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Appendix

A.4-1 Information for participants

A.4-1.1 Programming background and ethics

As the game is too complex for usual experimental software, such as Qualtrix or z-tree, and too time consuming for me to learn PHP and mySQL, I had to ask a software engineer to write an original game. The game is programmed in the language Golang and uses a mySQL database. The game does not use JavaScript so as to ensure that it can run from every browser, even with high security preferences.

The game was embedded on my personal webpage at the LSE and ran from a server that the software engineer Martin Starman had rented. The server ran with the company '1und1' that claims to only have servers within the European Union. It was not possible to run the game on an LSE server directly, and the LSE IMT web editor's staff had advised embedding the game on my LSE personal page. Data was at all times password protected and only Martin and I had access to it via an encrypted internet connection. Data was collected completely anonymously. There was no IP address stored. Participants are never asked to give their name or email address, postal address or any other information that would allow us to directly identify them. Data are stored in two separate files, one for game-related data, and the other for personal data, such as nationality. Both files refer to each other using a unique ID. The ID number is generated using an algorithm. This is supposed to ensure that people cannot guess other people's ID number. The ID is given to the participant via the informed consent form, and they are asked to note it down in case they want to approach me and ask to delete their participation. No one else except the participant can identify their information in the files using the ID. Unfinished games were deleted two days after the start. A game is defined as being 'finished' when the participant proceeded until after the final question of the survey. This might have led to a couple of games being deleted even though they were completed. This was changed in the last week of September 2016 – before the vast majority of participants played the game.

On agreeing to the informed consent form, the person also confirmed that they are at least 18 years old. In that regard, data protection might conflict with research ethics' requirements. I cannot verify the age reported by participants, or any other

characteristic for control purposes of those taking part, such as the field of study or the degree programme. Despite this limitation, there is no plausible reason to assume that a large percentage of participants would not have told the truth. At no point does the game offer any incentive to misreport. Moreover, in the answer options, the option "prefer not to say" was given so that people were even encouraged to report honestly, or not at all, if they so wished.

The very first question that appears on the webpage asks: "Have you played this game before?". There is no reason why a participant should misreport. They do not know what choosing either 'yes' or 'no' means for them playing the game, and, hence, could not infer any desirable behaviour from this. The answer option "no" is located on the right-hand side, while the option "yes" is located on the left-hand side. Hence, a person would have to think before answering the question. This is because usually one would expect any question before a survey or experiment to answer with "yes", assuming that one has agreed to something. And "yes" would be located on the right-hand side to allow the participant to proceed quickly. However, both are reversed for this question, requiring the participant to think. This ensures that we can consider "no"-responses to be indeed "no"-responses. If a person accidentally chose "yes", her game is not considered for the analyses.

A.4-1.2 Informed consent form

"Thank you for your interest in participating in this study.

This study is about economic preferences and co-operation. It will be conducted in European countries in comparative perspective.

The study is part of a PhD research project at the European Institute, London School of Economics and Political Science.

The following game is about an apple tree field and will last about 30 minutes.

During the game, data will be collected on your choices. A small survey on personal data follows after the game. You will not be asked to give your name. All the data that you give will be collected anonymously, stored and analysed. Instead, the data will be stored with respect to an ID number. This the only time that you can see your number:

This is your ID number: [...]

Only if you note down this number you can make the link between your data and yourself. No one else can do this. If you wish to have your data deleted at a later stage, please contact me. However, without your ID number I will not be able to trace data back to your person.

The game does not use cookies nor does it store your IP address. If you do not complete the game within two days, your data will get deleted. The game runs from a website and a server based in the European Union. Access to data is password protected.

Your participation is voluntary and you can quit the game at any stage you want. You do not need to give a reason.

Information about the results of this study will be published with the LSE Library upon completion of this PhD. The anonymised data will be made available to the academic community but they will not be able to identify or contact you.

If you have any further question or comment, please do not hesitate to send me an email: s.a.ciaglia@lse.ac.uk.

If you got a code word, please enter here: [...]

By clicking 'I agree' you confirm that you have read and understood the form, that you are at least 18 years old and that you agree to participate in this study."

Footnote to this page:

"PhD Research project by: Sarah Ciaglia, PhD candidate, European Institute London School of Economics and Political Science, Houghton Street, London WC2A 2AE, United Kingdom

Supervisors: Prof. Kevin Featherstone and Prof. Paul de Grauwe

This research project is kindly funded by the Konrad-Adenauer-Foundation with a doctoral scholarship."

A.4-1.3 Email to university administrations and professors

Dear [addressee],

I am writing to you following a search for Professors at the [university] homepage.

My name is Sarah Ciaglia and I am a PhD student at the European Institute, London School of Economics and Political Science, under the supervision of Professor Kevin Featherstone and Professor Paul de Grauwe. As part of my PhD research project, I am conducting an online experiment with students in Portugal, Greece, France, and Germany.

I would be very happy if you could forward the below link to your students for participating in the experiment.

The experiment is about economic preferences and co-operation. Please find below a short description and the link to the game. Additionally, I enclosed the game instructions for your information. The experiment is programmed as a simple online game for one person. All data are collected anonymously and the game lasts about 30 minutes. Participation is voluntary and unpaid. The game ends with a brief high scores evaluation so that participants know how successfully they played.

The link has already been circulated at universities in [name city and universities according to whether they have already been contacted at that time].

I would be very grateful for your support and if it was possible to send the below link to your students.

Please let me know if you have any further questions. I would be happy for a short reply.

With many thanks for your attention and best wishes,
Sarah Ciaglia

Sarah Ciaglia
PhD candidate
London School of Economics and Political Science
European Institute
Houghton Street
London WC2A 2AE
United Kingdom

Subject: LSE PhD Experiment "The Apple Tree Game"

["Good day" in native language: Bom dia (Portuguese), Bonjour (French), Kalimera (Greek), Guten Tag (German)],

Please find below the link to an experiment for Sarah Ciaglia's PhD project at the London School of Economics and Political Science (LSE).

The experiment is about economic preferences and co-operation. It will be conducted in European countries in comparative perspective. The game is about an apple tree field that you and 18 other farmers own together. The goal is to cultivate the field. You can harvest, invest and be happy – find your own strategy!

The Apple Tree Game: **http://personal.lse.ac.uk/CIAGLIA**

Enjoy a fun game. Participate in a novel game and PhD research project. Learn about experiments, what maybe helpful for your own studies.

["Thank you" in native language: Obrigada (Portuguese), Merci beaucoup (French), Efxaristo poli (Greek), Vielen Dank (German)] for participating!

[insert pdf on game instructions]

A.4-1.4 Game instructions

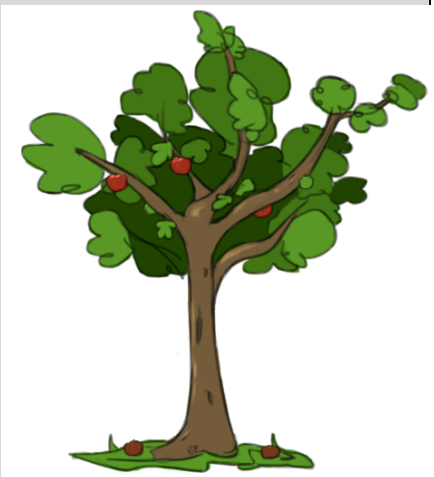
The Apple Tree Game

- Basic Game Instructions –

This game is about an apple tree field. Around a beautiful blue lake, apple trees grow.

You and 18 other farmers cultivate the field together. The field divides into private trees and shared trees. Each farmer owns one part of the field and cultivates the private trees alone. Depending on the size of this part, the farmer has 1, 2 or 3 trees. Additionally, every farmer shares some trees with a neighbour. Both farmers cultivate these shared trees together.

