

ReplicationWiki - Improving Transparency in Economic Research

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In empirical economics, a twofold lack of incentives leads to chronic problems with replicability: For authors of empirical studies providing replicable material is not awarded in the same way as publishing new irrepliable studies is. Neither is authoring replication studies.

We set incentives for replicability and replication. First, we gave replication seminars at several faculties internationally. Integrating replication in the education of young scholars raises the awareness for the importance of replicability among the next generation of researchers and ensures that a big number of scientists get incentives to write replication studies: credit points and the prospect of publications at least of working papers already during their time as students.

Second, our wiki documents the results of our replications and of those found in the literature. It includes a database of more than 2000 empirical studies. For each study we provide information about the availability of material for replication. This helps to identify practical examples for courses focusing on empirical methods or on particular topics. We provide an overview of journals and their policies regarding data availability and publication of replications.

Everyone can participate; even undergraduates can make their contribution: Everyone can find errors in Excel files, and everyone can confirm that some research is documented so well that one can follow each step and with one click reproduce all quantitative results.

In contrast to previous efforts like the report on the American Economic Review Data Availability Compliance Project, we build the basis for the first replicable review paper on replicability as we give account of which studies were tested and which results were found in each case. After exploring several dozen studies published in highly ranked journals, we have hardly determined any cases where we see replicability is fully ensured. We identified two main problems: First, not all published results can be obtained from the replication material provided. Second, information about how the used data were obtained from the raw data is rarely sufficient.

We invite for discussion to develop standards for how to make research replicable and how to write replication studies. For this we provide information about existing projects that facilitate the sharing of material for empirical econometric research.

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JEL Codes: A12, A20, C18, C80, Y80

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Introduction

Replication refers to the duplication of published results (McCullough et al. 2006).

While in other sciences replicability is regarded as a fundamental principle for research and a prerequisite for the publication of results, in empirical economics it is still not treated as a top priority. Results are based on data and calculations that usually do not get published and that are not routinely controlled. Although there have already been warnings in the literature for decades about the dangers of the neglect of replication, the big picture has not changed much. It should be the standard, not the exception, however, only a small minority of journals in economics have introduced policies that should help to ensure the replicability of their published results. Even in the few cases of mandatory online archives for data and code used for calculations, replicability cannot be taken for granted at all (McCullough et al. 2006). McCullough and Vinod (2003) put it very clearly: “Research that is not replicable is not science and cannot be trusted either as a part of the profession’s accumulated body of knowledge or as a basis for policy.”

With our initiative that helps to increase the number of replications and improves their visibility we hope to change the attitude towards replications, so that researchers see it as natural and do not feel singled out when others look at their work more closely.

In their 2000 reply to a replication of their controversial 1994 finding of a case where the introduction of minimal wages had caused an increase of employment (Neumark and Wascher 2000), David Card and Alan B. Krueger follow this approach, pointing out: “Replication and reanalysis are important endeavors in economics, especially when new findings run counter to conventional wisdom”. The economic knowledge about the effects of minimum wages on employment have greatly benefited from this debate, as has the econometric theory on how to identify such effects. In the same way has economics benefited from the debate about the success of development aid inspired by Burnside and Dollar (2000), its replication and extension by Easterly, Levine and Roodman (2004) and the subsequent reply by Burnside and Dollar (2004). Such progress is much facilitated by sharing the material used for research. Some researchers might also be best at giving helpful comments and improving ideas others had rather than at introducing entirely new thoughts on their own. These skills, which can be equally valuable, would otherwise be wasted.²

Hamermesh (2007) calls attention to the fact that a very large number of findings in economics are supported with data from just one country, the United States, even in those cases that have relevance internationally. This is not surprising as this is the country where the highest number of researchers is located, most high profile journals are published in the United States, and there are many institutions with a long history of high-quality data collection. However, one cannot generally assume that findings based on a specific period of time and in one country will also hold elsewhere and when investigating a different space of time.

Findings that are not tested by others in the field are less reliable. When they lead to wrong policies it can be very costly for societies.

For researchers, we see a twofold lack of incentives leading to chronic problems with replicability: For authors of empirical studies the workload needed to make their material replicable is not awarded in the same way as publishing new irreplicable studies is. Neither is authoring replication studies.

² We thank Prof. Albert Berry of the University of Toronto for this comment.

