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Changes in Scholars' Ways of Knowledge Production Shaped by Systematic Measures¹

Akademisyenlerin Bilgi Üretim Yöntemlerinde Sistemik Ölçülerle Şekillenen Değişimler

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ÖZ

Bu makale, akademik davranışlarda sistemik ölçmenin oynadığı rolü ele almaktadır. Girişimcilik kültürünün akademide ortaya çıkışı, nicel performans ölçümünü gerektiren bireysel liyakat vurgusu yoluyla rekabetçi atmosferleri teşvik etmiştir. Bilgi üretimi akademisyenlerin temel misyonlarından biri olduğu için, bu çalışma, ölçüm araçları, kurumsal yönetim, finansman organları ve devlet politikasını içeren çevresel faktörlerden etkilenen bilgi üretimi biçimleri üzerindeki etkileri ifade etmeyi amaçlamaktadır. Tayvan'daki 41 akademisyenle yapılan mülakatlar vasıtasıyla onların akademik uygulamalara ilişkin anlatılarını keşfe çıkan bu makale, bilgi üretiminin politik atmosfer tarafından nasıl şekillendiğini ampirik olarak analiz etmektedir. Bu değişirici davranış kalıpları; araştırma konularının seçimini, araştırma gündemi tasarımı, hibe başvuruları ve yayınları için strateji oluşturmayı, araştırmanın epistemik özelliklerinde hassas değişiklikleri içerir. Çalışma buradan hareketle, neoliberal çağda araştırmacılar, bilimsel topluluklar ve devlet arasındaki güç ilişkilerini karakterize etmektedir.

ABSTRACT

This paper considers the role played by systematic measuring in academic conducts. The introduction of entrepreneurial culture into academia fosters competitive atmospheres through its emphasis on personal merit, which entails quantitative performance measurement. As knowledge production is one of scholars' core missions, this study aims to articulate impacts on ways of knowledge production influenced by environmental factors, comprising measuring instruments, institutional management, funding bodies and state policy. By interviewing 41 scholars in Taiwan and exploring their accounts of academic practices, this paper empirically analyses how knowledge production has been shaped by policy environments. These modifying behaviour patterns include a selection of research topics, a design for research agenda, strategies for grant applications and publications, engendering delicate changes in the epistemic properties of research. From this, it characterizes power relations between researchers, scientific communities and the state in the neoliberal age.

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Introduction

Globalisation, Academic culture has been confronted by drastic transforms in the age of knowledge-driven economy, and one of these significant changes is the wide use of bibliometric indicators in academics' everyday life. On the one hand, university research is expected to take a more active role in industrial innovation and economic growth (Shore, 2020; Wright, 2016). On the other, the university, as part of the public sector, is under the pressure of transparency and accountability to improve cost-effectiveness in expenditure (Strathern, 2000; Weingart, 2005). As a result, excellence and productivity have become hallmarks in university management and knowledge governance. In the economic language, 'performing institutions should receive more income than lesser performing institutions, which would provide performers with a competitive edge and would stimulate less performing institutions to perform' (Herbst, 2007, p. 90). With this rationale, national performance-based research evaluation systems have been founded for allocating funding, rewards and prestige (Hicks, 2012). This phenomenon is described as marketized, neoliberalised or enterprising university. The tendency aiming to foster competitive atmospheres in academia can be identified in East Asia as well (Shin, Watanabe, Chen, Ho, & Lee, 2020).

A bibliometric indicator is the product of a quantitative calculation system which labels the importance, relevance or value of academic journals or publishers by numbers. When a demand for a universal criterion by which diverse outputs of researchers can be reduced to comparable data appears, bibliometric indicators have been deemed as objective and accountable measures for monitoring and quantifying scholars' efforts and then adopted widely in the performance-based funding system (Hicks, 2012; Weingart, 2005). Nowadays there are three major databases for exercising the bibliometric measure: the Web of Science (WoS), including the Science Citation Index (SCI), the Social Science Citation Index (SSCI) and the Arts and Humanities Citation Index (A&HCI); Scopus, owned by Elsevier; and Google Scholar (GS). All of these cover books, serials and conference papers, but each bibliographic database might have a better coverage than others in different fields (Larsen & Von Ins, 2010; Meho & Yang, 2007). Along these three 'international' databases, some national or local indexes have been developed to cover more journals published in the vernacular, such as the Érudit database in the province of Québec, VABB-SHW index in Flanders, IN-RECS in Spain, Taiwan Social Science Citation Index (TSSCI) in Taiwan.

