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Preregistrations and Scientific Impact in Management

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Abstract

This Master Thesis examines the scientific impact of preregistrations, with a focus on the field of Management. Preregistrations are often seen as a solution to improve research quality, but their real effect remains unclear, as they are a relatively new method for many scientific disciplines. It is often assumed that the number of citations shows how relevant or valuable a paper is. Based on this idea, an analysis of both preregistered and non-preregistered studies within three research fields (Management, Marketing and Psychology) was conducted. The results show that preregistration alone does not have a significant effect on citation counts. However, there are differences between the areas. Articles in Marketing tend to be cited less than those in Psychology, while for Management no clear difference could be found. These findings suggest that preregistration may not directly lead to more citations, but it might still help to improve transparency and research quality.

Kurzfassung

Diese Masterarbeit untersucht den wissenschaftlichen Einfluss von Preregistrations mit einem Fokus auf den Bereich Management. Preregistrations werden oft als eine Möglichkeit gesehen, die Forschungsqualität zu verbessern, aber ihre tatsächliche Wirkung ist unklar, da sie für viele wissenschaftliche Disziplinen noch eine relativ neue Methode darstellen. Es wird oft angenommen, dass die Anzahl der Zitationen zeigt, wie relevant oder wertvoll eine wissenschaftliche Arbeit ist. Auf dieser Grundlage wurde eine Analyse sowohl von preregistrierten als auch von nicht-preregistrierten Studien in drei Forschungsbereichen (Management, Marketing und Psychologie) durchgeführt. Die Ergebnisse zeigen, dass Preregistration allein keinen signifikanten Einfluss auf die Anzahl der Zitationen hat. Es wurden jedoch Unterschiede zwischen den Bereichen festgestellt. Artikel aus dem Bereich Marketing werden tendenziell weniger zitiert als solche aus der Psychologie, während für Management kein klarer Unterschied festgestellt werden konnte. Diese Ergebnisse deuten darauf hin, dass Preregistration möglicherweise nicht direkt zu mehr Zitationen führt, aber dennoch zur Verbesserung von Transparenz und Forschungsqualität beitragen kann.

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1. Introduction

Could you imagine a world without progress? Every single aspect of our lives is a result of changes made long ago, of new ideas and inspirations – personal or collective. There is no greater challenge and yet satisfaction than using all your abilities to create, to discover, to ensure a better future for humankind. Without science and in particular – research, nothing of such great importance would exist. Every day thousands of people around the world spend their time experimenting, hypothesising, collecting data, evaluating results and writing articles so that their findings could contribute for knowledge sharing and growth. But what about the problems these modern – day heroes face during their work?

On the other hand, one must not forget that modern science is constantly evolving, too. With the help of breakthroughs in technology, much more possibilities are available for experts around the globe. Almost every scientific field has its own rules and characteristics, but an important tendency is observed: an increasing number of disciplines started implementing new methods, hoping to stimulate research and limit questionable practices. At least part of the problems scientists face in their careers might be solved soon and thus, better, faster results should follow.

With the popularization of open science practices and in particular – preregistrations, a new era for research has begun. However, little is known about the impact of this method on different scientific disciplines. On the one hand, widely discussed in literature are preregistrations done in areas like Psychology, while the information regarding this procedure in other fields remains insufficient. Hence, the described research gap offers an interesting opportunity: one could examine whether preregistering a scientific study is an advantageous approach in various disciplines and if so – precisely what kind of positive effect is to be expected. This Master thesis evaluates whether study preregistrations have a significant scientific impact in Management. For the sake of consistency, the thesis is divided into the following sections: Section 2 gives a brief overview of the concept, as well as more information about the different types of preregistrations and where to find them online.

Next, in Section 3, a detailed literature review is presented, which includes some historical facts about the role preregistrations had in different disciplines. In addition, one can also find a comprehensive summary of both the arguments in favour and against the use of preregistrations as a common practice in research. Later, in Section 4 and 5 respectively, the methodology of the Master thesis and the process of data collection are being introduced, while Section 6 focuses on data analysis. Section 7 contains a thorough discussion of the results and explains which limitations of the thesis should be taken into consideration. Finally, in Section 8, the topic and its implications are summarized and some ideas for further research are being suggested.

2. What are preregistrations? – A brief overview

Why are preregistrations important for scientific research? To answer this question, one must first understand their essence. To begin with, most scientists choose to either *test* or *generate* hypotheses. In the first case, “hypothesis *testing*” means making “*predictions*”; hence it is a *confirmatory* research aiming the collection of *new* observations. On the other hand, the process of “hypothesis *generation*” includes “*postdictions*” – it is an *exploratory* research based on *existing* observations.

The distinction between the two concepts is not always clear and hence, many scholars find it difficult to rationalize which of their “analyses and outcomes” belong to which category (Nosek et al., 2018). Moreover, some researchers claim that the “post hoc explanations” (or in other words – the “postdictions”) in their papers are actually “predictions”. These misinterpretations add value to the written work and improve the chances of it being published. However, in the long run, the described practice might lead to serious problems, because replicating such studies is often an impossible assignment. To prevent this, scientists could use preregistrations where everything is thoroughly documented, and “predictions” are defined.

Hence, the main characteristic of preregistrations is the point in time when they were created – usually, at the very beginning of a research process, “before conducting any analysis of data” (Reich, 2021). Similarly, Toth et al. (2021) describe preregistering a study as “an opportunity for researchers to create and save a detailed, time-stamped plan of their hypotheses, methodology, and analyses prior to data collection and analysis.” (p.554).

On the other hand, the authors indicate that at a later stage of the process modifications are still possible; however, they must be explicitly declared so that every step could be traced by editors and readers and no doubts about the researcher's trustworthiness exist.

Important to realize is the fact that preregistrations have become an established norm in medical research (in terms of clinical trials) and in the last decades are also being adopted in other disciplines such as psychology, marketing and partially – in management. However, despite the many benefits “data sharing” brings to the scientific community, a lot of researchers are still reluctant to use preregistrations, because there is lack of “a culture that values open data” (Munafò et al., 2017).

Besides, the term “preregistration” is often misinterpreted by scholars, as Rice and Moher (2019) point out in their article. In psychological and medical research for example, there are two words to describe the same approach (“preregistration” and “registration”, respectively), which is rather confusing. Hence, the authors suggest that only “registration” should be accepted as an official term in all scientific disciplines. As a result, interpretation could become easier, and more scholars would feel confident enough to use this procedure in their work afterwards.

In general, preregistration is an open science practice, which means that all the relevant information is “transparent and accessible to others” (Munafò et al., 2017). As Reich (2021) emphasize, researchers are free to choose which aspect of their work they would like to preregister – for instance, either the whole study or only parts of it (such as certain “hypotheses” or just one of several experiments within the same article). Furthermore, there are no rules about how a preregistration plan should be structured in terms of “forms” or “levels of granularity” (Reich, 2021).

However, some authors suggest several basic components which every preregistration should include so that the addressed materials could be documented in a clear, organized way. According to Van 't Veer and Giner-Sorolla (2016), when preregistering a study, researchers need to explain in detail their “hypotheses, methods and analyses”. As an illustration, the authors give many concrete examples and discuss different scenarios, such that scholars could find relevant solutions to the problems they might encounter.

On the other hand, Reich (2021) argues that inexperienced scientists should first try to learn how to optimize their preregistrations and for them, an initially “short” documentation, with only several specifications, would be most appropriate.

Moreover, every scientific discipline has different priorities in research and hence, scholars might have to adapt their preregistrations accordingly (Van 't Veer & Giner-Sorolla, 2016; Reich, 2021). For this reason, the platform OSF offers a detailed template (around “ten page” document), which consists of “25 main questions” that are further divided into “one to five sub-questions” (Reich, 2021). Thus, researchers without much previous experience might think this template is relatively complicated (Reich, 2021; Paul, Govaart, & Schettino, 2021). However, OSF enables users to choose from a variety of other templates, including the one from “AsPredicted”.

The template provided by the platform “AsPredicted” is preferred by many researchers, because (by contrast with OSF) it has a simple structure of around nine questions, which “can be answered in less than a page” (Reich, 2021).

2.1 Types of preregistrations: unreviewed and reviewed (registered reports)

Even though they share some similarities, preregistrations and registered reports are two different approaches used in research. The typical preregistration is unreviewed by editors in its initial stage (when collection of data has not taken place yet). On the other hand, there is also a more complicated form of preregistration, whose main purpose is to ensure peer review of a study several times before its publication. In general, a first review is done before the actual collection of data (when study design is clearly described), and a second one – immediately after the study is written, but not published yet (Chambers, Feredoes, Muthukumaraswamy, & Etchells, 2014; Nosek & Lakens, 2014; Van 't Veer & Giner-Sorolla, 2016; Reich, 2021).

Hence, the essential difference between (unreviewed) preregistrations and registered reports is the possibility of publication. While there is no such guarantee for the former, the latter would be published even if the findings are not satisfactory, or, in other words, regardless of a “null, negative, positive, or surprising” outcome (Reich, 2021).

However, an important prerequisite for publication is whether the registered report was accepted “in – principle” or, to put it differently, the so-called “IPA” (“In Principle Acceptance”) was obtained (Chambers, 2013; Munafò et al., 2017; Rice & Moher, 2019; Reich, 2021). This is granted only when the researcher is going to act according to the “original preregistered plan” and, if necessary, is ready to record any “deviations” that might occur (Van 't Veer & Giner-Sorolla, 2016; Paul, Govaart, & Schettino, 2021; Reich, 2021).

Thus, registered reports would not be the best option for preregistering a study which is entirely “exploratory”. However, they still might offer some flexibility. Scholars erroneously believe that once they submit a registered report, they would not be able to include any “creative”, “unregistered exploratory” analysis in the final version of their paper (Munafò et al., 2017). On the contrary, this is possible, but only if scientists clearly describe such information as “post hoc” reasoning.

Naturally, preparing a registered report takes more time, but if successful, the benefits outweigh the costs. In the first place, even before the beginning of data collection, researchers receive valuable feedback and, in the end, the study is published, regardless of its findings (Reich, 2021). Hence, the efforts during the writing process were not meaningless (Yamada, 2018).

In addition, there is also the possibility “the strongest proposals” among the once submitted registered reports to receive the funding they need, if review is done by “both the funder and the journal” at the same time (Munafò et al., 2017).

Moreover, Van 't Veer and Giner-Sorolla (2016) argue that scholars might even combine the two approaches. For instance, a primary preregistration could help scientists to easily demonstrate the “proof of concept” and after that, by submitting a registered report, their work would be evaluated for an eventual publication at a later point in time (Van 't Veer & Giner-Sorolla, 2016).

Worth mentioning is the fact that registered reports are widely used in psychological research, but at the same time often mistaken for (simple, unreviewed) preregistrations (Chambers, 2013; Rice & Moher, 2019). This is the main reason why authors like Rice and Moher (2019) emphasize the need of clear, uniform terminology across all disciplines.