The Replication Initiative

We offer a strategy to set incentives for replication and replicability. By integrating replication studies in the education of young scholars, we raise the awareness for the importance of replicability among the next generation of researchers and ensure that a big number of scientists get incentives to write replication studies: credit points for their studies and the prospect of publications at least of working papers already during their time as students (Wohlfarth 2012, Zakula 2012, Weißer 2014).

By raising the number of researchers involved in replication and by providing an infrastructure for sharing their information, on the one hand we help to lower the amount of work researchers need to put into making their studies replicable. On the other hand, we facilitate the dissemination of insights derived from replication studies. In contrast to previous efforts like the report on the American Economic Review Data Availability Compliance Project (Glandon 2010), with our project we provide the basis for the first replicable review paper on replicability as we give account of which studies were tested and which results were found in each case. After exploring several dozen studies published in highly ranked journals we have not yet determined a single case where we see replicability is fully ensured.

Our procedure is as follows: First we make a selection of studies for each course, depending on the knowledge of the students with regards to methodology, statistical software, and previous knowledge in the fields of specialisation of the studies.³ For most students it will be difficult enough to work with the same software as in the original study and to use the code published by the authors. However, some may find it interesting and possible to work with different software or to write their own code. The Journal of Applied Econometrics does not ask its authors to provide code, and it is a valid point that just working with the same code again bears the disadvantage that errors may be overlooked and often times those who replicate will not fully understand the details of the calculations and may not even notice this. As a first step it is however useful to work with code that is already there in order to see how such code is written by experienced professionals and in order to learn from this.

After selecting their topic according to their preferences, the students start with checking the material available for replication: Is the data set complete? Is the data sufficiently well described? Can it be tracked back to the raw data? It is important to do this at the very beginning of the course because some students may realise that they lack the material necessary for replication. If so they should carefully describe why this is the case, and this should be rewarded for their grade. Then they should select a new study for replication.

Students should write a short summary of the original paper and describe the data, always focusing on the replicability: Availability of raw data, completeness and quality of description of the data set. An overview of means and variances is helpful to get a better understanding of the data.

Looking at the programming code, students should show whether it is sufficient to replicate all published results, including graphs and results mentioned in the text but not in tables. They should describe whether it was clearly indicated which part of the code produced which results and whether the code is commented sufficiently.

³ In the journals we looked at the software Stata was used by far most often. As this is also the software most of our students are familiar with, we nearly exclusively worked with this software so far. As previous studies have shown, different software can produce different results (McCullough and Vinod 2003). We thus would appreciate finding further partners for cooperation who could contribute expertise in using different software with their students. We consider it important to make replication possible for a large number of those interested. For this purpose we find it helpful to use free software such as R.

For the interpretation, students should explain if results they may have found different from the publication still allow the conclusions drawn by the authors. They should analyse if the applied methods are useful in identifying the effects of relevance and if robustness checks are sufficient. They should draw their own conclusions if they are convinced by the findings of the original study. If possible they should investigate if they can confirm the results or call them into question using different data or methods.

Our main results so far can be summarised as such: Only few journals have a policy for all empirical quantitative studies they publish to archive data and code as well as instructions on how to use them. Even for the cases in which such policies are in place, they are usually not consequently enforced. And even for journals that have taken measures to enforce such policies we often could not obtain all the published results from the material provided (Appler 2012, Altinkaya 2012, Becker 2012, Cyrus 2012, Heidt 2012, Höfer 2013, Horstmann 2012, Mai 2012, Meyer 2012, Renner 2011, Richter 2012, Schneider 2009a, Schneider 2009b, ter Braak 2009, Weißer 2012, Winnige 2012⁴, Wohlfarth 2012, Zakula 2012). Amongst others, we were confronted with deviations in the number of observations from those published (Zhou 2011), deletion of identifying variables (Rempel 2011), unavailability of software extensions required to run the underlying code (Shaheen 2013), unavailability of datasets in the version used for the original study (Renner 2011). Some of the difficulties we encountered may in the end turn out to be rooted more in the limitations of our own abilities rather than in the neglect of authors or editors to ensure replicability of their research. But not all of them. In one case an author even refused to provide code to us that by journal policy he and his co-authors would have been obliged to submit to the web archive.⁵

For journals that do not follow a data availability policy our experience is mixed: In some cases authors nicely provide help that allow replication to some extent (Enekel 2011, Liebrand 2012). However, the transformation of raw data to the final dataset was not transparent (Enekel 2011), and authors in these cases may use software for which code is often not saved in a way necessary for direct replication (Liebrand 2012).

