.71	62.89	14.3
	sociology	46	1.9	2.23	14.38	12.24	41.51	9.6
	technical	358	14.9	0.69	19.81	14.38	74.18	17.18
	Total	2,405	100					

4. Results

4.1. Descriptive statistics

As a starting point for our analysis, we turn to the graphical approach to show its key features and better depict the nature of our variables. We illustrate the distributions of plagiarized text by our variables of interest constructed in line with our hypotheses. We employ a visualization technique called the raincloud plot that combines both raw data points (“rain”) and data distributions (“clouds”) presented side by side in one graph. It is a beneficial choice for assessing how data are distributed and checking assumptions (Allen et al., 2019). Due to the nature of our data, the simple comparison of the mean values by groups can be misleading. Using this data visualization approach, we show differences in the percentage of borrowed text for selected variables such as gender, the year of defense, the organization type, and discipline (Figures 2–5).

Our data demonstrate that incorrect borrowing is nearly universally present in Russian dissertations. The average share of detected borrowings was 19.1% (median: 13.9%). Only a quarter of dissertations have a level of plagiarized text less than 7%. At the same time, it is rather unusual to copy the entire text: in the sample of 2,468 dissertations, we found only 41 where borrowing exceeded 50%. Figure 2 illustrates that the distributions of borrowed text for males and females are similar in shape. There are slightly more observations, with more than 75% of borrowed text, for men. Both men and women have a median value of 14.18%; there is no significant difference in variation (the standard deviation is 16.8% for men and 15.17% for women).

Fig. 2. Distribution of borrowed text by gender.

We considered the defense year of the dissertation as another common control variable (Figure 3). The biggest difference in the percentage of borrowed text is for 2005 compared to other years (the median is 9.59%). The Mann-Kendall Trend Test for median percentage of borrowed text showed $\tau = -0.333$, 2-sided $p\text{-value} = 0.25$. Because this $p\text{-value}$ is more than 0.05, the null hypothesis of the test is not rejected, and we concluded that a trend is not present in the data.

Fig. 3. Distribution of borrowed text by year.

Regarding the influence of organizational type on the percentage of the detected plagiarized text, we can distinguish between weaker and stronger organizations (Figure 4). The difference in median values is around 6% less borrowed text at stronger organizations. The distribution for “strong” organizations is less spread out and has a higher peak. There is some evidence for the effect on borrowed text by organization type where the dissertation was defended.

Fig. 4. Distribution of borrowed text by organization type.

Finally, we show how academic discipline affects the distribution of borrowed text (Figure 5). The highest median percentage of borrowed text is in agricultural dissertations (29.12%), legal sciences (25.6%), and chemical sciences (20.8%). The lowest is in physics and math (6.2%), philology (6.9%), and philosophy (8.4%). These results confirm the observation made on the study of text-recycling in four research areas. Horbach and Hoffman found that humanities are disciplines for which the wording is the essence of the novelty (2019). We found that in the social sciences, the incidence of plagiarism is evident for economics, pedagogy, psychology, and political science.

Fig. 5. Distribution of borrowed text by discipline, ordered by median percentage of borrowed text.

As our primary variable of interest is globalization, we engaged in a closer investigation of the relationship between globalization and the percentage of borrowed text (Figure 6). Physics and math stand out as having the highest level of globalization and the lowest median value for borrowed text. Dissertations in chemistry have a higher median percentage compared to other natural disciplines, which are more globalized than the social sciences. Other disciplines that more closely follow the pattern of higher globalization are associated with a lower percentage of borrowed text.

Fig. 6. Median % of borrowed text by globalization of discipline.

4.2. Regression models

We modified Eq. (2) with respect to our tested hypotheses. The model descriptions and the regression results are presented below.

4.2.1. Control model

This model includes only control variables in the location submodel, and the dispersion submodel is the null model, i.e., the intercept-only model (specified in Eq. 3):

$$\begin{aligned}\hat{\mu}_i &= \beta_0 + \beta_1 \text{gender}_i + \beta_2 \text{defense_year}_i \\ \log(\hat{\sigma}_i) &= \delta_0\end{aligned}\quad (3)$$

There is no statistically significant difference between the median for men and women in the percentage of plagiarized text (Table 3). In regard to the defense year, there is a statistically significant difference between theses in 2015 compared to 2007.