2.2 Study preregistrations: popular online platforms

Nowadays, there are several online repositories where scientists could preregister their studies. Some of the most popular platforms are “AsPredicted” and “Open Science Framework (OSF)”, but researchers from other disciplines (e.g., medicine) prefer “ClinicalTrials.gov”, since it is specifically organized to meet the needs of preregistrations in this scientific domain. In addition, Nosek et al. (2018) enumerate other lesser – known online registries that are chosen from scientists: “EGAP (Evidence in Governance and Politics)”, which is “hosted by OSF”; “RIDIE (Registry for International Development Impact Evaluations)”; and last, but not least – “AEA RCT Registry (American Economic Association’s registry for randomized controlled trials)”. The aim of such platforms is to keep the documentation of the planned study for later reference. In some cases, obtaining this information is possible only after an “embargo period” has passed (Nosek et al., 2018).

An interesting initiative of OSF was the so-called “Preregistration Challenge”, which took place approximately between 2015 and 2019. Some summarized information about this contest is to be found in the article of Toth et al. (2021), who used part of the collected data for one of their studies.

Participants in the initiative must have used templates, offered to them by the organization “Center for Open Science”, which was also responsible for supervising the smooth execution of the campaign as well as reviewing of all received preregistrations. One thousand prizes in total, each in the amount of one thousand dollars, were distributed among the first persons who: took part in the challenge; were approved by its reviewing team (only in terms of eligibility, credibility criterion was excluded at this stage); and above all – who finally were able to publish their preregistered studies before the campaign ended. However, there was an additional restriction: publication must have been made in one of the preselected journals. In addition, the awards were given not at once, but on four different dates.

Worth mentioning is another accomplishment of the “Center for Open Science” – the so-called “badges”, which are given to studies according to their contribution to “open science practices” (including preregistrations). The idea behind this initiative is to promote transparency and cooperation in research not only in psychology, as initially intended, but also in other disciplines (Paul, Govaart, & Schettino, 2021; Pham & Oh, 2021).

By receiving an “open data badge”, scientists are encouraged to preregister their work more often and as a result, there is already a tendency towards “increasing data sharing” (Munafò et al., 2017).

Interestingly, researchers themselves also seek ways to increase transparency in science. This is the reason why the “The Peer Reviewers’ Openness Initiative” is created, where scientists (in their role “as reviewers”) stand behind the idea of a widespread adoption of “open research” (Munafò et al., 2017). Moreover, in recent years one could find examples of work opportunities which include requirements with respect to “open-science practices”. This new “hiring and performance evaluation” considers not only the professional experience and personal skills of scholars, but also their attitude towards such modern methodologies (Munafò et al., 2017).

3. Literature Review

In this section one can find a thorough literature review, which will give the reader first theoretical insights into the topic. To begin with, preregistrations in different disciplines are briefly discussed. After that, a detailed analysis of the advantages and disadvantages of this methodology is introduced so that all aspects of preregistrations could be examined objectively.

3.1 Preregistrations in different disciplines

As already mentioned, preregistrations are gaining popularity in various scientific disciplines. Interesting details about the historical development of preregistrations are to be found in the article from Van 't Veer and Giner-Sorolla (2016). According to the authors, although considered as a relatively new phenomenon, first preregistrations actually date back to the 1960s. Naturally, this first form of preregistering a study is very different from the way scientists are used to put into practice today. In medicine for instance, the aim of preregistrations was to initiate research rather than analysing possible results. Unfortunately, some 20 years later, one was already aware that something had been done wrong: on the one hand, studies with “significant” results were preferred for publication and on the other hand, scholars complained that replicating them was often a very difficult (if not impossible) task. These first signs of “publication bias” and lack of “reproducibility” in research caused a shift in perception and thus, a search for ways of improvement.

Similarly, computer technology was also subject to important changes, which led to the creation of “World Wide Web”. With the first online repositories for registering “clinical trials” around “mid-2000s” a new phase began – what followed were political support from governments around the world (US and Europe in particular) and new rules and regulations (centred around publicly available information and more open science practices). Especially in medical research, where people's lives are dependent on unbiased decision – making, ethical norms and readiness to take responsible actions, there is no place for unclarity or lack of initiative. Next in their overview, Van 't Veer and Giner-Sorolla (2016) present some facts about preregistrations in psychology and neuroscience in the last decade.

As shown above, medical science and to be precise – clinical research, was one of the first disciplines which saw potential in preregistrations and included them in its guidelines. In this regard, worth mentioning are “the Food and Drug Administration in the United States” as well as “the European Medicines Agency in the European Union” (“FDA” and “EMA”, respectively) – good examples for agencies which not only have adopted preregistrations, but also made them mandatory (Munafò et al., 2017). However, researchers from other disciplines such as “social and behavioural sciences” still need to be encouraged to use preregistrations as part of their work, because for them this practice is rather “bureaucratic”. Munafò et al. (2017) tend to believe the described task is achievable and suggest that the so-called “Transparency and Openness Promotion (TOP) guidelines” might be helpful. To follow these principles, scholars must be more precise in their planning and report in details any deviations.

Similarly, Toth et al. (2021) argue that preregistrations are being widely adopted by researchers in most sciences, particularly in medicine. The authors give as an example the requirement in USA, originating more than two decades ago, which stipulates that clinical studies must be first preregistered. However, in some social science disciplines like “applied psychology” and “management”, scholars remain sceptical about the usefulness of this methodology. Their doubt could be explained by the common belief that exploratory studies might suffer if preregistrations become the new standard in research.

To investigate the issue in depth, Toth et al. (2021) present two studies: while the first one focuses on a comparison between “preregistered” and “non - preregistered” studies and their contribution to transparency in science, the second one aims to collect honest opinions from researchers’ community about what benefits and risks they associate with preregistration as a practice.

Finally, the authors summarize different recommendations for all people and institutions involved in the research process, especially those in the disciplines “management” and “applied psychology”. As a matter of fact, part of the results of the first study were derived from some data processing of the “Preregistration Challenge” (already discussed in subsection 2.2 of this work). Interestingly, the final dataset of this first study consists almost only of psychological articles, while other disciplines such as “political science” or “education” are underrepresented.

Furthermore, in their second study, Toth et al. (2021) dive deeper into the topic and try to investigate both the positive and negative sides of preregistrations as well as the reasons why this procedure is still not so widely used in all disciplines. For this purpose, the authors turn to two groups of scientists – the first one consisting only of such who have already included preregistrations in their work and the second one – researchers with no experience at all with this methodology. Both groups were equally important for gaining an insight into preregistrations in terms of potential risks and benefits, opportunities, and difficulties, as well as all the formalities which are part of the process.

If correctly assessed, this information might lead to a positive transformation in the way preregistrations are applied in science. As with the results of their first study, Toth et al. (2021) find a difference regarding the scientific field, which researchers in the two groups belong to. Those of them with at least some experience with preregistrations are scientists from “psychology” or its subdisciplines, whereas the other group consists mainly of scholars from “management and applied psychology”. This imbalance might be a clear sign that either not every scientific field is appropriate for preregistrations, or this methodology is yet to be incorporated into a greater number of areas.

To clarify the issue, Toth et al. (2021) give some suggestions based on the results of their two studies. To begin with, the authors find preregistrations to be a valuable, although often a very ambitious task, which includes a lot of uncertainties, but also offers as much as possibilities for both individual improvement and science development. Hence, they recommend to researchers from all disciplines, especially those from “management and applied psychology”, to be consistent in their learning how to apply preregistrations and when needed – to seek advice from colleagues and specialists.

With time, scientists could become experts in preregistering a study and contribute for more transparency in their corresponding fields. According to the recommendations of Toth et al. (2021), formulating “contingency plans” via preregistrations might be helpful for researchers: not only to prepare themselves for any type of scenarios, but also to become more confident. Another useful idea might be to preregister a “decision tree” so that even studies with a rather “exploratory” or “qualitative” focus could also be planned, at least to some extent.

Moreover, by sharing their personal experience, scientists could also help their peers, because other scholars often encounter similar problems in their own work. Thus, in the future, an improvement in research is to be expected.

Toth et al. (2021) continue their list of recommendations with some advice for educators and students. Since preregistrations are still not widely used in all scientific disciplines, this methodology might be popularized if it becomes part of the university education. In addition, it would be relatively easy to adapt the teaching program so that graduates could gain enough theoretical knowledge about preregistrations and later practice the acquired skill.

While aiming for more transparent science is laudable, researchers might achieve this goal only with great difficulty. Sometimes it even turns out to be an impossible task because of external factors. For instance, other parties involved in a study could hinder the disclosure of some important information. In such cases, Toth et al. (2021) suggest that scholars should persist in their attempts to work in a precise way and “be as transparent as they are able to be”.

To carry out a successful study, especially a preregistered one, is a long process which involves many people besides researchers and their team. Some of the most influential parties are the editors (as well as the reviewers). Above all, they must evaluate and accept the study for further publication and hence, are responsible for the variety and quality of research in scientific fields.

This might be a demanding job, which is the reason why Toth et al. (2021) have tried to give some useful recommendations to both the reviewers and editors of preregistered studies. To begin with, some additional “training” might be required so that reviewing would be based on different criteria (for instance, not solely whether results are significant or not). In addition, if one changes the order of examining the text (e.g., by leaving all the information about the outcomes for last), both the effects of “confirmation bias” and “hindsight bias” could be diminished. Furthermore, the detailed information (which a preregistration consist of) might be invaluable when analysing the credibility of the research at hand.

According to Toth et al. (2021), one of the most important benefits of preregistered studies is their transparency, which, in general, is an indicator of quality in research. Thus, when a journal includes more scientific works, which were originally preregistered (either without additional review, or as the more complicated type – “registered reports”), would be seen as a positive sign. It would mean that the journal has set higher standards for its publications and chosen to be a part of a new tendency towards better research practices. To illustrate this, Toth et al. (2021) describe the so-called “TOP Factor” (also known as “Transparency and Openness Promotion”), which rates journals according to their publishing policies about pre-registrations.

Last, but not least, Toth et al. (2021) make some recommendations for “funding agencies”, believing that their role in the preregistration process must not be neglected. Moreover, the authors argue that these institutions should be among the greatest proponents of preregistrations (because of the advantages which the methodology brings). The money, designated for investing in research, should be spent wisely and only for such studies, which are transparent and precisely done. As a matter of fact, some agencies have already decided to demand preregistrations in order to allocate funds. Nevertheless, much more similar measures need to be taken so that research quality could be ensured everywhere.

3.2 To preregister a study – an opportunity or a risk? Some arguments

As with every concept which is getting more attention in scientific circles, preregistrations have also been judged by scholars as both a positive and a negative phenomenon. On the one hand, many experts find this methodology as a revolutionary solution to existing problems in research. On the other hand, even if preregistrations might be useful for certain scientific purposes, they might also have important limitations. A more detailed analysis of existing literature regarding both the advantages and disadvantages of preregistrations is outlined in the following subsections.

3.2.1 Arguments for the use of preregistrations in research

Many scientists tend to believe that even though preregistrations are a challenging approach, they might be effective and even necessary for further development of research. Especially emphasized is the role of preregistered studies when discussing findings with higher quality and credibility. Nosek et al. (2019) encourage their colleagues to learn how to apply this relatively new methodology. Difficulties such as lack of enough experience and practical knowledge might be overcome by investing time in mastering analytical skills and planning wisely. In addition, the authors suggest concrete steps which could help solving different kind of problems that might arise during the process of preregistering a study. Despite all the challenges, preregistrations are being categorized as tools for fighting “selective outcome reporting”, “HARKing (hypothesizing after the results are known)” and even “publication bias”.