We had the support of our home university's Teaching Centre and could draw on its resources for research oriented teaching to bachelor students since we won their award for research oriented teaching and learning three times. It should not be underestimated that teaching bachelor students to try to replicate well published empirical econometric studies requires intensive supervision and a lot of patience. Students need to be instructed carefully in order to avoid as much frustration as possible, even though some is inevitable: Bachelor students will usually not be able to understand every detail of such studies, and they should know that this is neither expected nor necessary. In order to investigate transparency it is often sufficient to show that not all published results can be obtained with the archived replication material – which is not exactly a result a typical student feels enthusiastic about. Students need to be guided such that they do not make unrealistic plans on how to extend on existing studies that can only lead to disappointment. And it is not helpful to the discipline if students who do not manage to replicate empirical studies start sending angry emails to the authors, particularly in cases in which the “lack of replicability” lies in the lack of economic education of the student. In our experience replication, especially when done in groups that interact well, can benefit students by allowing them to better understand how the body of knowledge evolves through empirical research. Tendencies to take every empirical result presented to them as a “proof” of anything will not persist. On the other hand, replication can

⁴ Unpublished working papers will be published upon acceptance of this manuscript.

⁵ As an exception we do not name the respective study here as we do not have written proof of the authors' refusal.

help to show that it is too simple to say that “There are three kinds of lies: Lies, damned lies, and statistics” (Twain 1906). With our concept and the material we had compiled we could convince professors at several other faculties for cooperation: At the University of Toronto, the University of Bonn, at our own university’s Faculty of Social Sciences, and at the Graduate Institute, Geneva. A replication seminar was introduced for the MAGKS inter-university graduate program comprised of six German universities - Philipps University Marburg, RWTH Aachen, Justus-Liebig-University Gießen, Georg-August-University Göttingen, the University of Kassel and the University of Siegen. We gave a PhD seminar at Nanjing Agricultural University. The exchanges turned out to be very fruitful and we gained many insights that we could not have gotten otherwise. For documenting the results of our replications as well as those found in the literature we set up a wiki project. In our database we provide information about more than 2000 empirical studies, especially with regards to the availability of material for their replication.⁶ As of December 27, 2015, for 894 of these studies data, code and a readme for replication are marked as available in a journal archive.⁷ One can browse by [JEL codes](#), [methods](#), [data type](#), and [software](#) used. 280 replication studies are listed.⁸ For each there are fields for information on the type and result of replication, raw data availability, the question whether the original results are called into question, and whether the original authors accepted or rejected the results in case they replied. For replication type the question is whether the same or different code and data were used as in the original study. Replication success is defined as obtaining the same results, and alternatively one can state that no results could be obtained, i.e. the study was not replicable, or it was only partially successful. For raw data availability the alternatives are that the final dataset can be exactly replicated from raw data, raw data can be used to replicate a dataset that is not substantially different from the final dataset used for the publication, raw data is somewhat available but insufficient to replicate the final dataset, or raw data is not available at all.

All these categorizations are suggestions and can be changed by the community: both the general categorization options and the values assigned for every individual study. The more replications we look at the more we see that each case has its particularities and there need to be clear rules how to categorize. These rules will have to be constantly refined in order to do justice to all cases that will arise. It is crucial to understand that the wiki community does not and cannot judge who is right in case replications come to a conclusions different from the original studies. The wiki should not be seen as an endorsement of all the replications covered. There are of course also replications of questionable quality, and it surprised us during our project that we found that replications are themselves often not replicable – journals usually do not require to make code and data available for replications, which makes it difficult for the readers to come to their own conclusion. Often findings different from those of the original study arise because several changes are made to the original calculations simultaneously and it is not always clear which influence each of these changes had. Ideally, discussions could help to find a consensus, but the wiki is still far away from achieving this, and also scientific consensus can change over time. The wiki can just be used to document the state of the literature and provide a platform for discussion. It should be noted that there are no property rights, everyone can contribute, and everyone’s contributions can be edited by everyone else.

⁶ <http://replication.uni-goettingen.de>

⁷ <http://tinyurl.com/ReplicationWikiReadmeDataCode>

⁸ <http://replication.uni-goettingen.de/wiki/index.php/Category:Replication>

Attached is the syllabus of an example methods course in which graduate students of the Graduate Institute in Geneva learned empirical methods for microeconomics with replication of studies from the wiki database. A similar course was held at the University of Toronto.⁹

In cooperation with the RePEc bibliographic database dedicated to economics studies in the ReplicationWiki are linked to their pages and those link back, which significantly raised the number of views of our pages. We want to contribute to the identification of studies the scientific community regards as especially important for replication as is already practised by the 3ie project for the replication of impact evaluations in development economics (<http://www.3ieimpact.org/en/evaluation/impact-evaluation-replication-programme>).