In general, the exercise of research assessment with bibliometric indicators may lead to similar consequences in scholars' activities across different countries. Firstly, when scholars pay more attention to work on research outputs, it is not surprising that less resources will be allocated to teaching jobs and tutoring students, in opposition to the purpose of education (Back, 2016; Cheng, Jacob, & Yang, 2014). Secondly, the application of bibliometric indicators stimulates researchers to publish in English language journals, even in countries where a national database is utilised; this then increases the position of journal articles among all formats of outputs (Hammarfelt & de Rijcke, 2014; Li & Flowerdew, 2009). Thirdly, the increasing pressure from being evaluated might create a conservative environment where researchers would prefer to conduct a less risky and a shorter term study (Butler, 2007). Fourthly, an emphasis on the numbers of publications may drive researchers to divide their works into a 'minimum publishable unit' so that they are able to maximize the value of publications with the same work (Lawrence, 2003; Weingart, 2005). Finally, along with the growing competition for productivity and publication bias, which refers to the inclination of editing boards towards positive, attractive and novel results, there is an increase in both the rate of misconduct and retraction since the 2000s (Brembs, Button, & Munafò, 2013; D. Fanelli, 2009; Møller & Jennions, 2001; Steen, 2011; Yong, 2012). There has also been a decline in replication studies and negative results (Daniele Fanelli, 2012; Kelly, 2006).

In the past two decades, several academic scandals have taken place in Taiwan, with misconduct and fraud creating considerable negative impacts on Taiwanese prestige in global academic communities. In 2014, the *Journal of Vibration and Control* withdrew 60 articles simultaneously due to a 'fraudulent peer-review ring', comments from which had all been written by the same Taiwanese researcher (Barbash, 2014). In this case, the Minister of Education, who was the co-author of some retracted articles, resigned. In 2016, a significant academic scandal took place at the National Taiwan University, College of Medicine, one of the more prestigious institutes in Taiwan. A research team across several institutes under the College of Medicine was accused of producing fraudulent data, and two papers in *The Journal of Biological Chemistry* and *Nature Cell Biology* were retracted.

Similar tendencies can be observed around the world. For data fabrication, there are numerous famous examples, such as the cases of Haruko Obokata's stem cell research in Japan (Mikami, 2018), Hwang Woo-suk's cloning research in Korea (Kim, 2008). While data frauds definitely transgress academic ethics, some issues induced by the overly emphasis on publications are located in a grey zone, such as the use of ghost writers (Sismondo & Doucet, 2010) and predatory academic journals (Laine & Winker, 2017; Sorokowski, Kulczycki, Sorokowska, & Pisanski, 2017).

Undoubtedly, the academia as a career has always been characterized by competition and rapid publishing (Merton, 1973). However, the above cases imply significant changes have taken place in university management as well as power relations within the academia. A study regarding higher education policy is not only about the happiness (or unhappiness) of intellectual life. Because the nature of academic research consists of knowledge production and reproduction – in other words, what we have already seen and what we will see – the influence of academic affairs can diffuse into society as a whole in the long run. This paper does not propose to suggest a practical strategy for reducing rates of academic fraud. Instead, what this study aims to examine is the exact effect of metric tools on academic practices in everyday life: ways of knowledge production. From this, this study aims to contribute to an understanding of the implications behind the competitive atmosphere of academia built on bibliometric measures.

Methods and materials

Research Methods

There is a methodological challenge to couple changes in knowledge production with environmental factors, such as bibliometric indicators and funding bodies, in this case. In other words, even if both changes in academic activities and research assessment indeed exist, it is necessary to justify the causal relationship between them. To resolve this issue, several researchers attempted to categorize the 'epistemic properties of research content', including but not limited to characters of innovation, diversity, mainstream versus non-mainstream, contextualization versus generalization, basic research versus applied research, personal interests versus policy needs, risk-taking, methodological approaches and interdisciplinarity (Gläser, Laudel, Hinze, & Butler, 2002; Laudel & Gläser, 2014). Based on these epistemic properties, Gläser and Laudel (2015) develop a diachronic analysis of knowledge production, which incorporates the visualization of bibliometric analyses with in-depth interviews.

In order to identify trends and changes in research trails during scholars' careers, the first step of this informed interview is to create a graphical representation of a researcher's oeuvre (Gläser & Laudel, 2015). The bibliometric reconstruction of academic practice begins by reviewing the interviewee's CV or websites for the list of publications and then gathering records of these works from the Web of Science (WoS), followed by calculating the strength of relations among these publications via 'bibliographic coupling' (Gläser & Laudel, 2015). Because it is very possible for two publications to focus on similar research topics, if an

assemblage of the same references is cited in both of the publications, the strength of thematic connections is conducted by comparing the ratio of shared references of two publications (Gläser & Laudel, 2015). For social sciences and humanities where WoS coverage is not sufficient, thematic connections are manually identified according to titles and keywords. Taken together, both the clusters of publications that share similar academic interests and the importance of publications in terms of citation numbers are visualized in chronological order to present the change in research practice of individuals (Gläser & Laudel, 2015). In this way, the above qualitative method would be a suitable way to delineate links between the policy environment and individuals' academic practices.