Another supporting argument commonly used by scholars is that the preregistration of scientific works leads to more transparency in the field. Moreover, one can easily follow which findings are a result of a careful planning in advance. Even if some deviations from this procedure are to be observed, these would be explained and later serve as a starting point for future investigations by other scientists. The only important prerequisite for this process to be successful is sharing as much additional information and research materials as possible so that all steps are going to be reproducible. Admitting drawbacks, which are an inevitable part of every research, shows not only responsibility but also willingness for contribution to the scientific improvement in near future.

Similar ideas are to be found in the article from Paul, Govaart, and Schettino (2021). The authors first examine how transparency in science is the best countermeasure against “hindsight and confirmation” biases and afterwards introduce the concept of preregistrations by explaining in detail its main characteristics. Together with that, they remind the readers about the possibility of adapting some information after the study is preregistered – this option is not strictly prohibited. Nevertheless, it is essential for scientists to give a detailed explanation of the reasons behind these adjustments (in a separate part of the text) and in this way prevent “HARKing”. In addition, preregistrations could help spotting controversial behaviour in any form (for instance: funding of experiments for reasons different from scientific contribution).

Likewise, researchers themselves might reap the benefits of preregistering a study. The time spent in this process (organizing the work in advance, thinking about possible solutions, collecting ideas, anticipating outcomes, etc.) is an invaluable experience, which they could use throughout their career henceforth.

In addition, Paul, Govaart, and Schettino (2021) give their own proposal of preregistrations steps for a “ERP study” – what should be included in the documents, where to start, how to write a structured plan, which templates might be useful and other important details which are typical for such a research. Moreover, the authors believe that even if this preparation is too demanding and time – consuming, it facilitates the whole publication process (before finalizing a study, a throughout protocol is expected to be available).

In their paper, Mertens and Krypotos (2019) shed light on how exactly researchers in psychology might benefit from using preregistrations when the focus of their studies is a “pre-existing” rather than not yet collected, “original” dataset. To begin with, the authors have chosen to address transparency and replicability in psychological research and the two main problems that arise in this regard: “publication bias” and “post-hoc hypothesizing”, also known as “HARKing”. The two experts give many examples of bad data – related research practices, which unfortunately happen not only in psychology as a scientific discipline. They also did not forget to mention some counter – arguments against preregistrations and the challenges involved in this practice such as invested preparation time, uncertainties, poor documentation and alternative, better approaches.

Nevertheless, the authors recommend ways of managing these issues and give reasons why preregistering a study might in fact simplify scientific work. As already discussed, research might be defined as either “exploratory” or “confirmatory” and in psychology the latter prevails. A further distinguishment between the types of datasets (“pre-existing” versus “original”) leads to the assumption that scholars who use the former often face difficulties in adopting preregistration techniques in their practise. As a possible solution to this problem, Mertens and Krypotos (2019) suggest the usage of a template, which consists of several sample questions. By answering all of them, scholars should feel confident enough that their preregistration meets the established criteria.

Similarly, Strømland (2019) draws attention to the importance of preregistrations for scientific credibility and reproducibility by offering a model which tries to diminish the effect of the so – called “p – hacking” (also known as “selective reporting” or “inflation bias”). The author has chosen to focus on Experimental Economics since it is believed this field to be less affected by such type of a bias. However, recent studies have shown that the reality is constantly changing, and one should take into consideration every aspect and possible consequences of this phenomenon.

Yet another scholar realizes the difficulty of the task to enhance replicability of studies. Krause (2019) highlights the need of including preregistrations as well as enough supervision as part of the research process, but only after certain prerequisites have been met.

Another common problem in research, especially in recent years, is data manipulation. In the first place, even scientists are prone to different kind of biases as part of their human nature and aware or not, become victims of their own failures and imperfections. Additionally, the constant pressure (both external and internal) to have as many publications as possible in order to establish themselves in scientific circles, force some scholars (particularly the unexperienced ones) to neglect or even worse – to manipulate their work. According to Wagenmakers et al. (2012), preregistrations of studies might diminish the negative effect of these dangerous circumstances. The authors contend that a clear distinction between the kind of research used (either confirmatory or exploratory) is crucial not only in psychology (their primary focus in the article), but also in other scientific disciplines. This step should lead to more credible results and a limitation of falsifications in science.

Assuming that preregistrations have been made properly, no findings of an exploratory analysis could be declared as part of a confirmatory one anymore. In conclusion, Wagenmakers et al. (2012) embolden the usage of “online repositories”, where a detailed documentation of the preregistered study will be saved for future references.

All the above-mentioned arguments in favour of the decision for preregistering a study could be found in the short article of Sijtsma et al. (2021). In addition, it is also mentioned that preregistrations with free public access help scholars, who are systematically reviewing studies, to have a clearer picture of how many of them were not published at all due to unfavourable, negative outcomes.

Furthermore, the authors believe that in recent years the tendency towards “research integrity” is gaining in importance and open science practices (such as preregistrations) are an inevitable part of this phenomenon. They present some facts from a “World Conference in Research Integrity” from 2019, where entrants themselves were encouraged to preregister their works. However, the results have shown relatively low rates of preregistrations. According to Sijtsma et al. (2021), this outcome could be an important indicator that the aforementioned type of methodology is time – consuming, still unpopular among researchers (especially those accustomed to traditional practices) and last, but not least – probably not the best choice for every scientific discipline.

Although this may be true, Gelman (2013) believes that preregistrations contribute to knowledge sharing and improvement of concepts. One could benefit from preregistering a study by receiving constructive criticism and motivation to optimize their work. However, to strictly concentrate on a plan and execute each step with finest precision is somehow a “mechanical” way of doing research. The author suggests the use of the so-called “mock reports”, which might help clarifying in advance key elements of the future analysis, but at a much lower cost.

Likewise, Van 't Veer and Giner-Sorolla (2016) consider preregistrations as beneficial both at scientific as well as at individual level for researchers in psychology and other disciplines. To begin with, after preregistering a study, one has a clearer picture of what methods are appropriate to be used, which the underlying theories are and what type of research is leading to the results.

As discussed in the previous articles, the authors indicate the role of preregistrations in opposing “HARK-ing” and “publication bias”, but also “reporting bias”. The latter is a kind of “under – reporting” practice, when scholars prefer to address only certain part of their analysis, which seems to illustrate at best their findings, and leave other information out. However, a detailed documentation could help detecting this proceeding. Equally important are the individual benefits for researchers due to preregistrations. Van 't Veer and Giner-Sorolla (2016) believe that planning in advance involves learning skills such as critical thinking, cooperation and responsibility, which enhance quality. In addition, sharing knowledge becomes much easier and accessible for other scholars.

In case of the “reviewed preregistrations” an additional challenge is being introduced: other people would evaluate whether the plan is reasonable and flawless. At the same time, this additional pressure might be a stimulus for optimizing the study.

In their first study Toth et al. (2021) include both unreviewed and reviewed preregistrations (better known as “registered reports”), as well as other preregistration types so that a more comprehensive analysis could be done. Comparing each of them to non – preregistered studies separately, the authors intend to find an existing regularity which type of preregistration contributes to scientific transparency the most, if at all. On the positive side, according to the overall results of their work, Toth et al. (2021) conclude that preregistered studies seem to be more transparent.

Another interesting tendency is to be observed: some researchers were extremely honest and shared even the slightest deviations from their original plan, but others preferred not to be so conscientious. Thus, the personal characteristics of the scientists themselves must also be considered when evaluating whether a preregistration leads to a higher level of transparency in research or not.

However, Toth et al. (2021) realize that not all aspects of preregistrations have been discussed yet. For the sake of completeness, the authors carry out a second study, where researchers with and without experience with preregistrations were asked a list of “closed – and open – ended” questions. The aim of this procedure was to summarize different viewpoints and evaluate if preregistering a study is a reasonable practice.

Among the benefits mentioned are an improvement in the research quality, since planning in advance also means a better, thorough work, as well as a more transparent and credible science, because some questionable practices would be limited (leading to more trustworthy findings). In addition, Toth et al. (2021) summarize the examples which scientists gave when asked what type of research would be most appropriate for preregistration. As expected, favourites were “confirmatory studies, replications, follow-up studies, experiments, lab studies, and surveys” since the majority of them could be reproduced without much effort.

In the same way, Nosek et al. (2018) define the lack of reproducibility of studies as one of the main challenges in science and preregistrations – as one of the most appropriate solutions to the problem.

Furthermore, the authors believe that the combined effect of cognitive biases (such as “hindsight bias”) and complexity of research itself could lead to the misuse of “postdiction” and “prediction” by many scholars. The resulting bad research practices (like “HARKing”) would endanger science development and become the reason behind the growing number of studies of poor quality.

In addition, Nosek et al. (2018) point out that the tendency towards findings which are either “novel”, “positive” or “clean” (or all these characteristics together) could change the focus of research. If only such study results are preferred for publication by editors of journals, this would encourage scientists to behave opportunistically so that they could achieve success and receive recognition. Nevertheless, this negative tendency, especially both the “publication” and “reporting” biases which dominate research, could still be forestalled by using preregistrations.

However, Nosek et al. (2018) are aware that preregistering a study does not automatically solve all the problems which exist in science, neither is this methodology easy to adopt and without any risks involved. Ideally, preregistrations should be the initial part of a step-by-step scenario with certain rules and logical outcomes. In reality, circumstances are much more complicated, and some unexpected events might hinder the unproblematic implementation of the planned tasks. For this reason, Nosek et al. (2018) enumerate the main challenges researchers face with regard to the process of study preregistrations as well as the possible solutions to these problems.

To begin with, even if correctly planned, the collection of data might be done in a different way than initially anticipated. Such deviations could be a consequence of important, yet small details, which a researcher did not think of in advance, or simply because some participants in the experiment act irrationally. Even though there is no guarantee that in such cases the corresponding study results would be unbiased, Nosek et al. (2018) still consider preregistrations as a useful technique. The disclosure of “deviations and their rationale” could improve researchers’ ability to learn from past mistakes and at the same time contribute to transparency in research.

Second, once a study has been conducted and data observed, scholars might realize that the preregistration was done incorrectly. For some reason, their assumptions had been wrong and several stages later, after a careful data analysis, one finds unsatisfactory results.

According to Nosek et al. (2018), avoiding this outcome altogether is difficult, but it might still be described in the preregistered plan (for example, if scientists choose to preregister a “decision tree”). On the one side, some potential disadvantages of such course of action should not be ignored (e.g., the risk to “preregister biases”), but on the other side, at least these errors could be identified easily.

Third, the idea of a researcher to conduct a study by using data, which is already available, might contradict the use of preregistrations. In a typical preregistered plan, little is known about the future and data is yet to be collected. However, Nosek et al. (2018) suggest that even if data is “preexisting”, it still could be used in a preregistration, but they emphasize the need of decisions made “blind to the data”. In other words, it is crucial that scientists have not observed the dataset in advance.

Yet, if they partially did examine it, then this should be reported in the preregistration plan. The aim is to ensure credibility of the study and evaluate in advance to what extent results would be biased.