Finally, we provide instructional videos on replication.¹⁰ Our teaching resources can be freely used by any interested institutions or individuals such that everyone can participate in the improvement of replicability in empirical econometrics.¹¹

Journals investigated, replication policies, and wiki features

We so far focus on six journals that provide data of empirical studies in online archives. Five journals of the American Economic Association that all follow a similar data availability policy: The American Economic Review (Bernanke 2004)¹² and the American Economic Journals (Macroeconomics, Microeconomics, Applied Economics and Economic Policy). Furthermore, the Journal of Political Economy that adopted the American Economic Review's data availability policy.¹³ It is unclear to us why the Papers and Proceedings of the American Economic Review were for many years held to a lesser scientific standard and were exempted from the data availability policy of the American Economic Review. Fortunately, this has changed in 2015.¹⁴ The Biometrical Journal was the first journal we were aware of that has a Reproducible Research Editor who checks the replicability of published results at least from the material provided, even though that journal does not require its authors to contribute to its data archive.¹⁵ So far very few journals have followed suit. Students, even PhD students at prestigious faculties, to our experience are not usually aware of the fact that reviewers do not routinely check the results of the studies they referee. Another problem to us seems even more widespread - and more difficult to solve: Even for the few journals that ask their authors to provide information about how the final data that get archived were obtained from the raw data, no or by far insufficient details are supplied. Material for replication submitted voluntarily by authors of studies published in the American Economic Review Papers and Proceedings did not fulfil the requirements of replicability from raw data (Sailer 2011, Cyrus 2012). There seems to be a lack of standards for issues like how to document data cleaning and the merging of different data sets. Furthermore, many institutions that provide data frequently change datasets and do not archive each version of them. It seems promising to us that the project [Data Cite](#) introduces the [digital object identifier](#) system also for datasets, and we hope this will become an established standard.

⁹ <http://homes.chass.utoronto.ca/~benjamin/EC02803F-2011.html>, for an overview of all seminars held so far for which the author used data from the wiki, cf. http://replication.uni-goettingen.de/wiki/index.php/Portal:Replication_in_teaching#Replication_Seminars

¹⁰ A first video is already available in German – a presentation with an introduction to replication in general and to our project (Kneib 2012).

¹¹ http://replication.uni-goettingen.de/wiki/index.php/Presentation_slides

¹² <http://www.aeaweb.org/aer/data.php>

¹³ <http://www.press.uchicago.edu/journals/jpe/datapolicy.html?journal=jpe>

¹⁴ <https://www.aeaweb.org/aer/pandpstyle.pdf>

¹⁵ <http://onlinelibrary.wiley.com/journal/10.1002/%28ISSN%291521-4036/homepage/EditorialBoard.html>

The leading journal with a regular section focusing on replication of published studies is the Journal of Applied Econometrics (Pesaran 2003). As this journal typically publishes technically more demanding studies and it does not require its authors to archive the code they used to obtain their results we considered their material as insufficient at least for our bachelor students. The replications published however inspired us and we regarded that journal's data archive as such a valuable resource that we included most of the studies published in our wiki dataset.

In our wiki, we give an overview about journal policies on replication. To this date, only a minority of journals have introduced mandatory online archives for data and code used for quantitative empirical studies (Huschka and Wagner 2012). To our knowledge no journal has found a convincing strategy to achieve transparency of data cleaning and to deal with other issues concerning the manipulation of raw data. Very few journals regularly publish replication studies, most prominently the Journal of Applied Econometrics. The initiative to start a replication journal could help to improve the outlets for replication studies. This project requires the collective work of the community since a large amount of replication work is impossible to find in acceptable time for any single group given that the results are often just mentioned as asides of published studies. Especially when it comes to reproductions, i.e., empirical work on the same question as in a previous study but with different data or methodology, specific expertise is needed for each subfield of economics in order to assess the results in the context of the existing literature.

For the above described reasons we invite to further discussion about how policies should be designed in order to ensure replicability.