The game has 14 rounds. Each round has two stages. In the first stage, you can harvest apples and invest in items to support your trees. You can also choose to spend energy for things that make you happy, for example to enjoy the weather under beautiful spring blossoms.



In the second stage, you can punish other farmers if you think that they did not treat shared trees well. The basic rule is that a farmer should not harvest more than half of the apples on a shared tree. The other farmers can also decide to punish you.

A tree has always three kinds of apples: small, big and fallen apples. In each round, a tree grows new small apples. These apples grow big and ripe in the next round, fall down in the round thereafter and finally become fertile soil in the round after that.

A tree needs fertile soil. In each round, at least two fallen apples shall remain on the ground to become fertile soil. Then, the tree remains strong against weather and produces a slowly growing number of apples.

At the end of each round, you will eat the apples and they will give you energy (E) for the next round. Big and ripe apples yield double as much energy as small or fallen apples. You need the energy for harvesting apples, investing in items or to spend a happy time.

The goal of the game is to cultivate the field. Use your own strategy.

You can harvest, invest and be happy – find your own way!

Hint: Watch the weather reports and opportunities to co-operate.

A.4-1.5 Facebook post

The Apple Tree Game: http://personal.lse.ac.uk/CIAGLIA

Dear all,

Please support the experiment for my PhD project at the London School of Economics and Political Science (LSE).

It is a game about economic preferences and co-operation: You and 18 other farmers own an apple tree field together. The goal is to cultivate the field. You can harvest, invest and be happy – find your own strategy!

Thank you for participating!

A.4-1.6 Poster to put on campus

The poster is similar to the leaflet and the posters that I distributed around the campus in Lisbon. Moreover, the posts that have been put on Facebook and Moodle pages, announcing the experiment to be conducted a day later or the same day at a university in Lisbon, were similar.

A.4-2 Contacted Sample and potential participants

The list below indicates the number of student/times per means of distribution of the invitation[1]. For the exact numbers, I have to rely on what the person who forwarded the invitation reported to me. Moreover, more people could have received the invitation than I am aware of, as people might have forwarded it to colleagues or others without notifying me. For instance, some university administration staff sent it to professors to forward it to their students, but I did not hear back from the professors. Similarly, two professors were kind enough to agree to print out posters to put on the entrance door of their departments, but I could not track how many people had seen the poster. There were just a few such cases, which I do not include in the list below. I only list the numbers that were reported to me. For the distribution via Facebook, I relied on the number of members, followers, or 'likes' indicated for the groups, pages, and posts. The numbers are very high, however, one has to keep in mind that members might not regularly check their group notifications, and followers might not take notice of their followed page's posts, so, therefore, people might easily have overlooked the invitation. In contrast, 'likes' indicate that people have seen and appreciated the invitation. The number of likes is around 20 on the page.

A.4-2.1 Lisbon, Portugal[2]

A.4-2.1.1 Pre-test, in person (between 07/06 and 09/06/2016)

University	**N° of student/times**
Universidade de Lisboa, Law Department	participants: **12 students** contacts: announced by professor before exam; room with laptops organised by professor
Universidade Católica Portuguesa, Department of Political science	participants: **8 students**

1 I do not report the names of the people who forwarded the link due to data protection.

2 Because of the term dates, I started with Lisbon in June 2016. In Paris, the term and exam period were already over; in Berlin and Athens, the term was still running and I did not want to interfere with the usual coursework. In Lisbon, the exam period had just started and I considered it the best time as students might be favourable towards some relaxation after exams, and be more likely to play the game. In Lisbon, thankfully, each university offered me the use of their computer rooms. In some cases, professors were kind enough to reserve a classroom and ensure that participants brought their laptops. In order to distinguish them later from those who would play the game alone, I asked people to put a specific code word into the informed consent.

	contacts: announced by professor before exam; room with laptops organised by professor
Universidade Nova de Lisboa, School of Business and Economics (SBE)	participants: **1 student** contacts: announced by me before exam; computer room provided by university administration
Total	participants: **21 students** contacts: announced before exam

A.4-2.1.2 In person (between 14/06 and 21/06/2016)

University	**N° of student/times**
Universidade Católica Portuguesa, Department of Business and Economics	participants: **3 students** (**6 started** it, but 3 finished it) contacts: distributed about **160 leaflets** on campus
Universidade Nova de Lisboa, School of Business and Economics (SBE)	participants: **10 Bachelor**, **2 Master**, and **3 PhD** students contacts: announced before exams (about **170 students** in total), via 3 posters in front of the exam rooms, on the Nova Economics Club Facebook page (about **1,400 follower**), on Moodle pages of three teachers (numbers not reported), distributed about **80 leaflets** on campus
Universidade Nova de Lisboa, Department of Political Science (FCSH)	participants: **none** contacts: announced before exam (**4 students**); distributed about **60 leaflets** on campus
Total (Several students might have received the notification more than once)	participants: **10 Bachelor**, **2 Master**, **3 PhD**, and **3 students** contacts: about **300 leaflets**, **3 posters**; announced before exams (about **174 students**), on Facebook and Moodle pages (at least **1,400 recipients**)

A.4-2.1.3 Via email (between 15/09/2016 and 05/05/2017)

University	**N° of student/times**
Universidade de Lisboa, Law Department	about **270 Bachelor**, and **10 Master** students
Universidade de Lisboa, Political Science Department	about **20 PhD** students

Universidade de Lisboa, ISEG (Economics)	about **721 Bachelor**, **161 Master**, and **23 PhD** students
Universidade de Lisboa, Department of Labour and Business	about **65 Bachelor**, and **10 Master** students
Universidade de Lisboa, Department of Geography	about **20 Master** students
Universidade Católica Portuguesa, Department of Business and Economics	**all Bachelor** students (number not reported), **35 Master**, and **5 PhD** students
Universidade Católica Portuguesa, Department of Political Science	*no response*
Universidade Nova de Lisboa, School of Business and Economics (SBE)	about **1,960 Bachelor**, **1,060 Master**, and **30 PhD** students
Universidade Nova de Lisboa, Department of Political Science (FCSH)	about **570 Bachelor**, **60 Master**, and **20 PhD** students
Facebook student groups and pages	about **1,486 followers**
Total (Several students might have received the notification more than once)	about **3,586 Bachelor**, **1,356 Master**, and **98 PhD** students about **1,486 followers**

A.4-2.2 Paris, France (between 25/08/2016 and 06/06/2017)

University	**N° of student/times**
Sciences Po Paris	about **8,000 students** (school newsletter) about **150 Bachelor**, and **193 Master** students
Paris School of Economics (PSE)	**231 Master**, and **167 PhD** students (there are no Bachelor students at PSE)
Université Paris 1 – Panthéon Sorbonne, Economics Department	about **650 Bachelor**, **30 Master**, and **350 PhD** students
Université Paris 1 – Panthéon Sorbonne, Political Science Department	about **240 Bachelor, 400 Master**, and **100 PhD** students
École Normale Supérieure (ENS), Economics Department	about **60 Bachelor** and **Master** students
École Normale Supérieure (ENS), Social Sciences Department	about **250 Bachelor** and **Master** students
École Normale Supérieure (ENS), Department of Law and Public Administration	*no response*
Facebook student groups and pages	about **52,414 followers**/members

Total (Several students might have received the notification more than once)	about **1,040 Bachelor**, **854 Master**, **617 PhD,** and **310** students (degree programme not reported) about **8,000** students on the Sciences Po newsletter about **52,414 followers**/members

A.4-2.3 Berlin, Germany (between 20/10/2016 and 03/02/2017)