Fourth, one must not forget the existing of the so-called “longitudinal studies”, which are extremely difficult to be preregistered because of the size of their datasets. In addition, in most cases such research takes years, and it would be impossible to plan ahead every single detail. Notwithstanding, Nosek et al. (2018) argue that the solutions described so far could also be applicable to longitudinal studies.

Moreover, one might make use of the fact that this type of research relies on yearly “new observations”: preregistering them beforehand would be interpreted as “partial blinding”. As already discussed, this is less dangerous for the interpretation of results and ensures at least some level of credibility.

Fifth, Nosek et al. (2018) point out that preregistrations might be advantageous also for scientists who work on several experiments at once and who are able to collect data in an uncomplicated way. If a group of researchers gains valuable insights into the same topic just by changing some “key aspects” of the original experimental model, then preregistering this process would lead to more “reproducibility” in science. In such cases, the preregistered plan could consist of a “template” describing all common characteristics of the experiments and in addition, the concrete adjustments made for each of them.

Sixth, in order to be efficient, preregistrations must give detailed information about every aspect of a study, including its background (in terms of “area of research” and “outcomes” in the field).

According to Nosek et al. (2018), only a fully transparent preregistration, which admits some possible limitations of the analysis at hand, might decrease the negative effect of “selective reporting” in the future.

Next, the authors address the popular misbelief in science that preregistrations are a useful tool only for confirmatory research (or in other words – for testing predictions). Scholars find exploratory research more difficult to be preregistered, because little is known at the beginning of such a study. On the other hand, there is always a risk of the interpretation of postdictions as predictions: many researchers tend to believe (or at least claim) that their findings were already anticipated, while most are actually “exploratory results”. Nosek et al. (2018) clarify how preregistrations could help solving this issue and be beneficial for both testing and generating hypotheses.

What often happens during a research process is an alternation between “testing predictions” and “generating postdictions”. For instance, at the beginning, one could have some predictions which would be “worth testing”, hence a scholar conducts a confirmatory study. At the same time, some of the already collected data might be used by another scientist for an exploratory analysis, whose findings could inspire new experts to make further predictions, etc. The described cycle illustrates the crucial role both type of studies play in scientific development.

For this reason, Nosek et al. (2018) suggest the preregistration of two separate studies - one exploratory and one confirmatory, which are connected to each other. The idea behind that is the first research to be an exploratory one and have a “simple analysis plan”, while the second study which follows would be confirmatory with predictions based on the results of the first. Hence, more clarity and credibility could be achieved, and one would be able to identify which of the results were predictions and which – postdictions. On the other hand, in the case of the so-called “cross – validation”, scientists have the possibility to preregister only the exploratory process of one and the same study. Since “the dataset is split in two”, researchers might first generate hypotheses from one part of the data and then test predictions with the other (which was “sealed” until this moment). However, having enough observations (which one could divide in two different parts) is often a very challenging task and enough time and persistence are needed for its successful completion.

Certainly, as in most cases conducting a study involves a team of more than one researchers, there might be some differences in the way colleagues think or organize their work. Even if the scientists “agree on the study design and analysis plan”, they still might prefer to test dissimilar predictions. Nevertheless, Nosek et al. (2018) argue that submitting a preregistration under such controversial conditions is rather an opportunity for scholars: they could prepare themselves better and find enough theoretical support for the final decision what to be included in the study.

Finally, every research process is dedicated to finding answers, but in order to reach greater audience, it is also important how “interesting” these findings are. Hence, many scientists tend to explain in more detail those of their results which sound more impressive. Even though this is also true for preregistered studies, Nosek et al. (2018) emphasize that a more transparent research also means increased objectivity. Since the authors are among the greatest proponents of preregistrations, in the last part of their paper they suggest ways how this methodology might be popularized in scientific circles. To begin with, Nosek et al. (2018) believe that with more practical experience and appropriate theoretical knowledge scholars would be able to preregister their studies without many problems. In this learning process, an adequate “training” would be helpful, therefore the authors enumerate several sources for a successful start.

In addition, Nosek et al. (2018) point out that preregistrations are not an entirely new concept for scientists from different disciplines, who, at least once in their careers, needed to prepare similar documents when applying for a grant, communicating with “funding agencies”, etc. Thus, with relatively small additional efforts, researchers could learn how to successfully preregister their studies.

Equally important prerequisite for the widespread “adoption” of preregistrations are the benefits they bring to scientists. If by preregistering their studies scholars could expect more “grants, publications, and awards”, then they would be more motivated to invest time and resources in this practice. According to Nosek et al. (2018), some of the measures already taken (by journals, institutions, and organizations to include preregistrations in the research process) also have their positive effect. Good examples are the obligatory preregistration of “clinical trials” in US, the “Transparency and Openness Promotion (TOP) Guidelines” as well as the “badges” which are given to researchers and their preregistered publications.

Hence, the authors believe that in the future it might be even necessary to make preregistrations part of the approval criteria for publication of studies. To demonstrate how powerful this change might be, Nosek et al. (2018) mention the “Preregistration Challenge” and explain in detail the characteristics and advantages of “Registered Reports” (both already discussed in subsection 2.1 and 2.2 of this work, respectively). In addition, the authors note that the number of preregistrations in some online repositories (such as OSF) is constantly growing, which is a good indicator of the overall acceptance of this methodology in different scientific disciplines.

The tendency described above might give hope to authors like Munafò et al. (2017), who are worried about the lack of credibility and reproducibility in modern science. Among the suggestions in their paper, preregistrations are one of the most widely discussed solutions to these problems.

To begin with, Munafò et al. (2017) consider “cognitive biases” as one of the main reasons for “false conclusions” in science and emphasize the need of practices, such as “blinding”, which could diminish their negative effect on research in the long run. In particular, the authors believe that by preregistering “study design, primary outcome(s) and analysis plan” scientists might successfully continue with their research without being unnecessarily distracted by data and results.

As Munafò et al. (2017) explain, preregistrations were initially standardized in “clinical medicine” and their aim was to reduce “publication bias” and prevent “analytical flexibility” (in terms of “outcome switching”). Nowadays, a thorough preregistration of a study also means increased transparency (since, in most cases, all the relevant documentation could be found easily). Thus, scholars are able to clarify if their research is “data-contingent” (in other words: “exploratory”) or rather “data-independent” (“confirmatory”), which is major issue discussed in scientific circles (Munafò et al., 2017).

According to Reich (2021), common problems in research (such as those discussed so far) might be solved if scientists get accustomed to preregistering studies (or using “registered reports” in their work). Even though the authors give “educational psychology” as an example, other scientific areas could also benefit from such “bottom-up” actions. In addition, some “top-down” measures (in terms of offering help, support and even incentives to scholars) could be helpful.

Similarly, researchers who have already used this methodology also give their positive feedback. Many of these people enjoyed the process of preparing the documentation and were pleased having all the necessary details written in advance, which helped them to organize their ideas in a structured plan (Reich, 2021). They were also delighted to “share” their knowledge (in terms of “methods and approaches”) with fellow scientists (Reich, 2021). Moreover, in case of the successful submitting of “registered reports”, those scholars were proud that their work was “one-third finished” even before the official publication of the paper (Reich, 2021).

Identically, the author himself has been part of a “research team” who preregistered a study and found the methodology very practical for several reasons. To begin with, by documenting their “thinking and decisions”, the scholars had gathered strong evidence which of their results were predicted and which were interpreted “post hoc” (Reich, 2021). Furthermore, the team of colleagues was able to present such “confirmatory findings” that they as researchers had genuinely supported. Last, but not least – by working on their preregistration, the scientists had the possibility to evaluate whether their decisions to choose this study and interpret its results in a certain way were biased or not (Reich, 2021).

3.2.2 Arguments against the use of preregistrations in research

At the same time, other scientists openly criticize preregistration as a methodology and see it rather as a threat for research quality. To begin with, Felgenhauer (2021) partly agrees with the thesis that preregistrations could reduce the effect of p – hacking and hence contribute to transparency in science, but, on the other hand, he fears of the emergence of other, more dangerous practices. For the sake of illustration of his idea, the author uses a simplified model which shows an important regularity: researchers who tend to use manipulations in their work even in the absence of preregistrations, might behave more opportunistically once preregistrations are being introduced. The reason behind this interesting conclusion is the fact that scientists have the incentive to be successful (in other words – to be published), but at the same time most of them try to avoid negative (or false positive) findings.

Without the formality of preregistrations, a scholar could run experiments insofar as the costs are reasonable and eventually the desired outcome is achieved. Sometimes results are not sufficient or as good as expected and an experimenter might choose not to work further on this topic. Then again, there is always the possibility of manipulating data or using similar opportunistic methods, if the researchers themselves are prone to such behaviour. Naturally, this kind of activities are not tolerated in scientific circles and might be punished immediately.

On the other hand, when a study must first be preregistered, scholars have certain limitations – for instance, they could have only one chance to prove their theory by running an experiment, whose outcome sometimes diverges from the initial idea. In this case, researchers might be tempted to use manipulation to increase the probability of their work being published. To sum up, several factors (such as readiness to behave opportunistically, potential harms and costs as well as experiments of greater or poorer quality) define either the benefits or disadvantages of preregistrations as a methodology.

Since MacEachern and Van Zandt (2019) have gathered enough experience in both research and education, they are able to be more objective when discussing preregistrations. The authors do not completely deny the value of this procedure, but also emphasize its limited usefulness – not every type of research is suitable for a detailed planning. In addition, the two experts consider preregistrations as a threat for creativity.

According to them, it is of great importance that scholars have both the freedom and inspiration to “immerse” into data. The article ends with some encouragement of the open scientific practices, cooperative work with colleagues from other disciplines and more guidance on every level.

Even stronger arguments against preregistrations are given by Pham and Oh (2021), whose article focuses solely on the negative side of this phenomenon with respect to consumer research. The authors described the actual state of the field as a “crisis” due to the increased number of suspicious practices which lead to difficulties with study reproducibility. Amid the list with diverse solutions to the problem, one can find preregistrations to be one of the most promoted methodology among scholars of different disciplines. There is even a tendency towards accepting it as a mandatory condition for publishing a study in the future. Albeit its huge number of potential benefits, this research procedure conceals many more risks as expected.

To begin with, the process of preregistering a study involves extensive preparation and thus could be very bureaucratic, tedious, and sometimes even costly (Pham & Oh, 2021; Reich, 2021). Scientists “who conduct many experiments” might feel overwhelmed, because in the case of “simple”, unreviewed preregistrations, where no publication is guaranteed, part of their efforts could be in vain (Reich, 2021). When, on the other hand, researchers submit registered reports (which are reviewed several times before publication), the invested time for preparation is seen as “time shift” (Reich, 2021). Hence, only a change in the publication process (for instance, requiring journals to include articles regardless of their “experimental results”), might compensate the time wasted on preregistrations (Reich, 2021).

Another key point is that the repositories for open science resources need to be constantly maintained and their quality ensured (Pham & Oh, 2021). In addition, often to be found are discrepancies between the original, preregistered document(s) and the ex-post published ones. Equally important condition for choosing preregistrations might be the complexity of the used model (Pham & Oh, 2021). Some studies have simple structure with only two variables, whose interrelation is easily determined. Unfortunately, a model might also depend on many more aspects and thus its design would be difficult for interpretation in advance.