So far several blogs reported about the wiki,¹⁶ its pages have been viewed more than 935,000 times, and more than a hundred researchers have registered but contributions from outside of our team have been very limited. The feature to vote which studies are most relevant to be replicated has still not been widely used.¹⁷ With our experience we know how to expand the number of articles and journals covered at low cost, and the more research is covered the more useful the project can be for researchers. We think that getting endorsements from key players such as associations of economists or leading scientists could change this. We try to expand our network and to motivate those who teach seminars to include their results in the wiki. For this we also start a new replication working group of the Young Scholar Initiative of the Institute for New Economic Thinking with a workshop directly after the 2016 Annual Meeting of the American Economic Association.¹⁸ Combining the project with others could also help. It might be that many researchers are hesitant to register with their name, a restriction we had thought necessary to avoid the risk of anonymous allegations or even libel, in particular after the website science-fraud.org had to be shut down due to legal threats (Frezza 2013). We are considering to at least temporarily lift that restriction until more users are active and to use sighted versions to curtail abuse.

¹⁶ <http://davegiles.blogspot.de/2014/05/replication-in-economics.html>
<http://economistsview.typepad.com/economistsview/2014/05/replication-in-economics.html>
<http://www.edawax.de/2014/06/goettingen-university-project-fosters-replication-in-economics>
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<http://blog.repec.org/2014/07/16/economics-replication-wiki-now-on-ideas>
<http://andrewgelman.com/2014/08/22/replication-wiki-economics>

¹⁷ http://replication.uni-goettingen.de/wiki/index.php/Top_rated_studies_for_replication

¹⁸ <http://ineteconomics.org/ideas-papers/blog/replication-and-transparency>

Related Research

In order to develop standards for how to make research replicable and how to write replication studies we provide information about existing projects that facilitate the sharing of material for empirical econometric research like the Harvard [Dataverse](#) (Crosas 2011), [ResearchCompendia](#), or the [runmycode](#) page for sharing code and data and enabling readers to run code with a cloud technology (Stodden et al. 2012). The project [Teaching Integrity in Economic Research \(TIER\)](#) set a protocol for documentation of work with statistical data in economics that can serve researchers as orientation (Ball and Medeiros 2012).

We document projects from related disciplines that focus on replication and from which economists can learn, like the replication project in psychology that collects information about replication studies (Spellman 2012, <http://psychfiledrawer.org>) or the Reproducibility Projects of the [Center for Open Science](#), one of which was adapted for cancer biologists. Especially with regards to teaching the psychologists' perspective is very helpful to us (Frank and Saxe 2012).

Conclusion and Outlook

Much remains to be done to ensure full replicability of quantitative empirical research. Those journals that have data availability policies need to enforce them, and such policies need to become a universal standard in our discipline. Analogously, standards are needed for how to proceed for replication. In order to lower the amount of work every journal has with establishing such standards there should be a common effort to find them. And the results of replication studies need to be documented such that it becomes easy to find and compare them. The initiative may be better taken away from journals and their editors as they may be subject to conflicts of interest (Laband and Piette 1994). So crowd-sourcing that enables everyone to comment and make a contribution to us seems an approach that avoids such conflicts.

In our further research we plan to investigate how the degree of replicability of published studies influences the citations they get. To us it seems plausible that datasets of well replicable research will be used by other scientists, too, who will then cite the original work. If this is the case, we could show that there is another incentive to make research replicable, both for authors and journals.

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Appendix: Reading List and exam guidelines of the 2013 Course “Advanced Econometrics” taught together with Lore Vandewalle at the Graduate Institute, Geneva.

Reading List “Advanced Econometrics”
2013, Graduate Institute, Geneva

Prof Lore Vandewalle and Jan H. Höffler

PAPER 1: Matching used in robustness check (Diff in diff is the main methodology)

Harrison, A., and J. Scorse (2010), Multinationals and Anti-sweatshop Activism, *American Economic Review*, 100(1): 247-73.

OR

Fowlie, Holland and Mansur (2012), What Do Emissions Markets Deliver and to Whom? Evidence from Southern California’s NOx Trading Program, *American Economic Review*, 102(2): 965-993.

PAPER 2: Regression Discontinuity Designs used in robustness check (IV is the main methodology)

Clots-Figueras, I. (2012), Are Female Leaders Good for Education? Evidence from India, *American Economic Journal: Applied Economics*, 4(1): 212-44.

IMPORTANT: check if the data can be obtained for free! If not, another paper will be allocated (just forward me the email of the author saying that the data cannot be given for free)

OR

Clark, D. (2007), The Performance and Competitive Effects of School Autonomy, *Journal of Political Economy*, 117(4): 745-783.

PAPER 3: Duration Models (and probit)

Iyer, R. and M. Puri (2012), Understanding Bank Runs: The Importance of Depositor-Bank Relationships and Networks, *American Economic Review*, 102(4): 1414-45.