During the process of interviews, based on the diachronic visualization of previous publications, interviewees are invited to narrate their history of academic research and careers with an emphasis on thematic changes and its conditions. To gain accounts of changes in themes, discussions will focus on the separation of project clusters, which implies significant turns in research topics, and will explore all the reasons for these shifts, such as personal interests, career plans, group leaders' interests, requirements for instruments, government policies, or trends of the academic community (Gläser & Laudel, 2015). Even though some of these reasons might not seem obviously relevant to policy environments (for instance, personal interests, cooperation, or the graduate requirement for students), through further analysis of these, we may be able to find some subtle linkages to performance evaluations and to explore how the role of the bibliometric indicator is embedded and pervasive in academic life.

The empirical basis of this study is composed of 41 interviewees from 12 public universities, 5 private universities and 1 private college in Taiwan, as a part of my PhD research project. The interviewees were scholars in four academic areas: social science (labelled 'S, plus a number'), humanity (labelled 'H, plus a number'), engineering (labelled 'M, plus a number') and natural science (labelled 'B, plus a number'). The four specific disciplines were biomedicine, material engineering, history and sociology. Because my thesis took a qualitative approach, this sample did not aim to achieve statistical representativeness, but was chosen to illustrate the richness of the social world that it explored. Hence, my selection of interviewees aimed to be representative in terms of gender, career position (professor, associate professor and assistant professor), regions, and university types (shown in Table 1). Detailed personal information is hidden for anonymity. These semi-structured interviews consist of two sections: direct discussions regarding academic careers and then the diachronic visualization of interviewees' previous publications to generate specific accounts for each turn in research topics or publishing patterns. Figure 1 is an example of a research path of a molecular biologist.

Background of Academic Management in Taiwan

This section begins by considering the issue of promotion evaluations, which are the most important concern for most interviewees. In Taiwan promotion from assistant professor to professor requires two steps. Usually, promotion evaluation considers three areas: teaching, service and research, among which research takes the most crucial part. Detailed requirements vary, but the use of Key Performance Indicators (KPI) is common. There are charts, tables or formulas to list all the valid academic outputs and quantify scholars' performances in every department. Another feature of promotion evaluation in Taiwan is the time framework in which to amass the required KPI. In general, researchers have to submit their promotion proposal by a given deadline, or their department will not renew their contract. The time framework varies from 6 years to 8 years, depending on the institute; female researchers might be allowed a two-year extension to cover a pregnancy. The time framework seems to resemble the USA mode of tenure tracking, but it is applied both to promotions to Associate Professor and promotions to Professor. The appearance of a time framework represents the principle of accountability: candidates must justify their contributions within a certain period.

Regarding the distribution of research resources in Taiwan, even if each department or university may provide research grants, the major source for an individual scholar is a project-based fund from the Ministry of Science and Technology (MOST). MOST operates two grant schemes: MOST Research Project and National Sci-Tech Program. The MOST Research Project is exercised every year, open to all topics, whilst the National Sci-Tech Program is sporadic with a given topic. The period of the MOST research project varies from one to three years. When an approved project ends, principal investigators must write a report. If an approved project is two or three years long, principal investigators have to write an interim report annually. Applications are examined in terms of research proposals and previous performance, including publication lists and intellectual property lists. Along with MOST project funds, the Ministry of Education offer university-based block money, such as The Aim for Top University (2005-2017), and The Higher Education Sprout Project (since 2018). Usually, the block money is allocated to less than 20 universities from competitions. Hence, for individual researchers the MOST Research Project is the main funding source.

Changes in epistemic properties of research content

This section explores whether the introduction of the market principle and entrepreneurial culture into academia succeeds in transforming individuals' frames of action. Because knowledge takes centre stage in the intellectual world, this analysis focuses on knowledge production, followed by channels of communicating knowledge. Interviewees in my research provide numerous factors involved in knowledge production. I categorize these factors into three sorts: research topic selections; collaborative strategies; and research timelines.

Factors Influencing Research Topic Selections

The theme of research topic selections includes a variety of responses from interviewees grouped into the following: *departmental policy*; *innovation*; *personal interests*; *society's needs and policy needs*; *the mainstream*; *feasibility* and *extensibility*.

Departmental policy on promotion plays a direct role in choosing research topics. By the diachronic analysis of interviewees' knowledge production, significant turns in research topics could be identified. Two historians (H1 and H8) explained that they switched to different research themes for the requirements of promotion. In the name of *innovation*, only publications whose topics were entirely different to previous stages (PhD studies) qualified for promotion evaluations. Similarly, in M6's department, *innovation* (which meant publications differing from PhD research) was an 'unwritten' criterion for promotion. This case shows the influence of academic organizations on individuals' intellectual activities. Even if there was no such formal requirement, several interviewees (S6, M2, M3, M6, B2, B5 and B6) still reflected on *innovation* during the research design process. In particular, M3 was worried whether panel reviewers in the Ministry of Science and Technology (MOST) would question her innovativeness, because her research proposal was built on her PhD study. This case indicates that pursuit of innovation is not only a self-challenge but also about meeting the expectations of others.