Moreover, Pham and Oh (2021) believe that a significant part of consumer research discipline could not be preregistered due to its complex nature and, as an undesirable result, insufficiency might prevail. The authors also consider the possibility that other people involved in the preregistration process (such as editors) could decide that further reasoning is necessary and hence make scientists deviate from their original plan. Similarly, since data used in a study might be already collected, the task of researchers who want to preregister such analysis becomes more challenging. They need stronger arguments to prove their unbiased work (in terms of generating hypotheses and preregistering them without exploring the dataset in advance). Even if all potential risks explained so far could be ignored, there are some other problematic issues about preregistrations which Pham and Oh (2021) see as threats for scientific development. In general, one of the most discussed benefits of preregistrations is the assumption that they lead to greater transparency. At the same time, there are ways in which scientists might still be able to manipulate the documentation they choose to preregister. In that case only a suitable controlling mechanism might counteract this damaging effect, but this solution would not be for free. According to the authors, equally praised is the ability to replicate a study with less efforts if it was preregistered. This might also be only partially true because the specificity of a preregistration makes it bound to certain conditions and not a generalized starting point for further investigations. Moreover, even if a research is reproducible, it still might not contribute much for the scientific field and hence become irrelevant.

Pham and Oh (2021) continue with their critic by debunking another myth about preregistrations – what type of data is more appropriate to use in such cases. The general opinion is that only not yet collected dataset should be used when preregistering a study, since the alternative (already existing data) biases the analytical process which follows. However, according to the authors, the focus should be rather if a study, regardless of whether preregistered or not, has an actual fit between the research topic and its implementation as well as the type of data. In addition, Pham and Oh (2021) warn of the following tendency: editors might be misled by considering that a preregistered study is of better quality, simply because the preregistered information corresponds to the actual findings. This could lead to an increased number of type – I errors. The authors do not forget to discuss the relation of preregistrations to both confirmatory and exploratory research, which happens to be a bone of contention between experts worldwide.

Additionally, the two scholars enumerate other alternatives to preregistrations, whose positive impact on “transparency and reproducibility” in science could be the same, if not greater. Moreover, Pham and Oh (2021) believe that part of the scientific creativity also gets lost if researchers strictly follow all steps of their own preregistration. Sometimes the best and most valuable findings are a result of unconventional thinking, different perspectives and time spent on discussions with like – minded people.

The critique does not stop here – according to Pham and Oh (2021), scientists are somewhat forced to continue with their preregistered work even if it is a “causa perdata” because of sunk costs, complexity of the planned experiments or involvement of other people in the process. In addition, reducing science flexibility and making research unfavourable due to higher costs could lead to an escalation of the “errors of omission” (better known as “type – II errors”). Thus, the quality of research might be affected and only superficial studies with easily obtained confirmation of results would be preferred among scholars. Even worse, with strict rules and frames within which scientists should plan and execute their work, too much focus on these details could eventually cause a false depiction of reality.

Finally, Pham and Oh (2021) express their concerns that preregistrations are a potential threat for science because of the illusory impression they leave, particularly as “valid”, “unbiased” and “error - free”. Naturally, this is not always the case and in addition, not every study could be adapted for preregistration, which not necessarily means that it is of lesser quality.

Worth mentioning is another interesting argument against the massive use of preregistrations in research: they are costly. According to Pham and Oh (2021), costs could be described either in a sense of real expenditures and invested preparation time, or, more metaphorically, in terms of creating opportunities for manipulation of documents and results. As the authors note, some institutions might have better “resources and facilities” than others and hence, going through the whole preregistration process would be much easier for them. This unfair starting position could discourage scholars with less advantages from continuing with their research. Another point often overlooked is the role of editors, reviewers, and readers during (and after) the preregistration process (Pham & Oh, 2021). These groups of people have their personal preferences (for instance: which topics could be interesting and should be selected or praised, etc.).

In a way, with the influence they have, the above – mentioned communities might set standards for future research that are highly limited and unfavourable for science development.

Although being among the proponents of preregistrations, Paul, Govaart, and Schettino (2021) indicate some of the popular prejudices against this practice such as the time and effort needed for its successful implementation as well as some unexpected deviations from the original plan that may occur and hinder the process. Still, the authors see these disadvantages rather as opportunities to learn.

Szollosi et al. (2020) are among the scholars who also question the role of preregistrations in scientific research. According to the authors, part of the arguments in favour of study preregistrations are not consistent with the real benefits (or more precisely – the lack of such) of this method. They believe that the process of improving theory and resolving statistical issues does not necessarily depend on the fact whether a study is preregistered or not, but rather involve other factors such as better “statistical approximation” and “scientific problem – solving”. In addition, the authors point out the risk of preregistering a theory or studies of poor quality, which might have a negative effect on scientific development in the future. Thus, preregistrations should not be incentivized.

In their worst, studies could be already completed, and their preregistration plan might suspiciously (almost perfectly) fit the outcome thereafter. To better describe this phenomenon, Yamada (2018) suggests the term “PARKing” (“Preregistering After Results are Known”) and discusses it along with other dangerous, “un-ethical practices”. In the author’s view, although preregistrations are a good example for preventive measure against some of the “misconduct in research”, they are not the best solution and could even be harmful. A revolution in the way scientific research is done might be needed so that most of the negative tendencies disappear (or at least their effect be mitigated).

Other authors who partially discuss the flaws of preregistrations are Van 't Veer and Giner-Sorolla (2016), but they prefer to analyse “reviewed” and “unreviewed” types separately. First, additional effort is needed in both forms of preregistrations, but the “reviewed” are more complicated and consist of several stages where editors should re-evaluate the study before its actual publication. Some other popular concerns about preregistrations (especially the “reviewed” ones) are that if one uses this methodology, studies with no interesting contribution to science would prevail and creativity might suffer (Van 't Veer & Giner-Sorolla,

2016). However, the authors find these arguments not strong enough, since with proper rules adjustments, the negative effects could be avoided. Moreover, even the so-called “null results” findings have their important place in scientific literature and experts still have interest in them.

According to Van 't Veer and Giner-Sorolla (2016), equally weak logical reasoning is the fear that preregistrations are a potential threat to researchers with original ideas. If one has chosen to preregister a study, it is possible to restrict public access for certain time, which ensures that no idea might be stolen. In comparison, “reviewed” preregistrations could be exposed to greater risk, since some unethical editors might choose to misuse their power and take advantage of somebody else’s proposition (Van 't Veer & Giner-Sorolla, 2016). However, since in the preregistration process documents are time – stamped and everything is described in detail, such opportunistic behaviour would be exposed on time.

Nevertheless, according to the authors, not all disadvantages of preregistrations could be ignored. To begin with, even the most detailed plan is not capable of capturing every possible outcome – hence, this procedure is far from perfect. To some extent, “reviewed” preregistrations are less likely to leave a space for “flexibility”, since researchers are expected to justify their decisions in front of editors (Van 't Veer & Giner-Sorolla, 2016). Second, almost nothing could be done to entirely stop some scholars from falsifying their work and thus, endanger the integrity in their respective scientific fields. Last, but not least, Van 't Veer and Giner-Sorolla (2016) realize that in the vast world of research, not every type of study is suitable for preregistration.

Identically, Toth et al. (2021) summarize some concerns about this methodology, which scientists from different fields share. In their second study, the authors were able to ask two groups of researchers about the potential drawbacks of preregistrations. Some of these people have already preregistered a study of their own at least once, while the others were completely inexperienced.

Still, both groups are unanimous that preregistrations hinder the creative research process, set unnecessary limitations and last, but not least – demand a great amount of time for preparation and executing (Toth et al., 2021). In addition, preregistering a study is a confusing practice, and one needs to be competent enough to face the potential difficulties which might appear along the way.

In this context, Toth et al. (2021) point out that many researchers believe no adjustments are possible after a preregistration is submitted. However, this is not true, since modifications are not prohibited; they just have to be disclosed afterwards.

Another unfounded rumour which circulates is that preregistrations are risky because it becomes easier for other researchers to “steal” one’s own ideas before even the collection of data had begun (Toth et al., 2021). Again, as the authors emphasize, this could not happen so easily, since many repositories for open science offer the option of an “embargo”: nobody could access the preregistration for a certain period (for instance – till publication of the study), unless the researcher allows it.

Nevertheless, scholars are still sceptical because of some “privacy and confidentiality issues” regarding the use of “online platforms” (Toth et al., 2021). An equally important argument against preregistrations is that they are incompatible with some disciplines and type of research. As examples, Toth et al. (2021) give studies which are either “large or complex”, “qualitative”, such that rely on “secondary data sources” or are simply an “exploratory research”. Moreover, among scholars from different disciplines prevails the opinion that to be published nowadays, one should always aim for having “significant” results (Toth et al., 2021). Thus, preregistrations would lose their importance, if editors continue to have the same criteria as before and consider only certain types of research as “worthy” of publication.

In addition, one of the participants in the second study of Toth et al. (2021) claimed that scholars would prefer to use preregistrations only in two scenarios: either if this becomes a prerequisite for publication (in most of the highest – ranking scientific journals) or a condition for “promotion” or “tenure” (in the institutions, where most of the researchers work). In other words, by incentivizing preregistrations or making them mandatory, there would be more scientists who are willing to give their best and invest time and resources in this practice (Toth et al., 2021).

4. Methodology of the Master thesis

The present section provides a detailed overview of the methodology chosen to be used in this Master thesis. One can find more information about what the planned stages of the research process were, what type of data was required, why certain approaches were preferred and what were the reasons behind the made decisions. Data collection and data analysis will be discussed separately in the two following sections – Section 5 and Section 6, respectively.

The very first step of writing this thesis included a consultation with my supervisor, who was kind enough to give some initial ideas. These suggestions proved to be very useful for the organizational planning. Although preregistrations were already established in disciplines like Medicine for example, they were a relatively unknown research practice, which was gaining popularity among academics only in recent years. Moreover, an increasing number of scientists from different disciplines were choosing to preregister their studies as a sign of a transparent and credible interpretation of results.

However, it was difficult to find enough information about preregistrations in Management and hence, one was able to identify a research gap with a potential relevance for many scholars. It became clear that the scientific impact of preregistrations in Management could be an excellent topic for further investigation. By answering this research question, one could evaluate how preregistrations could shape the research process in the future and whether this practice might be beneficial for scholars (in terms of broader recognition among their peers as well as proven quality of their studies).

Shortly after the formulation of the research question, one needed to define how this impact should be measured and what other disciplines besides Management would be an appropriate basis for comparison. What was needed for the purpose of this quantitative research was a reliable secondary data because it would have been less costly and time-consuming to collect information in such a way. As one found, a popular method to measure scientific impact of a research study was to consider “the number of citations that papers, authors, departments or journals receive” (Mingers & Lipitakis, 2010, p.624). Since Google Scholar was a respected search engine for literature across different scientific disciplines with a free access, used every day by many people around the world, it seemed the optimal source of such information.

Moreover, it was organized in a way that users could easily see the number of citations their search result has. Hence, the impact of preregistrations was going to be expressed as a number of citations in Google Scholar: more citations were equivalent to a greater impact and quality of the scientific studies in question. Even though it was possible that later other factors regarding these articles also had to be considered (such as the popularity of their author or authors, the journal and year of their publication), at this stage of the planning process one needed to continue with the further aspects of the Master thesis.