OR

Costa, D. and M. Kahn (2007), Surviving Andersonville: The Benefits of Social Networks in POW Camps, *American Economic Review*, 97(4): 1467-87.

PAPER 4: Randomized Controlled Trials

Dupas, P. and J. Robinson (forthcoming), Savings Constraints and Microenterprise Development: Evidence from a Field Experiment in Kenya, *American Economics Journal: Applied Economics*.

OR

Angrist, J., D. Lang and P. Oreopoulos (2009), Incentives and Services for College Achievement: Evidence from a Randomized Trial, *American Economic Journal: Applied Economics*, 1(1): 1-28.

PAPER 5: Instrumental Variables

Edmonds, E., N. Pavcnik and P. Topalova (2010), Trade Adjustment and Human Capital Investments: Evidence from Indian Tariff Reform, *American Economic Journal: Applied Economics*, 2(4): 42-75.

OR

Bosch, M. and M. Manacorda (2010), Minimum Wages and Earnings Inequality in Urban Mexico, *American Economic Journal: Applied Economics*, 2(4): 128-149.

Exam Advanced Econometrics: REPLICATION

Follow the instructions carefully!

Timeline exam

February 25: Email the composition of groups

You have to form groups of 4 students by February 25 and send an email to lore.vandewalle@iheid.ch with the composition of each of the groups. Each group will get one of the following econometric tools allocated (randomly):

- Matching
- RDD
- Duration models
- RCT
- Instrumental variables

For each of the tools we selected two highly published papers, out of which you can choose the one to be replicated. You can switch tools between groups based on mutual agreement. Do inform me in case you do so.

March 6: One page feedback on whether the paper is suitable for replication

You should make sure that the paper of your choice can be replicated:

- Is raw data available?
- Is the data set complete?
- Is the data sufficiently well described?

If you realised that one of the two papers cannot be replicated, you should carefully describe why this is the case (this will be rewarded for your exam!). If none of the papers can be replicated, we will send you another one.

May 22: Deadline seminar paper

One seminar paper has to be handed in per group. Explain in detail how you proceeded for the replication, and which conclusions you draw. Below are some suggestions about how to proceed:

- 1 Short summary of the original paper
- 2 Data
 - Is raw data available?
 - Is the data set complete?
 - Is the data sufficiently well described?
 - Make an overview of means and variances
- 3 Stata code
 - Are all results replicable?
 - Clearly indicate which part of the code produced which results?
 - Are the codes commented sufficiently?
- 4 Interpretation
 - If the results you find are different, does it change the interpretation?
 - Is the applied method useful in identifying the effects of relevance?
 - Are the described robustness checks conducted?
 - Are the conclusions drawn in the paper convincing?
- 5 Can you confirm the results or call them into question using different data or methods?

Examples on how to write a replication study can be found at:

- “Instructions for authors” on journal websites, e.g. by the Journal of Applied Econometrics
- Examples in the literature, e.g. the Albouy versus Acemoglu, Johnson and Robinson debate (syllabus). Other examples:
 - Fisher, A. C., W. M. Hanemann, M. J. Roberts, and W. Schlenker (2012), “The Economic Impacts of Climate Change: Evidence from Agricultural Output and Random Fluctuations in Weather: Comment.” *American Economic Review*, 102(7): 3749-60.
 - Mueller, H. (2012), “Growth Dynamics: The Myth of Economic Recovery: Comment.” *American Economic Review*, 102(7): 3774-77.
 - Goettingen replication working papers
- Further information on replication and its methodology: <http://www.3ieimpact.org/en/evaluation/impact-evaluation-replication-programme>

May 29: Exam (evening)

Each group has to discuss the replication of another group (random allocation).

On the evening of the exam, each paper will be allocated 35 minutes: 15 minutes to present the replication, 5 to 10 minutes for the discussion by another group and 10 to 15 minutes for a class discussion. In between the third and the fourth presentation, we will take a 10 minutes break.

A note on the evaluation

It is hard to say in advance which papers will be easy to replicate (if you tried something that did not work out, do write it down in your paper.). Some papers will allow extensions, for others it will be impossible. All of these papers are highly published, so not finding any problem or new extension does not necessarily imply you did a bad job! The aim of this exercise is to provide a good replication: what matters is being as complete as possible in judging the paper.

The 6 points of the exam will be allocated as follows:

- Written paper: 4 points
- Clarity presentation: 1 point
- Discussion: 1 point