4.2.2. Globalization model

This model includes control variables and globalization as our variable of interest in the location submodel and globalization in the dispersion submodel (specified in Eq. 4):

$$\begin{aligned}\hat{\mu}_i &= \beta_0 + \beta_1 \text{gender}_i + \beta_2 \text{defense_year}_i + \beta_3 \text{globalization}_i \\ \log(\hat{\sigma}_i) &= \delta_0 + \delta_1 \text{globalization}_i\end{aligned}\quad (4)$$

Increasing the level of globalization lowers the percentage of borrowed text with a negative coefficient in the location submodel (estimated coefficient = -0.4207, $p < .001$, which is the median difference) and with a positive coefficient (estimated coefficient = 1.331, $p < .001$) in the dispersion submodel. It implies that with higher values of globalization, there is a higher spread among the quantiles for the percentage of borrowed text. Regarding the control variables, they have similar effects as the control model.

4.2.3. Organization model

This model includes control variables and organization type as our variable of interest in the location submodel, and the dispersion submodel is the null model (specified in Eq. 5):

$$\begin{aligned}\hat{\mu}_i &= \beta_0 + \beta_1 gender_i + \beta_2 defense_year_i + \beta_3 organization_type_i \\ \log(\hat{\sigma}_i) &= \delta_0\end{aligned}\quad (5)$$

There is a statistically significant difference between strong and weak organizations. The median value is lower by 0.533 for research-oriented organizations.

4.2.4. Full model

The full model includes control variables and both the globalization and the organization type in the location submodel and globalization in the dispersion submodel (specified in Eq. 6):

$$\begin{aligned}\hat{\mu}_i &= \beta_0 + \beta_1 gender_i + \beta_2 defense_year_i + \beta_3 organization_type_i + \beta_4 globalization_i \\ \log(\hat{\sigma}_i) &= \delta_0 + \delta_1 globalization_i\end{aligned}\quad (6)$$

The higher the level of globalization, the lower the percentage of borrowed text (estimated coefficient = -0.990, $p < .001$). A higher value of globalization is associated with higher variability in the percentage of borrowed text (estimated coefficient = 1.378, $p < .001$). The effect of control variables is similar in significance levels, size, and direction to previously described separate models.

Table 3. CDF-quantile regression models

	Control	Globalization	Organization	Full
<i>Location submodels</i>				
intercept	-1.265 (0.124)***	-1.251 (0.118)***	-1.725 (0.131)***	-1.671 (0.126)***
2008	-0.183 (0.138)	-0.129 (0.133)	-0.137 (0.136)	-0.100 (0.130)
2009	-0.158 (0.132)	-0.125 (0.126)	-0.136 (0.130)	-0.117 (0.124)
2010	-0.078 (0.139)	-0.055 (0.134)	-0.045 (0.137)	-0.021 (0.131)
2011	-0.179 (0.137)	-0.146 (0.132)	-0.123 (0.136)	-0.099 (0.129)
2012	-0.035 (0.139)	-0.013 (0.134)	-0.032 (0.137)	-0.008 (0.131)
2013	-0.124 (0.146)	-0.097 (0.140)	-0.109 (0.143)	-0.085 (0.136)

	Control	Globalization	Organization	Full
<i>Location submodels</i>				
2014	-0.255 (0.139)	-0.203 (0.134)	-0.238 (0.137)	-0.207 (0.131)
2015	-0.616 (0.152)***	-0.607 (0.148)***	-0.560 (0.152)***	-0.564 (0.147)***
male	-0.023 (0.046)	0.062 (0.046)	0.043 (0.045)	0.094 (0.045)*
globalization		-1.598 (0.282)***		-0.990 (0.286)***
weak			0.533 (0.052)***	0.469 (0.053)***
<i>Dispersion submodels</i>				
intercept	-0.179 (0.021)***	-0.288 (0.025)***	-0.207 (0.022)***	-0.314 (0.026)***
globalization		1.331 (0.184)***		1.378 (0.184)***
num. obs.	2,405	2,405	2,405	2,405
log likelihood	1591.150	1641.756	1641.843	1679.258

Note: Baseline categories are 2007 for defense year, strong for organization type, Female for gender.

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

To summarize the results, regarding the controls, there is no statistically significant difference between men and women in the percentage of plagiarized text. In relation to defense year, the only statistically significant difference is between 2015 theses compared to 2007, but we cannot assume a slowing trend in the percentage plagiarized over the years. As we expected, there is a statistically significant difference between weak and strong organizations. Theses associated with research universities and the Russian Academy of Science have, on average, fewer plagiarized texts (compared to median values). Finally, our hypotheses H1–H3 are not rejected based on our regression analysis results.

5. Discussion and conclusion

Our purpose was to examine the level of plagiarism in Russian science empirically and to identify its causes. To the best of our knowledge, ours is the first study of academic plagiarism conducted on an unbiased sample of non-English dissertations analyzed through an online plagiarism detection service. The results suggest that the rate of incorrect borrowing is substantial among Russian degree holders. With an average share of detected borrowings of over 19%, the incidence of plagiarism on the academic periphery is remarkably higher than in Western countries (Hodges et al., 2017).