Numerous researchers (H3, H4, M6, B4 and B7) mentioned that they followed their *personal interests* to conduct research, while some (H5, H9, B1, B6 and B11) emphasized *society's needs* or *policy needs*, such as researching diseases that only occur in Taiwan. H9 and B6 mentioned that they would highlight the aspect of society's needs or policy needs especially when composing a research proposal for grants. In another instance, interviewee M6, a junior researcher, emphasized the dignity of personal interests. However, he developed a novel research topic because he had been advised by his department to compete for a project with a given topic, and he succeeded in getting the grant. This infers that state policy has infiltrated into individual researcher's agendas though the mechanism of research funding allocation.

Like the concern about society's needs or policy needs, a concern about *the mainstream* shows an intention by individuals to coordinate with collectives. Numerous interviewees (H3, H5, H8, M1 and B7) mentioned that they would consider current trends among fellow academics. For example, M1 published few papers on nanotechnology but this topic only lasted a couple of years. M1 explained that there had been a fashion for nanotechnology; hence, he had attempted to research this topic for a while but later returned to his main field. Some researchers (H3, H5 and H8) may consider fashionable topics seriously particularly while designing a grant application. On the other hand, interviewee B6 argued that she would prefer to avoid the hottest topic but attempted to find alternatives to discover a research niche. Overall, the mainstream research topic often implies linkages with state policy or fund schemes.

The most common factors when designing research agenda is *feasibility* (H2, H3, S1, M5, M9, M10, B5, B6 and B8). The idea of feasibility includes available grants; numbers of postgraduate students and research assistants; pilot tests; equipment requirements and access to fields and archives. As with previous elements, concern with feasibility was also meant to convince panel reviewers of applicants' capacity (H3, M5, M9 and B5). As interviewee M5 argued, if one switches to an entirely different research topic, one's research proposal is less likely to be approved due to its 'innovation'. In other words, innovation is placed in opposition to feasibility; researchers have to grapple with the balance with them. A similar concern is *extensibility*. As numerous interviewees (H8, M5 and M7) argued, it was rational for researchers to continue developing previous studies. Meanwhile, for grant application, extensibility was also taken as a strategy to prove the feasibility of projects (B3 and B6).

Taken together, I highlight several factors involved in procedures of selecting research topics. They are *departmental policy; innovation; personal interests; society's needs and policy needs; the mainstream; feasibility* and *extensibility*, which each play a part in shaping the epistemic properties of research content. Admittedly, not all the factors are directly related to neoliberalised universities or entrepreneurial culture, for instance *personal interests*. *Departmental policy* on *innovation* may show the influence of university bureaucracy on individuals, but does not necessarily link to marketization of higher education. The issues of *feasibility* and *extensibility* could be regarded as a practical strategy for conducting research. Meanwhile, interviewees also infer an awareness of being measured. Due to precariousness in research grants, anxious researchers might choose a less risky approach to knowledge production.

The issues of *society's needs and policy needs* manifests in the mechanism of neoliberal governmentality in academia. By designing a set of goals and rules for competition-based grants, the state is able to govern knowledge production at a distance instead of direct domination; that is, the technique of governance (Miller & Rose, 2008). For scholars, along with anxiety regarding research resources, their primary concern is to stand out in evaluations rather than questioning the rationales of policy needs and society's needs.

Collaborative Strategies

Collaboration accounts for several appearances of new research themes. The following factors stimulated scholars to cooperate with others: *mentorship; personal networks and interests; science policy* and *technology support*.

Several collaborative projects were intentionally prompted by competitive research schemes, either granted by MOST or by the Ministry of Education. For example, one state university (where interviewees S5 and B8 worked) used to be funded by The Aim for The Top University Project, granted by the Ministry of Education. Under the scheme S5 (a senior professor) conducted interdisciplinary research with scholars whose expertise was in marine science, while B8 (a junior associate professor) took part in a collaborative project with peers

from another medical university. MOST's research schemes also played a similar role in encouraging academic collaboration. For instance, interviewee S2, a senior researcher, conducted a collaborative project on infrastructure with foreign scholars, and the project was funded by MOST to enhance international cooperation. Under MOST grant schemes, interviewees S7 working at a private university and M10 working at a public university were involved in collaborative research projects.

Mentorship is a reason for developing a novel research topic. Two interviewees (S8 and M1) had published a couple of journal articles whose themes are different to their main focus. These separate works were inspired by supervising students with various interests. Interviewee M4 also launched a new topic due to a supervisee's interest, which eventually turned to one of his main research interests (unlike in the case of S8 and M1). As previous studies indicate, cooperation with students could be a practical strategy to multiply one's publications (Gläser, Lange, Laudel, & Schimank, 2010). Interviewee S1 stated a similar phenomenon but in the opposite tune. He listed a few prestigious scholars who had published several journal articles in diverse sub-disciplines but had never released a monograph, because they only followed students' research projects instead of conceiving a coherent research project for themselves.