University	N° of student/times
Humboldt University, Economics	about **20 Bachelor** and **Master** students, and **124 PhD** students
Humboldt University, Social Sciences	about **15 students** (degree programme not reported), **200 Bachelor** students, and **1,281 recipients** of the department's newsletter (open to all for registration)
Humboldt University, Education	about **200 Bachelor** and **Master** students
Free University, Economics	about **120 Bachelor**, and **70 Master** students, and put poster on Campus
Free University, Political Sciences	about **648 Bachelor**, and **411 Master** students, and put up posters on Campus
Technical University, Economics	*no response*
Technical University, Social Sciences	*no response*
Hertie School of Governance	about **350 Master**, and **50 PhD** students
Scholarship students, Konrad-Adenauer-Foundation, Berlin	*no numbers reported*
Facebook student groups and pages, Berlin	about **18,085 follower**/likes/members
Facebook student groups and pages, Germany (incl. students abroad)	about **21,346 follower**/likes/members
Total (Several students might have received the notification more than once)	about **968 Bachelor**, **831 Master**, **174 PhD**, and **235** students (degree programme not reported) **1,281 recipients** of a department's newsletter put up **posters** at two campuses about **39,431 followers**/likes/members

A.4-2.4 Athens, Greece (between 05/10/2016 and 10/05/2017)

University	N° of student/times
Athens University of Economics and Business (AUEB), Department of International and European Economic Studies	about **490 Bachelor**, **70 Master**, and **15 PhD** students
Athens University of Economics and Business (AUEB), Department of Economics	about **230 Master**, and **70 PhD** students
Athens University of Economics and Business (AUEB), Department of Business Administration	*no numbers reported*
Piraeus University, School of Economics, Business and International Studies	about **310 students** (degree programme not reported)
Panteion University of Social and Political Sciences, Department of Economic and Regional Development	about **25 students** (degree programme not reported), and **10 PhD** students
Panteion University of Social and Political Sciences, Department of International, European and Area Studies	about **100 Bachelor,** and **25 Master** students
Panteion University of Social and Political Sciences, Department of Political Science and History	*no numbers reported*
National and Kapodistrian University of Athens, Department of Economics	about **100 students** (degree programme not reported), and **25 Master** students
National and Kapodistrian University of Athens, Department of Political Science	**13 Master**, and **2 PhD** students
National and Kapodistrian University of Athens, Department of International and European Studies	**75 Bachelor**, **23 Master**, **10 Master** and **PhD** students
National and Kapodistrian University of Athens, Department of Philosophy and History of Science	*no numbers reported*
National and Kapodistrian University of Athens, Jean Monnet European Centre of Excellence	about **500 students** from all degree programmes (most of them (80%) are at least Master holders)
National and Kapodistrian University of Athens, Medical School	**48 Master** students
National and Kapodistrian University of Athens, Political Economy of Sustainable Development Lab	about **400 Bachelor** students
Facebook student groups and pages	about **1,322 follower**/members
Total (Several students might have received the notification more than once)	about **1,065 Bachelor**, **434 Master**, **87 PhD**, and **945** students (degree programme not reported) about **1,322 followers**/members

A.4-2.5 Other addressees (between 04/11/2016 and 16/01/2017)

Facebook contacts	**N° of (potential) recipient/times**
PhD colleagues from London, and their contacts	about **8,547 follower**/likes
LSE Societies (German, French, European)	about **4,181 followers**
Post shared by the LSE European Institute	about **4,561 followers** (Twitter: 3,741 followers)
Total (Several people might have received the notification more than once)	about **17,289 followers**

A.4-2.6 Summary: all countries, via email

Total n° of (potential) recipient/times (Several people might have received the notification more than once)	about **6,659 Bachelor**, **3,475 Master**, **976 PhD**, and **1,490** students (degree programme not reported) **9,281 recipients** of newsletters put up **poster** at two campuses about **111,942 followers**/likes/members

A.5-1 Description and Meanings

Please contact the author for further information.

A.5-2 Programming Handbook

Please contact the author for further information.

A.5-3 Literature on experiments

A.5-3.1 Irlenbusch and Sutter (2006)

Participants receive an initial endowment of 60 tokens at the beginning of each round. Then, a player has to choose between two abstract options: Y or X. Y represents the willingness to co-operate for the prevention of the public bad, whereas X stands for free-riding. If a player chooses X, they receive an additional 60 tokens, but lose – like all other players – 15 tokens (or 10 or 20 depending on the player's size). These payments are supposed to reflect the utilities and costs of an excessive deficit. Considering only the payoffs of one period, free-riding is the dominant strategy. Taking also the other periods into account, the payoff would be maximal, if all players co-operated. All actions are revealed after each phase.

In case a player chooses X, an SGP, like a three-stage voting procedure, follows. In the first stage, all players decide on the opening of a sanctioning procedure. If the player chooses X again in the next period, the other players decide whether to impose a sanction S of 15 tokens. Additionally, they decide about opening a second sanctioning procedure. If again in the next period (i.e., third stage) the player chooses X, the others decide about a sanction L of 150 tokens. Hence, if a player chooses X three times in a row, they face a total cumulative sanction of 165 tokens – compared with a gain of 135 tokens. Participants are paid after the experiment according to the number of tokens gained.

A.6-1 Description of the dataset and the variables

This appendix is dedicated to giving more detailed explanations about how the dataset and the variables are constructed, and to show their descriptive statistics.

A.6-1.1 Dependent variables and power analysis

A.6-1.1.1 Dependent variables

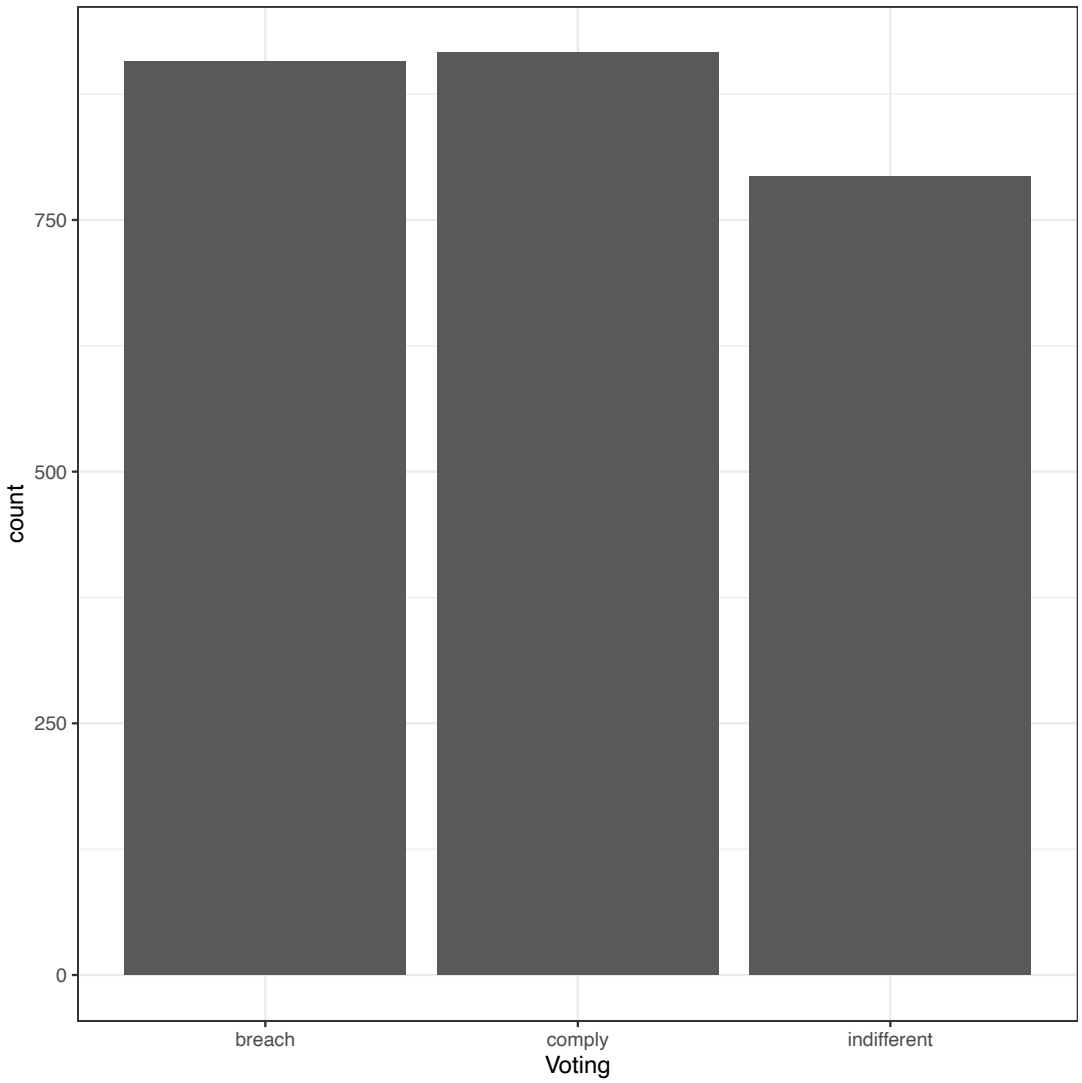
For Stage 1 compliance, 'overharvesting' is defined as having requested[3] more than half of the available ripe apples on a shared tree[4]. For Stage 2 compliance, voting 'yellow' is considered a breach in cases where the participant should have definitely voted green (i.e., unjustified sanctioning), or red (i.e., breach of rules). There are some cases where the participant can make a judgement call and I consider them as 'compliant[5]. In case a participant does not cast any vote, the variable takes the value 'indifferent'.