This study was designed to determine the role of academic disciplines in addition to individual and organizational factors relevant for explaining the rate of plagiarism. The empirical results showed

remarkable variation across disciplines: while the incidence of incorrect borrowing is relatively low in physics, earth science, and humanities, scientists from social sciences, chemistry, and applied fields have engaged in plagiarism more regularly. We proposed that socialization with a scientific ethos would be different for those who engaged in the international community in comparison to those who preferred to stay local. We measured the globalization of academic disciplines by calculating the share of publications indexed in the global citation database in the overall output of academic disciplines. In general, disciplines closely follow the pattern: a higher level of globalization is associated with a lower percentage of borrowed text (with chemistry as an exemption, which expresses an unexpected pattern of a globalized field with a high level of borrowed text). Even after running regression models with a number of controls, the effect is significant. We also found that unauthorized borrowing is less prevalent in research-oriented institutions supporting global standards in their academic ethos.

We suggest that further research on structural factors explaining academic misconduct requires special efforts to improve the level of conceptualization of disciplinary variance. Horbach and Haifmann (2019) demonstrated that the extent of text-recycling is associated with differences in publication cultures among scientific disciplines. Seeber et al. (2019) considered the role of disciplinary differences in social structure to explain the incidence of self-citations as an opportunistic response to the use of metrics. However, less attention has been paid to the specifics of disciplinary conventions regarding dominant academic norms. Authors with plagiarized dissertations might not perceive themselves as scientists involved in the blatant disregard of norms. They could rationalize their actions, for example, by borrowing technical parts of the text (descriptions of experiments) or using the work of colleagues to which they have contributed (as when a supervisor writing a doctoral dissertation uses dissertations of candidates of sciences defended under their supervision). In our study, we argue that authors from less internationalized disciplines might not prioritize the norm of complete originality or even have alternative norms. We found that their dissertations contain less dispersion in the amount of plagiarized text, meaning that it is common to borrow some parts of texts from time to time.

Empirically, it might be fruitful to examine whether academic disciplines express different patterns of incorrect text borrowing. Researchers usually use the percentage of borrowed text as the primary dependent variable without any attempts to categorize different types of plagiarism. We suggest that online software provides the opportunity to deepen our understanding of academic plagiarism if we focus on the practice of text borrowing. The relevant research questions include the following: Which parts of text are borrowed more often? Where are they located? How long are they? Do scientists copy substantial sections, or rather segments of small size? We suggest that the remarkable difference between disciplines might be evident regarding the different types of academic plagiarism. It is also possible that dominant rationalizations that scientists use to explain why their behaviors differ from socially accepted patterns are reflected in the dominant practice of text borrowing.

The prevalence of academic misconduct in developing countries is still an underdeveloped topic (Vrana 2018; Zhang 2010); although their output in global science is increasing, national policies on research integrity are still being created. Plagiarism in non-Western countries is usually considered in the context of authors' attempts to publish something in international journals (Biagioli 2012). Struggling with this challenge, they borrow different portions of articles to get through the standard of an Anglophone paper. However, we studied dissertations written in a local language published before the pressure to publish internationally. It seems that plagiarism on the academic periphery is related to more than the desire to cut corners and publish internationally at any cost. The general attitude to the norm of originality might be different, especially in disciplines (social sciences and applied fields) that do not follow the global publication culture. Local conventions to the originality of academic texts exist outside of opposition to the global norm. If we study the academic (semi)periphery only through English-language publications, we lose other explanations why scientists may ignore the global norm of originality.

This study's findings may be limited by a number of factors. The main limitation, as well as the advantage of this study, is relying on secondary sources that provide opportunities to collect more reliable empirical data at a lower cost than surveys. Our focus on doctoral dissertations, not on academic journal publications or books, allows us to avoid the limitation related to differences in disciplinary publication practices. An examination of journal papers, for example, would leave out other relevant publication formats; thus, dissertations help us to study plagiarism across different disciplines. We have to admit that dissertations are the secondary media for publication and spreading ideas in Russian science compared with other publications. It is more common to read and cite papers and books, not dissertations, which are considered a necessary evil to merit promotion at a university. As a result, authors might not put as much effort as they put it into writing academic papers that are widely read by other scientists. We stress, however, that before submitting a dissertation for a doctoral degree, a scientist has to publish at least 15 journal papers in social science and humanities discipline and at least ten papers in other sciences. It means that dissertations are partially based on published texts.

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