Another important choice to be made was selecting two scientific fields of study so that one of them would be similar to Management (but still having its peculiarities) and the other would be focused on different (yet related) research topics. As kindly suggested by my supervisor, Marketing and Psychology were chosen as the two other disciplines where one was going to analyse the impact of preregistrations. According to Vieira and Teixeira (2010), Management and Marketing are two scientific fields which share some “similarities”: both could be described as “a non-autonomous, hybrid, and recent field of research” and are influenced by Psychology (p.642). On the other hand, even though Management and Psychology are “related” disciplines, the former is characterized by “micro and macro research”, while the latter “focuses more on individuals and small groups” (Agarwal & Hoetker, 2007, p.1307). Thus, by evaluating preregistrations in Management, Marketing and Psychology, one was able to compare results from three leading scientific disciplines.

However, for a more comprehensive analysis, it was essential to also consider the not preregistered studies within the same fields of research. Preregistrations were gaining popularity mostly in recent years and thus, most scientific journals consisted of a higher number of studies which were not preregistered. Only by comparing the two types of articles, one could find possible causality. In addition, Sarafoglou et al. (2022) show in their study that the decision whether scientists would prefer to preregister their research or not might depend on their “past experience”. Academics who already have used preregistrations in their work tend to have a more positive attitude towards this practice (despite the invested time and efforts), while their colleagues who have never preregistered a study remain rather sceptical (Sarafoglou et al., 2022). Hence, if scholars from a certain scientific discipline got accustomed to use preregistrations, then the impact of this practice on the research field in question might be greater.

The next organizational task was to design a simplified research model so that it would be easier to understand which variables should be included and how they interacted with each other. The model created for this purpose is shown in the picture below.

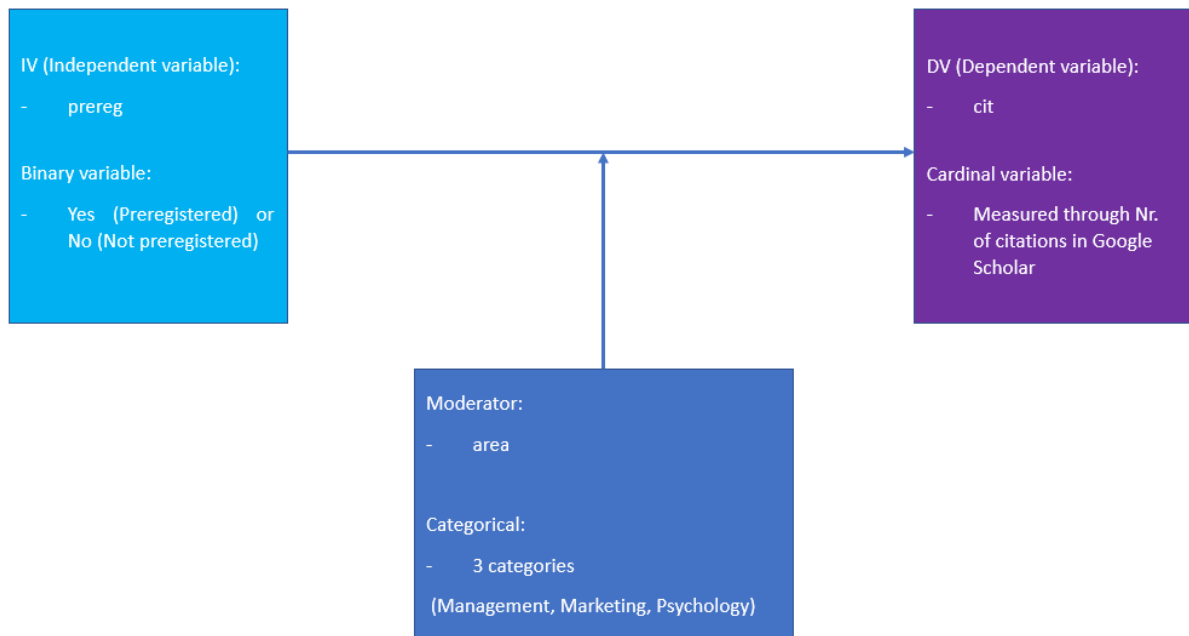


Figure 1. Research model

As illustrated in the model, the independent variable (IV) is named “prereg” (derived from the word “pre-registration”) and is defined as a binary variable. It could take the following two values: “Yes” or “No”, indicating that the collected observations were either preregistered studies or not.

The dependent variable (DV) is called “cit” (a short form of the word “citations”) and is treated as a cardinal variable. It is measured by the number of citations (according to Google Scholar) a study received. As already explained, this measurement was used to show the quality of a scientific work (more citations meaning greater scientific impact). Initially, it was assumed that the values this variable could take were natural numbers (1,2,3... to infinity), or, in other words, a study should have been cited at least once. However, during data collection, several articles with zero citations were found. Hence, to be precise, the DV “cit” had whole numbers as values (0,1,2,3... to infinity; also known as “non-negative integers”). In addition, since the chosen dependent variable was also a count variable (measuring how many times a research study was being cited), the use of Poisson regression in the upcoming data analysis appeared to be a reasonable approach.

The research model also includes a moderating variable called “area”, which consisted of three categories for each of the three scientific disciplines that were previously chosen: Management, Marketing and Psychology. With the introduction of this moderator, it was possible to examine whether the relationship between preregistrations and their scientific impact would change and in particular – be stronger in certain cases (for instance: preregistered studies within the Management discipline). A possible control variable considered in the analysis is the year of publication, since it might influence the number of citations of a study (by receiving more peer attention with time).

The main hypothesis that had been initially developed can be formulated as follows: “If a study is preregistered, then it will have a greater scientific impact and more so within the Management discipline”. An alternative formulation may also be: “the scientific impact of preregistrations will be greater if a study belongs to Management discipline”.

The following two sections outline important methodological aspects: while Section 5 presents a detailed description of the process of data collection, Section 6 gives information about the statistical analysis procedures. Next, an initial discussion, based on the results of this analysis, is provided in Section 7.1, followed by some limitations of this thesis in Section 7.2.

5. Data collection

This section describes the collection of data, the creation of the relevant dataset as well as the unexpected challenges which needed to be addressed.

The data collection process included a detailed search with several predefined criteria. It considered scientific articles with and without preregistered studies, which were published in the period 2018 – 2022, across three different academic disciplines: Management, Marketing and Psychology.

Two types of scientific papers were of interest – both articles without any reported preregistrations and such with (at least one) preregistered study or experiment. To ensure data quality, a list of highly ranked journals was preselected for each scientific discipline. Among them were for instance “Academy of Management Journal”, “Journal of Marketing” and “Journal of Applied Psychology”. As already explained in Section 4, Google Scholar served as the primary information source regarding the number of citations.

Given that study preregistration is a relatively new approach especially for disciplines like Management, it was necessary to define an appropriate time frame for the upcoming data collection. The initial idea, kindly suggested by my supervisor, was to look for scientific papers with a starting point 2018. The selected period of five years (2022 marking its end) was considered sufficiently long for gathering enough data records at this stage of dataset preparation (please note that the writing of this thesis took more time than anticipated, hence the gap between data collection and publication of results). Although a few preregistered articles from 2016 and 2017 were identified, they were excluded from the final version of the dataset. The reasons behind this decision are discussed in more detail in Section 6. Thus, only studies from 2018 onwards were considered for further analysis.

An interesting phenomenon was observed in the final dataset: most of the scientific articles with mentioned preregistrations were not exclusively preregistered. Many of them had a combination of preregistered and non-preregistered experiment or studies. This tendency was more typical for papers within the Management and Marketing disciplines.

During the data collection process some unexpected issues arose. Creating a suitable dataset was a thorough process, which took several months for completion and almost as much for refining and double-checking all the data records for inconsistencies. Even though one used already publicly available secondary data (the number of citations according to Google Scholar), it was still necessary to describe and summarize this information in an appropriate table in Excel. The final dataset consisted of 18 columns, which description served as creation for variables at a later stage. A summary of the columns as well as their descriptions are shown in the Table 1 in Appendix B.

Once the final version of the dataset (named “Dataset.xlsx”) was created, it was possible to begin with data analysis in STATA.

6. Data analysis

This section aims to give an overview of all statistical methods which were chosen for data analysis. The scientific impact of preregistrations, measured by number of citations, was investigated in a stepwise approach as follows: (1) descriptive statistics, (2) model selection, (3) regression analysis and (4) post-estimation tests.

6.1 Descriptive Statistics

The initial overview of the data used for further analysis was provided by some general descriptive statistics. The dataset consisted of approximately 271 observations (from the period between 2018 and 2022) and was processed in the statistical software STATA (Version 18.0). All data records were categorized into three different academic disciplines (Management, Marketing and Psychology).

name	varlab
id	ID
year	Year
journal	Journal
area	Area
area_ps	Dummy var for Area = Psychology
area_mk	Dummy var for Area = Marketing
area_mn	Dummy var for Area = Management
prereg	Preregistered: Y or N?
types	Types of Studies across Areas
cit	Nr. of citations according to Google Scholar (= impact / prestige)
authors	Author(s)
papername	Name of paper
preregat	Preregistration available at
template	Template from AsPredicted.org
nrtotalst	TOTAL Nr. of studies/experiments
nrnotprereg	Nr. of NOT preregistered studies/experiments
nrprereg	Nr. of PREREGISTERED studies/experiments
addst	ADDITIONAL studies/experiments
nraddsttotal	Nr. of ADDITIONAL studies/experiments in TOTAL
addstprereg	PREREGISTERED ADDITIONAL studies/experiments
nraddstprereg	Nr. of preregistered ADDITIONAL studies/experiments

Table 1. Variables Overview

The dataset includes both continuous and categorical variables, which were recoded if needed. The variable *area* is a categorical variable showing the research area to which each article belongs. Initially, it was a string variable, hence it was recoded as follows: Psychology (*area* = 1), Marketing (*area* = 2), and Management (*area* = 3).

In addition, three dummy variables (*area_ps* for Psychology, *area_mk* for Marketing, and *area_mn* for Management) were created, so that they can be used separately in regression models in case of specific conditions. Each of these dummies takes the value 1 when the article belongs to the respective area and 0 otherwise.

The two main variables were *prereg* and *cit* – the former being the independent variable in the model, while the latter was used as dependent variable. In addition, *prereg* was binary, indicating whether the study was preregistered or not (*prereg* = 1 for preregistered and *prereg* = 0 for non-preregistered). The variable *cit* was a count variable expressing the number of citations.

Last, but not least, a new variable *types* was generated so that all possible combinations of area and preregistration status could be captured and all types of studies across the three academic disciplines could be distinguished. The six corresponding categories were: 1 = Not Preregistered in Psychology, 2 = Preregistered in Psychology, 3 = Not Preregistered in Marketing, 4 = Preregistered in Marketing, 5 = Not Preregistered in Management and 6 = Preregistered in Management. All six study types (area × preregistration combinations) were well represented in the sample. There were no missing values in the dataset.