3 As described in Chapter 5, requested apples show how much a participant wants to harvest and this can be more than in the end were actually harvested because the requests of both neighbours have to be balanced against each other.

4 As described in Chapter 5, there is the guideline to always leave two apples on the tree so that they can fall down and fertilise the ground (so called "sustainable harvesting"). Here, we do not account for this as otherwise the guideline would become a prescription. The decision for sustainable harvesting is voluntary while the decision to overharvest is linked to a potential punishment. Moreover, harvesting more than half of small or fallen apples are not considered as the game instructions only refer to ripe apples. We account for small and fallen apples with different variables, and the calculation for different variables should not be based on the same data in order to avoid correlations.

5 In the game instructions, there is a mistake for Stage 2. Instead of saying that voting is based on requested ripe apples, the instructions for the participant say "not to harvest more than half". However, the programming for computer-farmers' votes on other computer-farmers is based on the number of requested, not harvested, apples. In fact, in most cases, this does not make a difference. There is no difference for laid-back (LB) and moderate (M) farmers not located next to an aggressive farmer (A) as they are never voted yellow or red, i.e., they neither request nor harvest half or more than half of ripe apples (>=x/2). There is also no difference for A as they always request >x/2 (except in Round 1, when they request x/2). A always has one neighbour being LB and with him A can request and harvest as much as they want, hence, A always deserves red (except in Round 1 where they deserve yellow or green as they harvest exactly x/2). A moderate farmer (M) located next to A requests tit-for-tat (i.e., requests the same as A requested in the round before). Therefore, we have to check in which round which of the two requests more. If they request the same (even though it is above x/2), they end up harvesting exactly x/2 – which would be a judgement call for the participant to assign either green or yellow – while both would deserve a sanction if we considered the number of requested apples. Given the tit-for-tat strategy this always happens in boom rounds (round 3, 6, and 9), as in bust rounds, they start with co-operative harvesting, and in recovery rounds, they may already have requested more but deserve a warning (not a fine). Hence, in total, there are only three rounds where a vote would be wrong because of the difference between taking as basis the number of requested or harvested apples.

Figure A.6-1-1: Voting correctly – per round.

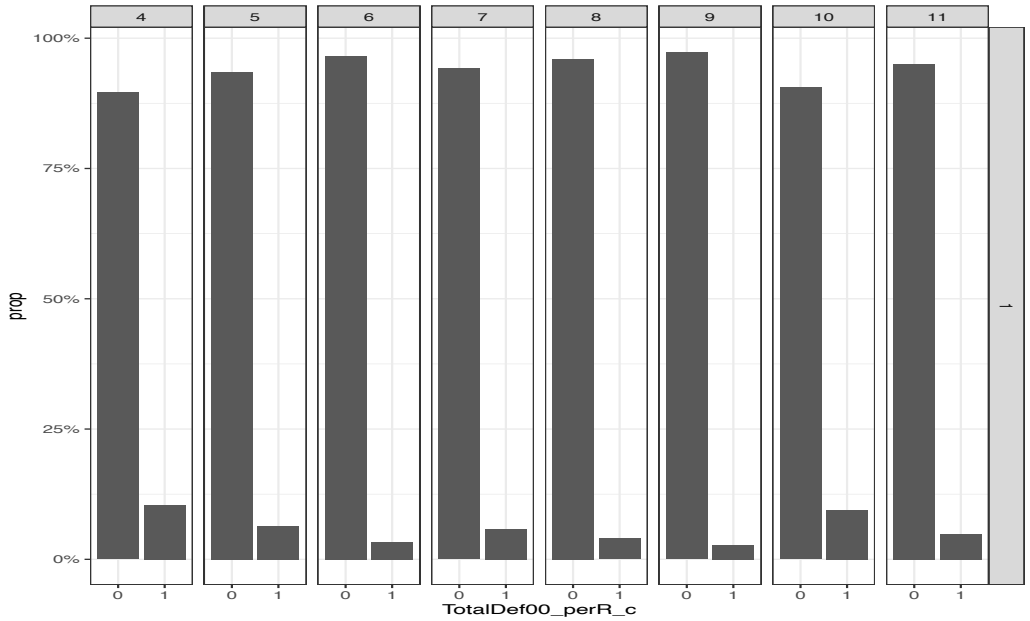


Source: own calculation. The y-axis shows the absolute number of participant-rounds that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent').

Given the fact that the first three rounds are not used for the analysis, only two potentially wrong rounds end up in the analysis. Moreover, there are only two such farmers, F13 and N1. Hence, in total, there are 4 observations (round-farmer – 2 times 2). Therefore, due to this mistake, the participant potentially votes wrongly for green in maximum 4 out of 144 cases (round-farmer, 8 times 18). Now, after the game, it is not possible to understand with what intentions a participant voted for these two farmers in these two rounds. However, the mistake can be considered negligible as it only concerns 2.8% of all votes.