Besides mentorships, *networks with peers* and *curiousness* accounted for several collaborative projects for broadening academic horizons (S2, M10, B2, B3 and B4). However, in my study, there is insufficient data to be able to assert linkages between these two considerations and neoliberalised universities.

In disciplines of nature sciences and engineering (NSE), *technology support* is a common reason for co-authorships (M3, M6, M8, M10, B2, B3, B4, B8 and B11). The term 'technology support' means that scholars might partially contribute to research projects through providing instruments, materials or research methods to achieve substantial data, rather than taking part in the project as a primary investigator. In fact, most interviewees would like to name this kind of collaboration as technology support rather than as a form of substantial collaboration. Most interviewees would not list those nominal publications in a section outlining their core effort towards promotion evaluations nor for obtaining research grant applications; they might just list the nominal papers in appendixes. Several studies reported difference in authorship culture among various disciplines (Liu, 2003; Nederhof, 2006; Piro, Aksnes, & Rørstad, 2013). I argue that the co-authorship pattern in Taiwan might be seen as a way to acknowledge participants' contribution instead of a practical strategy in response to the neoliberalised university.

Several studies suggest that academic performance assessments may make interdisciplinarity difficult (Rafols, Leydesdorff, O'Hare, Nightingale, & Stirling, 2012; Schäfer, 2016; Wilsdon et al., 2015). As a qualitative study, this study does not aim to show, overall, if performance assessment produces positive or negative impacts on interdisciplinary studies. For instance, in B8's case, the collaborative project diminished gradually after the grant scheme had terminated. Conversely, my analysis delineates the capacity of science policy on interdisciplinary communication for influencing researchers' motivations for academic cooperation.

In sum, this section identifies four factors relating to collaborative strategies: *mentorship*; *networks*; *science policy*; and *technology support*. While these do not necessarily link to the marketization of academia, the role of *science policy* is a prominent example to show the government's capacity to mobilise academics by competitive grant schemes.

Research Timelines

The final aspect relating to knowledge production is a timeline. The timeline comprises

when a researcher composes a research agenda, how long the researcher takes to complete a project, and when the researcher summarizes findings for publication. There are two sorts of time frameworks playing a part in research agendas. The first timeline reflects on MOST research project grants. As MOST research project grants are allocated annually, applications for MOST research projects has become a part of academic routine.

Scholars who could not manage these administrative tasks may refuse to apply for a MOST project (like interviewees H2 and H4). Since the cost of research is less in history than for other disciplines, historians are less vulnerable to needing the MOST research scheme. On the other hand, scholars who rely on MOST financial support have to adjust timelines to MOST agendas. For example, B3 stated that she had to submit an article to an academic journal during the summer terms; in this way, she could conclude a project with a paper and submit it for the next application by December. In another instance, a junior researcher M7 complained that he had no choice but to rush into publishing in low ranked journals in order to fit the MOST timeline. If he had had more time, he would round out his research.

Another significant factor is the time framework for promotion, while promotion is one of the most prominent concerns among scholars. Therefore, this anxiety might cause researchers to adjust their research agenda to the promotion timeline. For example, B7 published six papers two years before the promotion deadline; interviewees S2 and H7 followed a similar pattern. In line with the case of MOST research fund schemes, B8 complained that he did not have enough time to elaborate his research due to the promotion timeline. On the other hand, after promotion, interviewee M8 began to slow down his rate of publishing.

As Latour (1987) points out, techniques of knowing a given subject play dual roles in collecting information, as well as in establishing new dimensions of time and space, within which centres of calculation enable domination and mobilize the targeted domain at a distance. These empirical data suggest that grant schemes and performance evaluations have built a time dimension which scholars are obliged to inhabit. In this way, academic life is divided into small segments with assigned tasks for each timeline.

Taken together, this section elucidates how a milieu of neoliberalised universities with performance evaluations and ‘projectification’ reshapes faculty’s behaviours. In selection of research topics and collaborative strategies, external factors, such as science policy and social needs, partially affect individuals’ decisions about research contents. In respect of timelines, external timetables play a significant role in modifying scholars’ research agendas, working against long-term studies. The external timeline also engenders profound impacts on publishing behaviours, which will be analysed in the following section.

Changes in publishing patterns

This section continues to apprehend the impacts of the neoliberalised university on ways of communicating knowledge: in the form of publication patterns. A focus on publishing patterns is important for two reasons. First, communicating knowledge is an indispensable component of intellectual life. Second, as promotion and grant applications are the main source of scholars’ anxiety, publications are one of the major indicators used in processes of evaluation. Discussion of this is organized into two aspects: researcher’s perspectives; and editor’s viewpoints.