Preregistered: Y or N?	Area			
	Psychology	Marketing	Management	Total
No, not preregistered	61	42	39	142
Yes, preregistered	16	71	42	129
Total	77	113	81	271

Table 2. Preregistrations among areas

The average number of citations (*cit*) was 27.85, while the standard deviation of 25.97 was relatively high. This indicates that the number of citations varies substantially across the sample. In addition, the minimum number of citations is 1, while the maximum reaches 274 (could be a possible outlier and must be taken into consideration). On the other hand, the variable preregistration (*prereg*) has a mean of 0.476, which denotes that approximately 47.6% of the articles were preregistered.

The variable *area* is a categorical variable with values from 1 to 3, which corresponds to the three scientific areas: Management, Marketing, and Psychology. The mean of 2.01 suggests a relatively balanced distribution.

Variable	Obs	Mean	Std. Dev.	Min	Max
id	271	136	78.375	1	271
year	271	2020.812	1.141	2018	2022
journal	271	6.303	3.304	1	14
area	271	2.015	.765	1	3
area ps	271	.284	.452	0	1
area mk	271	.417	.494	0	1
area mn	271	.299	.459	0	1
prereg	271	.476	.5	0	1
types	271	3.506	1.717	1	6
cit	271	27.845	25.97	1	274
preregat	271	5.808	1.826	1	7
template	271	3.255	.692	1	4
nrtotalst	271	3.963	2.82	1	17
nrnotprereg	271	2.557	2.123	0	12
nrprereg	271	1.406	2.245	0	17
nraddsttotal	271	1.624	2.293	0	15
nraddstprereg	271	.469	1.371	0	13

Table 3. Descriptive Statistics

Next, to get a better overview of the distribution of number of citations, a histogram of the variable *cit* was plotted. It was not normally distributed but rather right-skewed. In addition, some articles were highly cited with more than 100 citations. These were identified as possible outliers and hence all papers with more than 100 citations were dropped from the analysis.

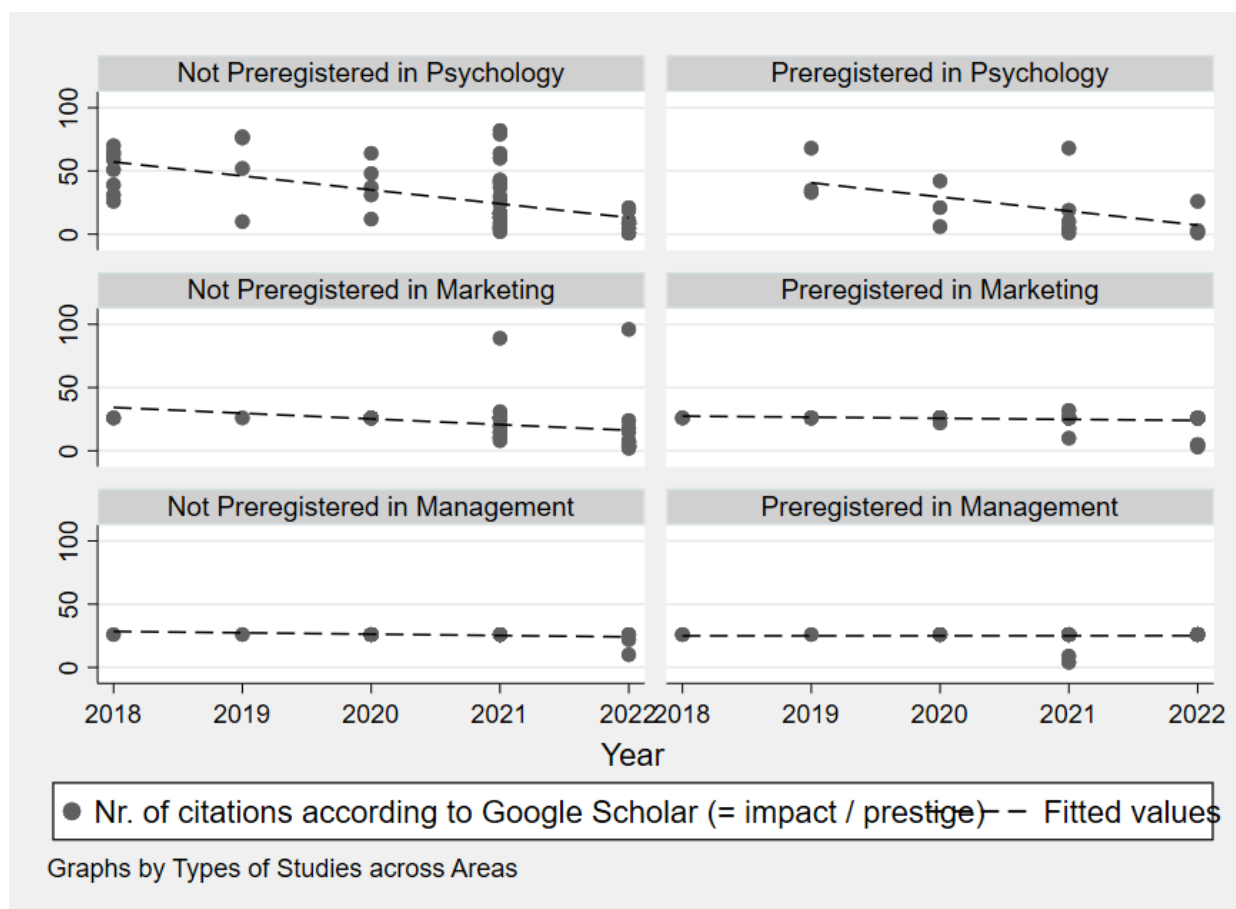


Figure 2. Scatterplots

Furthermore, as Figure 2 above shows, some scatterplots were created to visualize the number of citations across publication years, separately for preregistered and non-preregistered articles in each area (types). These plots were useful for interpretation of possible patterns and trends over time. Additionally, fitted lines were also included to make potential relationships between publication year and number of citations more visible. There is no clear pattern between citations and time. In general, there are also no great differences between the groups.

6.2 Model selection

In the following some preliminary checks in the process of model selection will be discussed. To ensure the suitability of the data, a correlation matrix for the main variables (cit, prereg, area, and year) was computed. As expected, no problematic correlations were detected. The dummy variables for the different areas showed perfect collinearity.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) id	1.000																
(2) year	0.028	1.000															
(3) journal	-0.020	-0.144	1.000														
(4) area	-0.509	0.092	-0.062	1.000													
(5) area_ps	0.675	-0.135	-0.008	-0.831	1.000												
(6) area_mk	-0.435	0.101	0.109	-0.034	-0.527	1.000											
(7) area_mn	-0.186	0.022	-0.109	0.843	-0.402	-0.567	1.000										
(8) prereg	-0.533	0.072	0.186	0.231	-0.336	0.251	0.055	1.000									
(9) types	-0.610	0.104	-0.000	0.958	-0.839	0.043	0.767	0.500	1.000								
(10) cit	-0.098	-0.383	-0.005	-0.041	0.087	-0.092	0.016	-0.013	-0.041	1.000							
(11) preregat	0.361	-0.020	-0.161	-0.199	0.303	-0.240	-0.035	-0.685	-0.379	0.025	1.000						
(12) template	-0.358	0.118	-0.007	0.121	-0.245	0.255	-0.037	0.394	0.224	-0.057	-0.447	1.000					
(13) nrtotalst	-0.430	0.084	0.077	0.026	-0.356	0.600	-0.302	0.430	0.150	-0.096	-0.245	0.294	1.000				
(14) nrnotprereg	-0.189	0.002	-0.097	-0.065	-0.233	0.518	-0.332	-0.125	-0.095	-0.046	0.113	0.007	0.616	1.000			
(15) nrprereg	-0.359	0.103	0.188	0.094	-0.225	0.262	-0.063	0.655	0.276	-0.076	-0.413	0.361	0.669	-0.174	1.000		
(16) nraddsttotal	-0.190	0.175	-0.052	0.173	-0.243	0.173	0.049	0.257	0.229	-0.063	-0.076	0.126	0.238	0.007	0.290	1.000	
(17) nraddstprereg	-0.147	0.124	0.031	0.102	-0.187	0.181	-0.014	0.359	0.196	-0.076	-0.174	0.187	0.295	-0.124	0.485	0.649	1.000

Table 4. Correlation matrix

Additionally, the average number of citations between preregistered and non-preregistered studies was compared. Non-preregistered studies tend to have slightly higher number of citations, but a t-test showed no significant difference in number of citations between preregistered ($M = 24.70$) and non-preregistered papers ($M = 25.10$), as the p-value was clearly above 0.05 (see Appendix C, Table 2). Lastly, an additional check for multicollinearity was being conducted by using Variance Inflation Factors (VIF) based on a simple regression model including the main variables (prereg, area, and year). All VIF values were low, which suggested that multicollinearity should not be a problem in the analysis.

6.3 Regression analysis

The initial analysis led to the decision to use Poisson regression, since this is a common procedure when having a model with a count data as dependent variable. It is important to mention that in a Poisson distribution the mean and variance are the same. However, after a detailed examination of the variance of the variable *cit* there was evidence that it was much larger than its mean, which raised concerns about overdispersion. Hence, it was necessary to test for it.

As a first step in this regard a Poisson regression was run in STATA. The goodness-of-fit test showed a significant result ($p < 0.05$), indicating that the Poisson model does not fit the data well. This was also supported by the high chi-square value in the model (see Appendix C, Table 3 and Table 4).

Unfortunately, since the conducted checks showed that the variance exceeded the mean significantly and overdispersion was going to be a problem for the further analysis, an alternative regression model was chosen: the so-called NBREG (negative binomial regression). In general, it is more suitable when dealing with overdispersed data. Moreover, the model also included an interaction term between preregistration and the research area, exactly as it was planned in the initial research model. The model fit improved, and the likelihood-ratio test confirmed that the overdispersion parameter (alpha) was significantly different from zero. This suggested that the negative binomial model is more appropriate for the given data.

Both the Poisson and negative binomial models were also estimated using Incidence Rate Ratios (IRRs) for easier interpretation. A final model comparison confirmed that the negative binomial regression is better suited for this analysis.

6.4 Regression Results

The results of the negative binomial regression are shown below. The variable *prereg* is not significantly related to the number of citations. This means that preregistered articles do not receive more or fewer citations compared to non-preregistered ones.

```
. nbreg cit i.prereg##i.area
```

Fitting Poisson model:

```
Iteration 0: Log likelihood = -1738.2821
Iteration 1: Log likelihood = -1738.2821
```

Fitting constant-only model:

```
Iteration 0: Log likelihood = -1122.2898
Iteration 1: Log likelihood = -1072.482
Iteration 2: Log likelihood = -1068.9725
Iteration 3: Log likelihood = -1068.969
Iteration 4: Log likelihood = -1068.969
```

Fitting full model:

```
Iteration 0: Log likelihood = -1065.8163
Iteration 1: Log likelihood = -1065.7702
Iteration 2: Log likelihood = -1065.7702
```

Negative binomial regression

```
Number of obs = 265
LR chi2(5) = 6.40
Prob > chi2 = 0.2694
Pseudo R2 = 0.0030
```

Dispersion: mean

Log likelihood = -1065.7702

cit	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
prereg						
Yes, preregistered	-.210444	.1773297	-1.19	0.235	-.5580039	.1371159
area						
Marketing	-.3098352	.1244064	-2.49	0.013	-.5536673	-.0660031
Management	-.0995586	.1272278	-0.78	0.434	-.3489206	.1498034
prereg#area						
Yes, preregistered#Marketing	.3974332	.2138205	1.86	0.063	-.0216473	.8165137
Yes, preregistered#Management	.1945269	.2236845	0.87	0.384	-.2438866	.6329405
_cons	3.337204	.0802223	41.60	0.000	3.179972	3.494437
/lnalpha	-1.10475	.0986434			-1.298088	-.9114126
alpha	.3312937	.0326799			.2730535	.401956

LR test of alpha=0: **chibar2(01) = 1345.02**

Prob >= chibar2 = **0.000**

Table 5. Negative binomial regression

Regarding the areas, an interesting phenomenon was observed – articles from Marketing tend to receive significantly fewer citations compared to articles from Psychology (the reference group). However, the difference for Management is not significant. The interaction terms between *prereg* and areas are also not statistically significant, suggesting that the relationship between preregistration and number of citations does not vary much across the three academic disciplines.