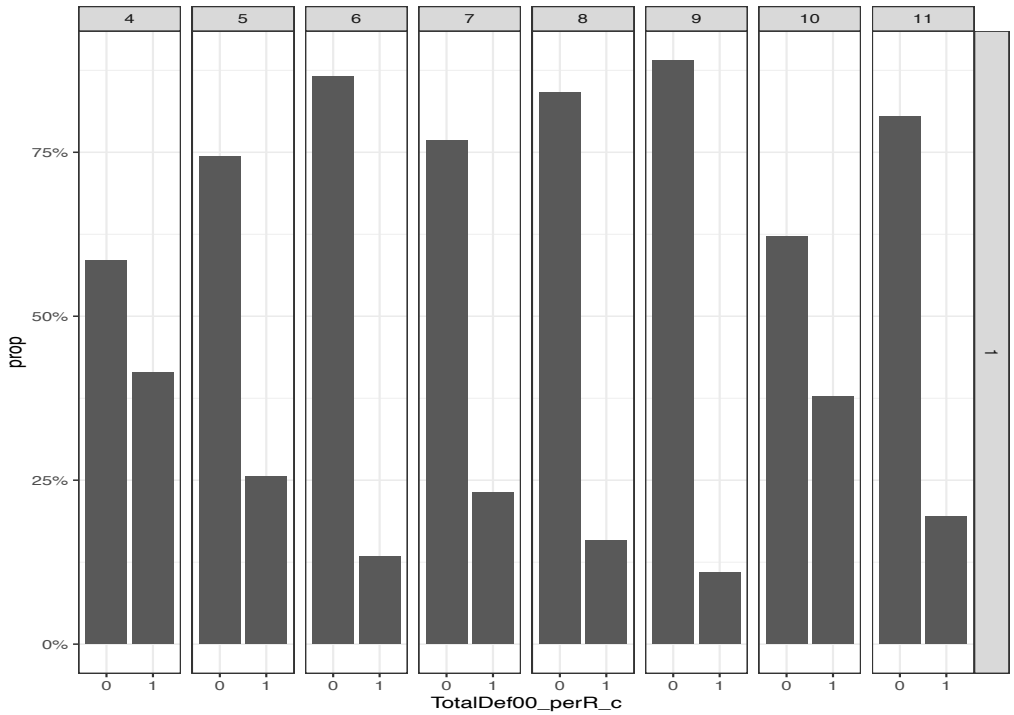
Overharvesting often takes place in bust, less in recovery and least in boom rounds.

Figure A.6-1-2: Overharvesting – per round, all participants.



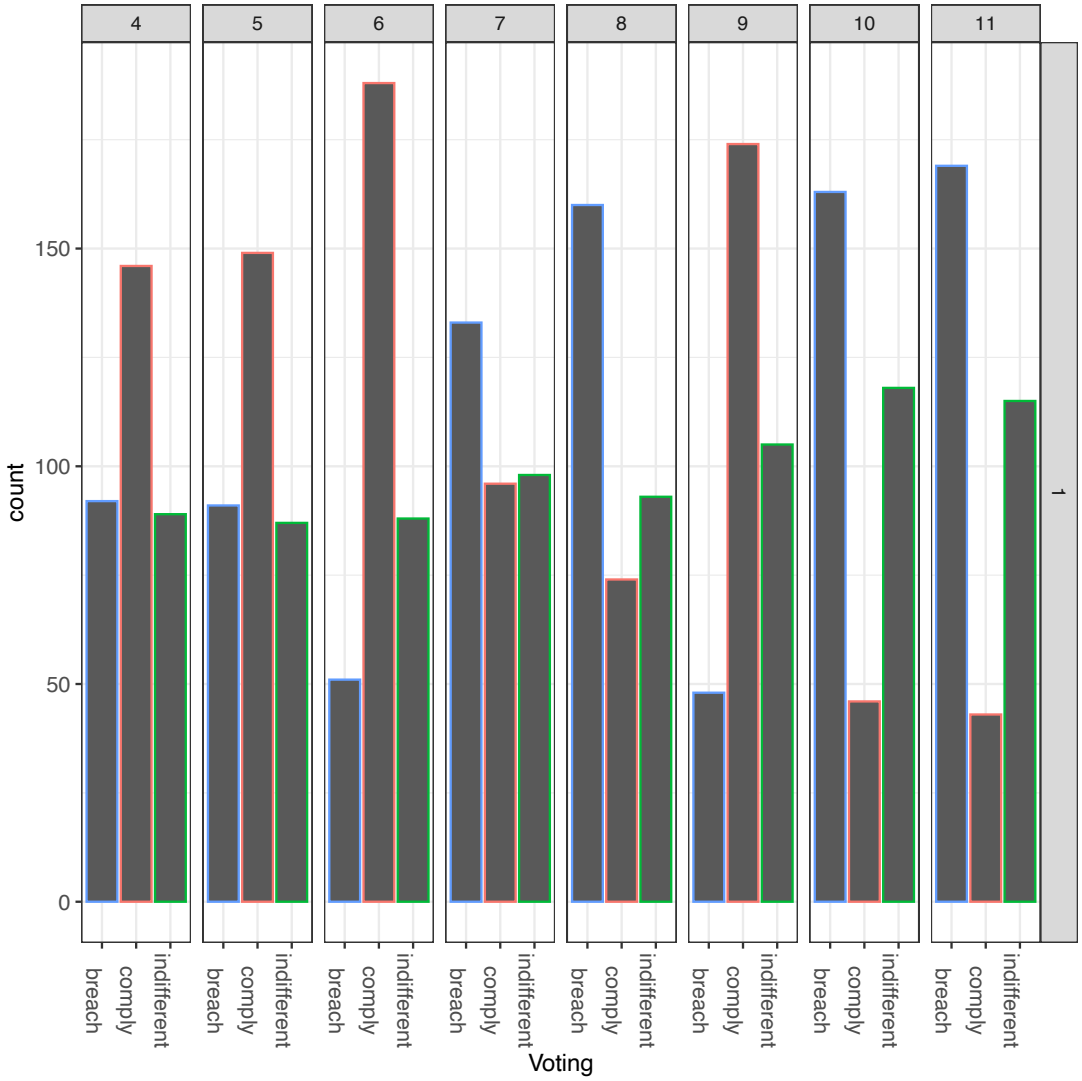
Source: own calculation. The y-axis shows the proportion of participants that overharvested ('1') or not ('0') in each round ('TotelDef00_perR_c').

Figure A.6-1-3: Overharvesting – per round, only participants that overharvested at least once during the game.