Impacts of Bibliometrics on Publishing Strategies

Interviewees’ considerations involved in publishing strategies include *publishing formats*, *bibliometric indexes*, *selection of languages* and *readerships*. Selection of publishing formats reflects influences of academic institutes’ preferences. In my interviews, NSE researchers displayed a preference for serials over books. For these researchers, the genre of

books is a means to summarize well-known knowledge rather than a platform to share a novel discovery. Hence, several scholars (M6, M9, B1 and B8) mentioned they might write a book in future to conclude their academic career. Several NSE scholars (B3, B5, B6, M3, M4 and M5) mentioned that they had or would write a book chapter for the sake of invitation and favours, but did not take it as a major achievement. For instance, M3, a junior scholar, had published a book chapter due to invitation, but M3 doubted if members of the hiring panel treated it as valuable, while the genre of books and chapters was placed in an appendix.

On the other hand, there is a tension in the selection of publishing forms in disciplines of social sciences and humanities (SSH), where writing books is considered a benchmark. In spite of this tradition, numerous SSH scholars (S3, S9, H3, H7 and H9) did not give priority to monographs, because book-type publications did not actually count in promotion evaluations. It is said that the value of monographs was too ambiguous and 'subjective' to be marked. Hence, under the rhetoric of objectivity, book-type publications were excluded from assessments. Even if the value of books was recognized, two associate professors (H2 and S3) would prefer to publish journal articles instead of books, because it took less time to finish a journal paper than a monograph, considering the promotion timeline. In this context, interviewee H7 (a junior scholar) felt frustrated, because she could not fulfil her desire to publish a monograph, as a traditional scholar would. Nevertheless, in the cases of S5 and H10, the traditional emphasis on the monograph had been systematically preserved. In H10's department, publishing a monograph was an essential condition for promotion.

Although there are several media to present research discoveries: journal articles, workshop papers, conference papers, book chapters and monographs, development of bibliometrics, to a certain extent, is on the basis of journal articles. In addition, because social sciences and humanities (SSH) research is published more often in book form, and sometimes features a national or regional orientation, the coverage of SSH research is limited in bibliographic databases (Archambault, Vignola-Gagne, Côté, Larivière, & Gingras, 2006; Nederhof, 2006). Because of a difference in publication customs between NSE and SSH, it raises a question whether bibliometric indicators could be justifiably used for measuring productivity across academic disciplines (Glänzel & Schoepflin, 1999; Piro et al., 2013). Despite the difference in academic traditions, several studies indicate that scholars are encouraged to publish in academic journals rather than other forms in the light of performance evaluations and demands for accountability (Hammarfelt & de Rijcke, 2014; Rijcke, Wouters, Rushforth, Franssen, & Hammarfelt, 2016). My empirical data represent the similar conflicts between NSE and SSH in Taiwan's academia as the bibliometric indicator is utilized for performance evaluations.

When selecting a journal to submit to, there is near-consensus that bibliometric indexes are the most important standard. An indexed journal is better than a non-indexed one, whereas a high ranked journal is even better than a low ranked one. The bibliometric index was described as a guarantee of 'credit' (S10) or 'authority' (B11). For NSE areas, SCI is the main bibliometric database. For SSH domains, recognized bibliometric indexes are SSCI, A&HCI, THCI (Taiwan Humanities Citation Index) and TSSCI (Taiwan Social Sciences Citation Index). H3 attributed this trend to favouring indexes to unavoidable external expectations. S6, an associate professor at a private university, stated this as a strategy to survive in academia. The junior researcher S1 shared a personal experience; after he had published a paper in a non-indexed journal, he gained no praise but advice that he should choose an indexed one wisely for the next paper. The case of S8 (a senior scholar) is a counterexample; interviewee S8 avoided publishing in indexed journals consciously as a non-cooperation movement against the neoliberal culture. As a result, he would remain in the position of associate professor.

Along with selections of publishing genres and journals, choice of language is another crucial topic. There are numerous studies focusing on the representation of languages in bibliometric databases, as well as impacts of performance evaluations on changes in language usage in academy (Archambault & Larivière, 2009; Archambault et al., 2006; Engels, Ossenblok, & Spruyt, 2012; Hammarfelt & de Rijcke, 2014; Nederhof, 2006). A prevailing usage of English in academy has been noted even in Western but non-English speaking countries. My empirical data also show a similar preference for publishing in English, but the degree varies across different disciplines. Furthermore, I identify two determinants accounting for the choice between English and Mandarin: bibliometric authority and readerships.

The emphasis on bibliometric indexes, especially for SCI, still plays a crucial role in language usage. This is because in NSE domains, most of SCI-indexed journals are English. Even though there are a few Mandarin-language journals enrolled in SCI, their Journal Impact Factors are relatively low. This fact provides Taiwanese NSE researchers an incentive to only publish in English (B3, B7 and M8), unless they are invited to publish in Mandarin-language journals (M2). In another example, M4, a senior professor, used to publish in Mandarin-language journals occasionally. However, when he developed a novel research theme, there was no available Mandarin-language journal for the topic.