6.5 Post-estimation tests

After running the Negative Binomial Regression in STATA, some additional post-estimation tests were carried out. Unfortunately, the commonly used in STATA Pearson χ^2 goodness-of-fit test (via the command *estat gof*) is not available for NBREG. Nevertheless, other procedures still provided enough evidence that the chosen model was more appropriate for this analysis. For instance, the likelihood-ratio test confirms that the negative binomial model fits the data better than the Poisson one. Another comparison (between AIC and BIC values) also showed that the negative binomial regression model was the better choice for analysis (see Appendix C, Table 5).

Another postestimation step was testing whether the interaction terms between preregistration and area are jointly significant using a Wald test (*testparm*). The result ($p = 0.1593$) showed that the interaction is not statistically significant (see Appendix C, Table 6).

The following section provides a discussion of the results of the data analysis and highlights some limitations.

7. Discussion

This section presents a summary of the main results with some possible explanations as well as several limitations of this research.

7.1 Explanation of results

The results of this research lead to the conclusion that preregistrations as a methodology does not significantly influence how often articles are cited. In other words, the preregistered papers from this dataset were cited neither more nor less compared to those that were not preregistered. Possible explanation might be that the number of citations is most likely influenced by other factors, such as topic of the paper, the journal where it is published, how visible the article is, or even the popularity of its author(s).

There are also several differences between the research areas. For instance, articles within Marketing discipline tend to be cited less compared to articles within Psychology area, while for Management, the difference is not statistically significant. This tendency is probably a result of the general citation “behaviour” of these fields. In addition, Psychology remains a larger and more active discipline with generally higher number of citations, and preregistration is already more common there (becoming even a standard, a norm). On the other hand, Marketing may naturally have fewer citations due to its smaller size or specific publishing practices.

Last, but not least, the limited effect of preregistrations might also be explained by its current state: it may be recommended more often, but it is still not widespread across all research areas. Therefore, readers, peers and even authors themselves might not yet consider preregistrations as an important part of their decision-making process which papers to cite.

7.2 Limitations

This Master Thesis was carefully planned to address the main aspects of the research question and to analyse them in detail. However, some limitations should be mentioned.

To begin with, the data collection process aimed to include both preregistered and non-preregistered studies. However, as the search results had shown, the sample was imbalanced and not perfect, even if randomized as initially planned. A bias might exist, because it was much easier to find non-preregistered articles in all scientific journals (especially in the disciplines Marketing and Management).

Second, the dataset was updated several times during the writing process. Interestingly, even though after a few months, most of the scientific papers showed little to no change in their citation counts. On the other hand, according to Google Scholar, there were also some articles, whose number of citations had risen progressively (or was negatively adjusted due to misinformation). Unfortunately, it would have been complicated to create separate datasets to compare all value fluctuations through the years. Therefore, the reasons behind these developments remain open for future research. Moreover, the use of Google Scholar as the only source for number of citations might also be an important limitation. As mentioned, the numbers change continuously, and the created dataset may not fully show the most recent numbers of citations.

Additionally, there were differences in how authors reported additional studies and experiments. Some papers described them in detail and counted them separately, while others were less precise. However, this information was not included in the statistical analysis.

Another limitation could be the impact of the COVID-19 pandemic, which started in 2020, because it might have influenced citation patterns and publishing behaviour. Some papers may have received more or fewer citations depending on whether they were related to COVID-19, as this was the main topic during that period. This external factor was also not considered in the current analysis.

Finally, in recent years there is an increasing use of artificial intelligence (AI) tools, which gain more popularity even in scientific circles. In general, the process of creating preregistrations templates (brainstorming of ideas, collecting of initial data, writing proposals, etc.) might be positively affected by the adoption of AI. Such tools could make preregistration easier and less time-consuming for researchers and might even influence how research is written, published, and cited in the future. However, this factor was not taken into consideration in this thesis, as it mainly affects papers published more recently.

8. Conclusion

Even though research was once an extremely competitive environment, nowadays other norms and values prevail. Knowledge sharing is an essential step so that the whole humankind could benefit from a fast scientific progress. Therefore, the introduction of preregistrations gave hope that good planning and open science approaches are a favourable combination but also brought up some important questions. Would the practice of study preregistrations be the long – awaited solution to the most issues that hinder scientific growth? Or is it rather only a modern method, soon to be denied and forgotten? On the other hand, people tend to be sceptic: we usually need more proofs, more examples, more tangible results – and all this in short time. Should we then determine the future fate of preregistrations only based on a brief observation, without genuinely learn more about them before our final decision?

One must not forget that there is also a third option – preregistrations might be useful, but only for certain scientific disciplines. This does not mean that preregistering a study should be always seen as an unnecessary additional step in the research process.

If it is advantageous for certain disciplines – it would be a good idea to let them benefit from this procedure and use it for science development. However, for those fields of study, such as Management, where pre-registrations do not help much or even complicate the research process, other alternatives should be explored. Very often the perfect solution to a problem is found just by initially rejecting a certain idea.

This Master Thesis aimed to investigate whether preregistrations have an influence on the number of citations in Management by taking into consideration two other research areas (Psychology and Marketing). The results showed that preregistration alone does not significantly affect how often articles are cited. However, differences between the scientific fields were observed, with Marketing articles receiving fewer citations compared to Psychology, while Management showed no clear difference. These results neither fully confirm nor completely reject the usefulness of preregistrations. They simply suggest that their influence might not be found in just a stand-alone measurement such as number of citations, but most probably in other aspects of scientific work, such as transparency, replicability, and research quality. In other words, preregistrations might not be the universal solution for more qualitative studies, but they could still play an important role for scientific progress.

Only time will show us how we should develop our research methods and remain ethical, responsible and transparent. As a researcher it is tempting to think mainly about publications of studies or future rewards, while sometimes forgetting our core values. However, such a behaviour would bring us many disappointments in the long run. I believe that the future is bright and even if every day we face many challenges, both as professionals and persons, science is going to give us many creative solutions and help us building a better future. But one is certain – we need to adapt ourselves and never stop trying new things. This process of learning is long; it lasts a lifetime.

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Appendix

Appendix A – References for Dataset

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Appendix B – Dataset

Column in dataset	Description
ID	Unique identifier
Year	Year of publication
Journal	Name of the journal
Area	Scientific discipline (Management, Marketing, Psychology)
Preregistration available at	Source of the preregistration (or no preregistration at all)
Template from AsPredicted.org**	Whether a template was used
TOTAL Nr. of studies/experiments	Total number of studies reported in the article
Nr. of NOT preregistered studies/experiments	Number of non-preregistered studies
Nr. of PREREGISTERED studies/experiments	Number of preregistered studies
ADDITIONAL studies/experiments	Whether additional studies were mentioned
Nr. of ADDITIONAL studies/experiments in TOTAL	Total number of additional studies only
PREREGISTERED ADDITIONAL studies/experiments	Whether there were preregistered additional studies
Nr. of preregistered ADDITIONAL studies/experiments	Number of preregistered additional studies only
Author(s)	List of authors
Name of paper	Title of the paper
Nr. of citations according to Google Scholar (= impact / prestige)	Number of citations (Google Scholar)
Percentage (%) PREREGISTERED studies/experiments	Percentage of preregistered studies
Duplicates?	Whether paper is an unique data record

Table 1: Dataset columns

** y = yes

n = other (this includes OSF itself as well as other sites/platforms); so no aspredicted at all, but OSF only
for instance

b = both (aspredicted & other); other could be OSF

x = not preregistered

Appendix C – STATA

```
. ttest cit, by(prereg)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]
No, not	137	25.10219	1.630053	19.07928	21.87866 28.32572
Yes, pre	128	24.70313	.769462	8.705469	23.1805 26.22575
Combined	265	24.90943	.919438	14.96737	23.09907 26.7198
diff		.3990648	1.843268		-3.230376 4.028505

diff = mean(**No, not**) - mean(**Yes, pre**) t = **0.2165**
H0: diff = 0 Degrees of freedom = **263**

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = **0.5856** Pr(|T| > |t|) = **0.8288** Pr(T > t) = **0.4144**

Table 2: Ttest

```
. poisson cit i.prereg##i.area
```

Iteration 0: Log likelihood = **-1738.2821**

Iteration 1: Log likelihood = **-1738.2821**

Poisson regression

Number of obs = **265**

LR chi2(5) = **58.82**

Prob > chi2 = **0.0000**

Pseudo R2 = **0.0166**

Log likelihood = **-1738.2821**

cit	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
prereg						
Yes, preregistered	-.210444	.0595602	-3.53	0.000	-.3271798	-.0937081
area						
Marketing	-.3098352	.0421526	-7.35	0.000	-.3924528	-.2272175
Management	-.0995586	.0407001	-2.45	0.014	-.1793293	-.0197878
prereg#area						
Yes, preregistered#Marketing	.3974332	.0725724	5.48	0.000	.255194	.5396725
Yes, preregistered#Management	.194527	.0743649	2.62	0.009	.0487744	.3402795
_cons	3.337205	.0249688	133.65	0.000	3.288267	3.386142

Table 3: Poisson regression

```
// 4.1. Test the poisson for goodness-of-fit
```

```
estat gof
```

Deviance goodness-of-fit = **2194.125**

Prob > chi2(259) = **0.0000**

Pearson goodness-of-fit = **2310.304**

Prob > chi2(259) = **0.0000**

Table 4: Test goodness-of-fit for Poisson regression

```
. // Model comparison: Compare the two models in one table
.
. estimates stats model_poisson model_nbreg
```

Akaike's information criterion and Bayesian information criterion

Model	N	ll(null)	ll(model)	df	AIC	BIC
model_pois~n	265	-1767.69	-1738.282	6	3488.564	3510.043
model_nbreg	265	-1068.969	-1065.77	7	2145.54	2170.599

Note: BIC uses N = number of observations. See [\[R\] IC note](#).

Table 5: Model comparison

```
. testparm i.prereg#i.area

( 1) [cit]1.prereg#2.area = 0
( 2) [cit]1.prereg#3.area = 0

      chi2( 2) =    3.67
Prob > chi2 =    0.1593
```

Table 6: Postestimation