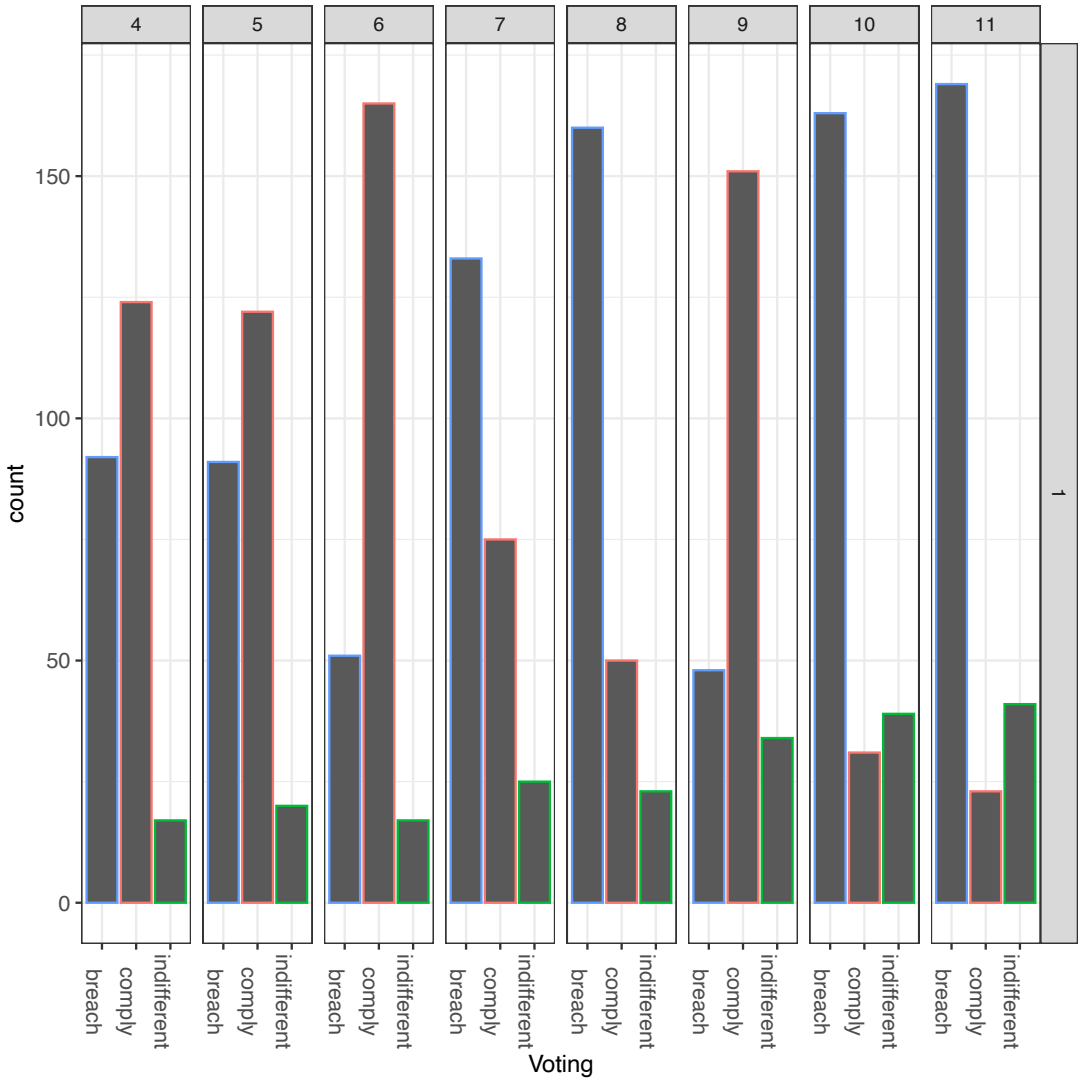
Source: own calculation. The y-axis shows the proportion of participants that overharvested ('1') or not ('0') in each round ('TotelDef00_perR_c').

Figure A.6-1-4a: Voting – per round.



Source: own calculation. The y-axis shows the absolute number of participants that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent'), ('Voting').

Figure A.6-1-4b: Voting – per round, only participants that voted incorrectly at least once during the game.



Source: own calculation. The y-axis shows the absolute number of participants that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent'), ('RuleTypeVot_perR').

A.6-1.1.2 Power analysis

To define whether the dataset is large enough to analyse both variables for a breach, I compute the experiment's power[6]. Power is defined as "the probability of detecting an effect when it exists" (Statistical Consulting Group 2021a*)*. Calculating power with R (DataCamp 2020, Kabacoff 2017, Statistical Consulting Group 2021a), shows that the dataset is large enough for analysis with regard to both 'overharvesting' and 'voting

[6] In case the dataset would have been too small, i.e. underpowered, interpreting null effects would have been difficult as this could in fact hide an effect, which I do not see because the dataset is too small. In contrast, I could be confident with interpreting significant effects as it is unlikely that the effect would disappear in a larger dataset.

incorrectly'[7]. It requires 1055 participant-rounds and there are 2616 in the sample. As regards 'voting incorrectly', the analysis requires 1235 participant-rounds. This means I would need 155 participants in total.

As assumptions, I use the proportion of breaching (i.e., 'overharvesting' and 'voting incorrectly', respectively) in the treatment group (i.e., participant-rounds associated with 'bust') and in the control group (i.e., participant-rounds associated with 'recovery' and 'boom'). Overharvesting happens in 4.3% of the cases in the control group and in 8.6% of cases in the treatment group. 'Voting incorrectly' happens in 31.7% of the cases in the control group, and in 39.6% of cases in the control group. All in all, the power analyses reassures that I can proceed with the empirical analyses and interpret with good confidence that the findings reflect a more general pattern.

Table A.6-1-5: Number of observations.

	Power analysis results	Dataset 1	Proportion in the control group	Proportion in the treatment group
Overharvesting	**1055**	**2616**	4,3%	8,6%
Voting incorrectly	**1235**	**2616**	31,7%	39,6%

Source: own calculation.

[7] We set as significant level 0.05, as power 0.8 (which is a commonly used value, see Statistical Consulting Group 2021a), and 0.375 for bust participant-rounds as a share of all participant-rounds.

A.6-1.2 Dataset

A.6-1.2.1 Descriptive statistics on treatment and control variables

From all the data in the experiment, I have constructed variables that will be used for the analyses[8]. The table below shows all variables with their coding and brief description. Some variables enter the analysis only as per round variables, and some as aggregate variables (see green colouring). This means that for some, it is important to note the round in which they take a specific value; some represent general behaviour which only solidifies across all rounds. Using either the per round or the total variable also depends on the analysis. I round all decimal variables to their second digit and centre all variables around 0 or to floor with 0 in order to avoid too many different scales of variables (this is important for panel data; see Krause and Urban 2013). Variables that use the bare number of items are adjusted according to a farmer's size, so that the numbers are comparable across small, medium and large farmers[9].

The aggregate variables across all rounds ('total') are calculated at the aggregate level. I did not want to take the type that a participant played most per round as this might carry risks of false second round interpretations. Therefore, Stage 1 compliance is defined as having overharvested once on any shared tree in any round. This might be biased because this might feel like 'less' breaching than the case where someone overharvests on all trees in all rounds, which equally takes the value of '1'. However, this is a straightforward condition and another cut-off point might be arbitrary. Stage 2 compliance is calculated in the same way as above, but with the aggregate variables for voting behaviour. Again, this might entail hard conditions, however another cut-off point might be arbitrary.

8 The details on how all variables are calculated can be found in the R programming scripts.
9 Size adjustment is calculated such that for small, medium and large participants the number is divided by the number of trees at their disposal, hence 3, 5, or 7.

Table A.6-1-6: Names and descriptions of variables.