Another aspect is an imaginary of readerships. Several interviewees (B4 and M9) explained that high Impact Factor journals meant international visibility and a wider audience. In SSH disciplines, the relation between used languages and readerships are subtler. Previous studies point out, the national or regional orientation of SSH literatures is more significant, leading to a lower coverage of international bibliometric databases (Archambault et al., 2006; Hicks, 1999; Nederhof, 2006). The national or regional orientation of SSH research underlines the preference for languages used, as well as the boundary of readerships. For example, S3 and S7 (two associate professors at private universities) favored Mandarin-language journals because of their prominent regional orientation. Even if H10 (a professor) focused on European history, because she aimed for dialogue with domestic readers, she mainly published in Mandarin. By contrast, because S10, a senior professor, was interested in American studies, most of her publications were written in English. Several scholars (H1, H5, S6 and S8) mentioned they would switch between English and Mandarin, depending on the properties of their research topics and their assumed audiences.

Meanwhile, along the topic-led readerships, international visibility (which means foreign readers), is an imperative for academics, despite the regional orientation of SSH literatures. For instance, interviewees S1 and H3 would like to publish in English in order to be visible to international academic communities. This infers the imaginary of global readerships has priority over research orientation. In contrast to a traditional audience sharing similar interests, a new type of 'imagined academic communities' is produced via international bibliometrics. However, because those international bibliometrics are in favour of English-language journals, regarding membership of the imagined global academic communities, scholars in Taiwan, to a certain degree, are attracted to get more involved in research topics of Western importance than before.

Impacts of Bibliometrics on Editor's Practices

The rising role of bibliometric indexes engenders impacts on journal management. The concern about bibliometric performances was stated by several editors (S2, M4, M5 and B10). In practice, a citation analysis was utilized to compare with other journals' performances in internal discussion. For editors of SSH journals, another primary concern was to register their journals in bibliometric databases, such as TSSCI or THCI (H1 and H4). To be recognized by the bibliometric index, the criteria of bibliometric databases have been adopted by editors.

Several strategies were used to round out Impact Factors or citations. First, because review papers in general could gain more citations, editors may actively invite scholars to write a review article or even write one themselves (M4 and B10). Second, editors might actively cooperate with academic conferences for organizing a special issue, which could draw more attention to their journals (M4 and B10). Otherwise, editors may prefer short articles and diversify a volume to attract more audiences (S2). These show that the bibliometric index has turned into an authoritative mechanism to justify the value of academic journals. In another instance, H5 was in charge of a non-indexed journal. He felt sorry when he attempted to invite researchers to submit articles, because he thought this article would not help their career.

The influence of bibliometric indexes on journal's value is remarkable. Numerous SSH editors (H1, H4, H5, H6, S2 and S5) observed that quite a few journals which were excluded from TSSCI or THCI eventually disappeared, while indexed journals gained more submissions, resulting in decreasing diversity in academia. This situation happened to NSE journals as well. Interviewee M2, a senior professor, used to be a chief editor of a domestic Mandarin-language journal. According to M2, when the focus on SCI arose in the 1990s, fewer researchers were willing to submit their findings to the Mandarin-language journal, which led to a decline in journal quality. The decrease in the quality of the Mandarin-language journal made it more difficult to be included in SCI. This indicates that the absence of Mandarin-language journals is a self-fulfilling process, launched by enthusiasm for international recognition. As the result, the non-indexed journal lost readership gradually and faded out from bibliometric-based academic communities.

Discussion: Academic Autonomy and University's Missions

This project attempts to couple individuals' academic exercises with managerial strategies and evaluation metrics, while it is difficult to isolate specific effects from a large research policy context. Drawing on the graphical representation of a researcher's oeuvre, this analysis partially illustrates shifts in research trails during scholars' careers and its links to the policy environments and institutions' expectations. Despite the heterogeneity and complexity of individual research traces, it shows that grant schemes, institutional customs and bibliometric indicators play a prominent role in strategies for research targets, timelines, collaboration and publication. This empirical analysis investigates not only the influence of entrepreneurial culture on the epistemic properties of research but also delineates cotemporary models of university management as well as knowledge governance. Applying the diachronic representation of a researcher's oeuvre in investigating German early career researchers, Laudel, Bielick, and Gläser (2019) shows that academic organizations engender a significant influence on shaping scholars' professional practices. My analysis suggests that the institution could either amplify or abate the effect of state policy, reflecting its academic customs and relations with state funding agencies.

As Esposito and Stark (2019) argue, 'reality is not the starting point, it is the result of observation, produced the reciprocal reference of observers to the perspectives of others' (p. 12). My interview data show that the evaluation metrics have gotten involved in constructing a new academic reality and identity. The introduction of bibliometric indicators offers practitioners a new way to perceive quality journals, by which a lack of publications in indexed journals has become a task to be performed and achieved for researchers. It then modified standards of outstanding institutes and scholars, and renewed the definition of academic excellence, which substantially constitutes academic identity. Furthermore, previous studies suggest that compatibility is one of key features to understand the constitutive role of measuring instruments, highlighting the agency of numbers (Espeland & Lom, 2015; Latour, 1999). The use of bibliometric indicators renders intellectual efforts and reputations more commensurable. In Esposito and Stark's words, 'rating and rankings are tools to get an orientation in such a

world ... here the observation of others provides a reference point from which to observe oneself' (p. 19). The same could be said for the relations between the bibliometric indicators and the imaginary of academic community/self.