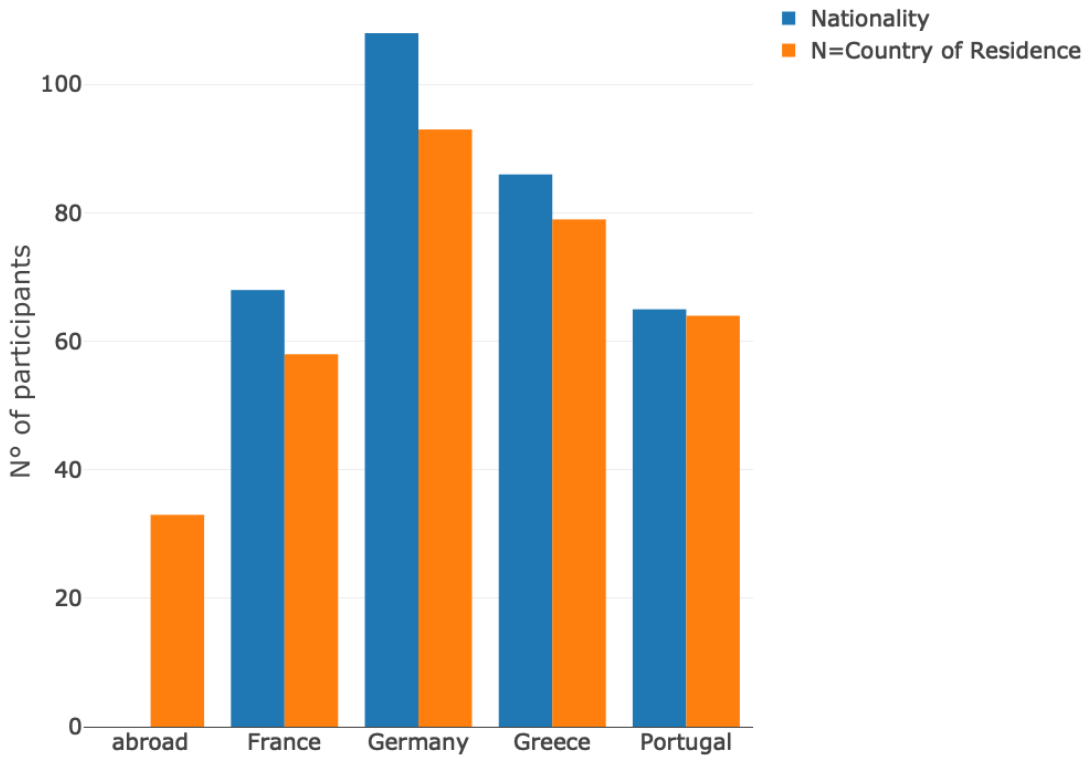
	Variable	Coding	Explanation
Dependent variables	**Overharvesting** [numeric]	(0/1)	coded '1' if there was overharvesting
	VotingIncorrect [numeric]	(0/1)	'breach' is coded '1'; and 'comply' and 'indifferent' are coded '0'
	VotingCorrect [numeric]	(0/1)	'comply' is coded '1'; 'breach' and 'indifferent' are coded '0'
Treatment variables: economic necessity and political importance	**BusinessCycle** [character]	bust, recovery, boom	rounds 4,7,10 are coded 'bust', rounds 5,8,11 'recovery', rounds 6,9 'boom'
	Size [character]	small, medium, large	depending on whether the farmer disposes of 1, 2, or 3 own trees
	Nationality [character]	France, Portugal, Germany, Greece	nationality of participant
Economic policy ideology	**InvestmentType** [character]	stimulus, prevention, no type	comparison between the number of purchases of stimulus and of prevention items; coded 'no type' for balanced, no such investments or no investments at all
	RiskAversion [character]	risk-averse, risk-taking, no type	comparison between the number of purchases of ladders and of shepherds; coded 'no type' for balanced, no such investments or no investments at all
	Sustainable [character]	(0/1)	coded '1' if in all rounds, across all trees where two apples were always left on the ground and if the participant never harvested a small apple
Strategic interactions	**Co-operation** [character]	exploiting, co-operative	is coded 'exploiting' if a participant harvested from, but never invested in, shared trees, calculated across all rounds, all shared trees, and both neighbours
	ReciprocalVoting [numeric]	0-1	number of deals with which a participant complied as a share of all deals that the participant has sealed, coded '0' in case no deal was sealed
Rule abidance	**Overharvesting** [numeric]	(0/1)	coded '1' if there was overharvesting
	Voting		

	[character]	comply, breach, indifferent	coded 'comply': voted correctly for a sanction (yellow or red) and against a sanction (green), added up across all computer-players per round; coded 'indifferent' in case the participant abstained from all votes
Control variables	**HappinessPoints** [numeric]	>=0	total number of happiness points, size-adjusted
	Bucket [numeric]	>=0	number of purchased buckets
	InvestmentRate [numeric]	0-1	all investments as a share of all cumulative available energy points
	International [character]	(0/1)	coded '1' if the participant has lived or is currently living abroad, i.e., not in their country of nationality
	Economics [character]	economics, SocSci, 0	field of Study: economic, social sciences, or other
	PolSpec [numeric]	(0/1/2/3/4)	political spectrum, ranging from left (0) to right (4)
	Trees [character]	apples, trees, 0	goal stated as apples, trees, or other
	Male [numeric]	(0/0.5/1)	coded '1' for men, '0' for women and '0.5' for those who preferred not to say their gender
	Age [numeric]	>=0	age
	Capital [character]	(0/1)	coded '1' if the participant is currently living in the capital

Source: own description.

As regards the treatment variables, the number of participants per nationality are similar for Portugal (65 participants) and France (68), while Greece (86) and Germany (108) are higher. There are some differences with regard to the number of participants who currently live and have always lived in their country of origin (orange bars). 'Abroad' depicts all those who are currently not living in their country of origin – there are 33 such participants. Therefore, I need to include a dummy variable accounting for those (variable 'International').

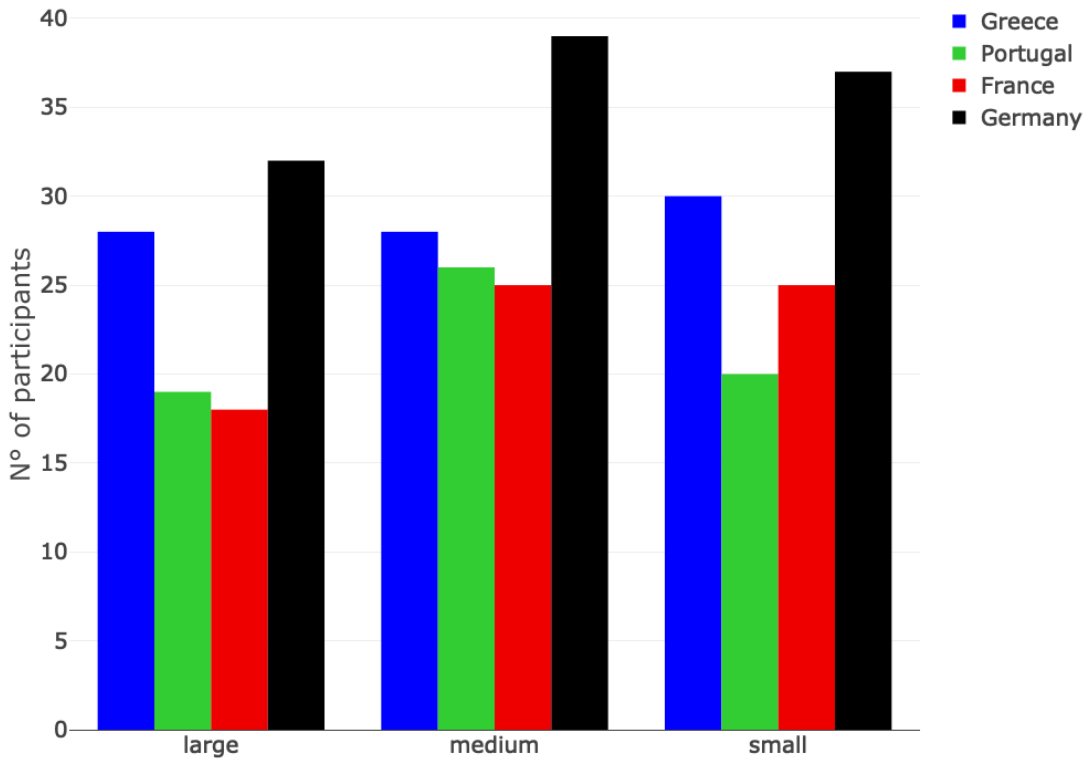
Figure A.6-1-7: Number of participants per nationality and country of residence.



Source: own calculation.

The number of participants per size of a farmer is rather balanced across nationalities as the figure below shows. There is a maximum difference of 7 participants between the categories per nationality.

Figure A.6-1-8: Number of participants per size of farmer and nationality.



Source: own calculation.

The number of rounds per business cycle period is the same for 'bust' and 'recovery'. For 'boom', there are fewer rounds.

Figure A.6-1-9: Number of rounds per business cycle period.