As the systematic assessments have established new dimensions of space and time where academics inhabit, this research outlines a shift in power relations between the state and academia from government to governance. It illustrates how scholars have been channelled to the axis of entrepreneurship characterized as self-disciplinary, productive and competitive by the introduction of persistent performance evaluation. With the implementation of punishment and reward through the practice of grant allocation, performance evaluations, hiring policy and honouring systems, bibliometric values have turned to a norm in academy to classify desirable intellectual labour, as well as guide individuals to productivity (Foucault, 1979). This echoes with Foucault's argument: disciplinary power is not necessarily oppressive but has to be productive to enact effect. Meanwhile, the set of criteria and assessment empowers the state to lead scholars towards the supposed model of behaviours without a direct command; that is to say, governmentality (Gane, 2012; Miller & Rose, 2008). By this mechanism, the responsibility for economic growth, industrial innovation and state progress is efficiently transferred to scholar communities in the age of knowledge-driven economy (Shore, 2020; Wright, 2016). The above notions then provoke a question: how far academic autonomy can be said to exist.

A critical study of performance evaluation in academia does not mean that the academic community does not need any evaluation. Conversely, the academic society is a self-organized professional group, built on a set of specialized norms and peer review culture (Merton, 1973). For an ideal scientific community, performance assessment is conducted in accordance with discipline-specific quality benchmarks without diminishing academic freedom and epistemic diversity; the purpose of an ideal evaluation is to approach scientific truth via enhancing the quality of research (Hallonsten, 2021). However, the current evaluation regime embedded in entrepreneurial culture is a means to serve national progress and economic growth, whose utilitarian orientation might contradict the core values of academic practices and university education (Back, 2016). It is also true that the mission of university as well as the role of academic research have varied over periods, reflecting changes in political configurations and social contexts (Martin, 2003; Mirowski, 2011). Hence, it is not practical to reverse the neoliberalised university back into the 'the good old days'. An ideal model of academic evaluation rests on an ideal imaginary of scholarships in contemporary society. This answer entails more philosophical or theoretical discussion on a fundamental assumption: 'what are universities for', but is beyond the scope of this present article.

Conclusion

In summary, this article depicts an explicit landscape of the neoliberalised university by inquiring into subjective experience and building a link between policy environments and individual activities. Through tracing the deployment of governing techniques, which in this case is bibliometric meritocracy, this empirical research presents how neoliberal principles of competitive markets and accountability have been duplicated from state bureaucracy to academic communities, and eventually internalized into individuals' conceptions as well as practices. These modifying behaviour patterns include a selection of research topics, research agenda, strategies for grant applications and publications, engendering delicate changes in the epistemic properties of research. Through the analysis of everyday practices in academia, this study articulates the power relation between the academic institutions and state bureaucracy, which is characterized by neoliberal governmentality.

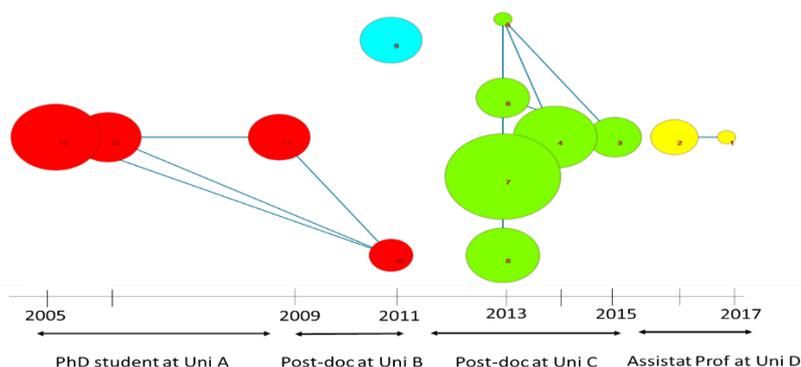
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Figure 1: Example of a research trail of a molecular biologist.



Each circle represents interviewee's publications, linked by bibliographic coupling (lines). The relative size of circles is decided by citation numbers.

Table 1: Overview of interviewees

	Sociology	History	Material Science	Biomedicine
Position				
Professor	3	2	4	3
Associate Professor	4	5	2	4
Assistant Professor	3	3	4	3
Post-Doc				1
Gender				
Male	7	7	9	9
Female	3	3	1	2
University Type				
Public	6	10	10	7
Private	4*			4**
Sum	10	10	10	11

*: 2 Christian universities and 1 Buddhist university

** : 2 Christian institutes