	Boom	Bust	Recovery
Number of rounds	654	981	981
	25%	38%	38%

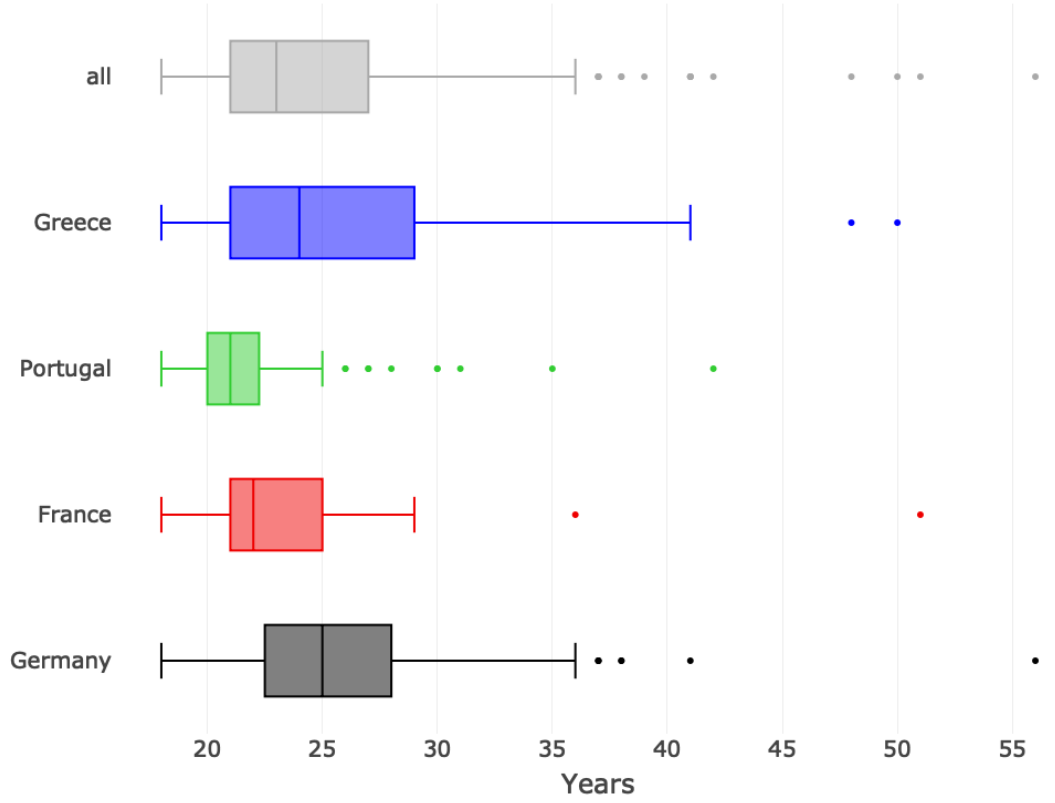
Source: own calculation.

In order to check whether the dataset is biased, and whether as a result I would need to restrict the dataset or whether it is enough to include control variables, I compare the dispersion per nationality. In the event of the control variables having significantly different numbers per nationality, the variable's effect might show bias.

Age of participants ranges from 18 to 60 years, while the vast majority is in their 20s. Both the mean and median age is 23 years. The mean and median age and

the dispersion differ across nationalities and, therefore, are included as a control variable.

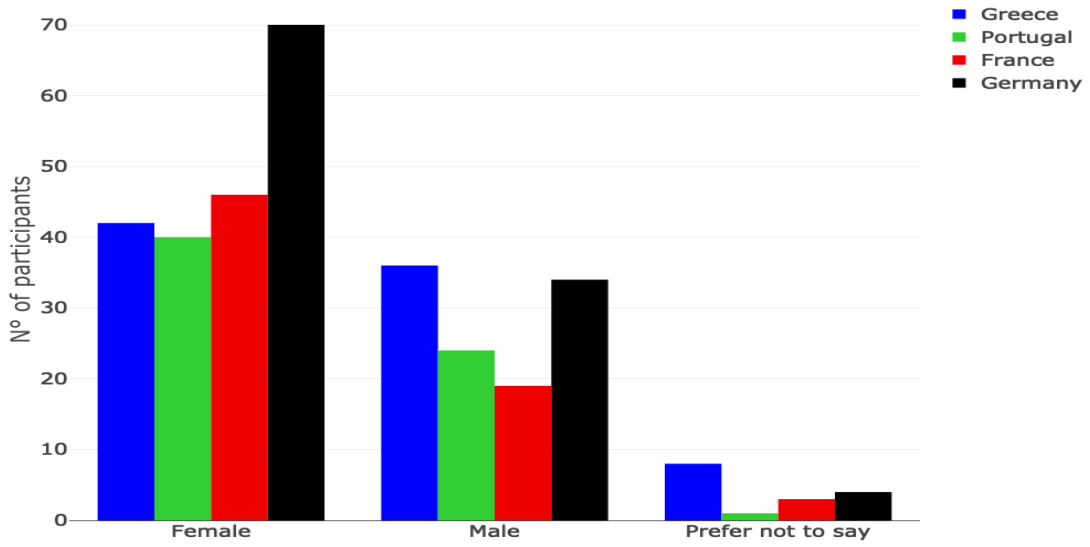
Figure A.6-1-10: Age per nationality.



Source: own calculation. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

The graph below shows that, except for Greeks, there are almost double as many women than men having participated in the game. Moreover, the dispersion across nationalities differs. There are only a few participants that did not want to state their gender. As a result, I use the variable 'male' as described above.

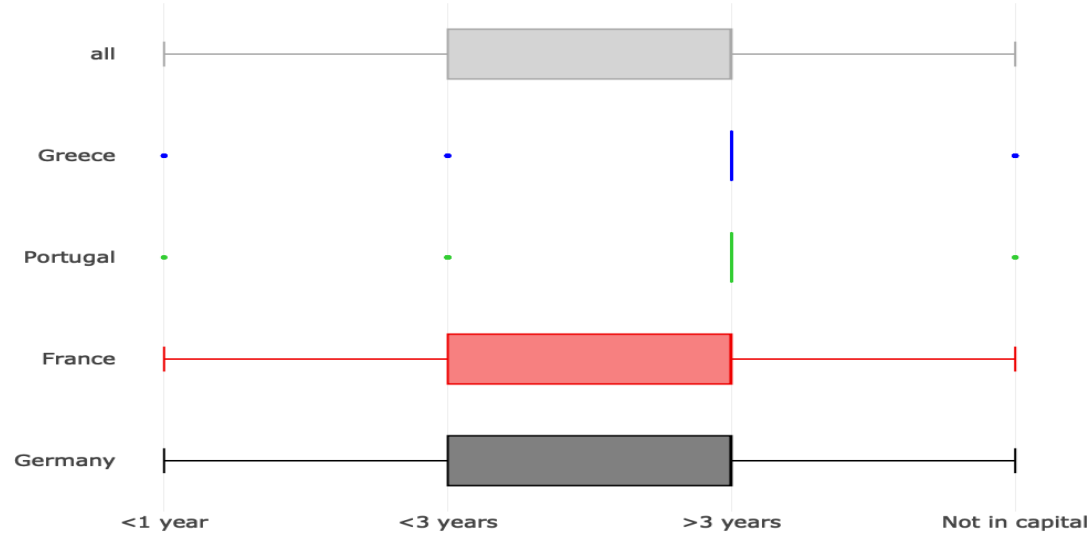
Figure A.6-1-11: Gender per nationality.



Source: own calculation.

The graph shows that only the vast majority of Greeks and Portuguese live for at least 3 years in the capital and, hence, can be considered as target groups of this experiment. For German and French participants, the dataset also includes several participants who lived somewhere else in the country before, potentially in more rural areas. As explained above, this might bias comparisons between nationalities. Therefore, I need to include the control variable 'capital'.

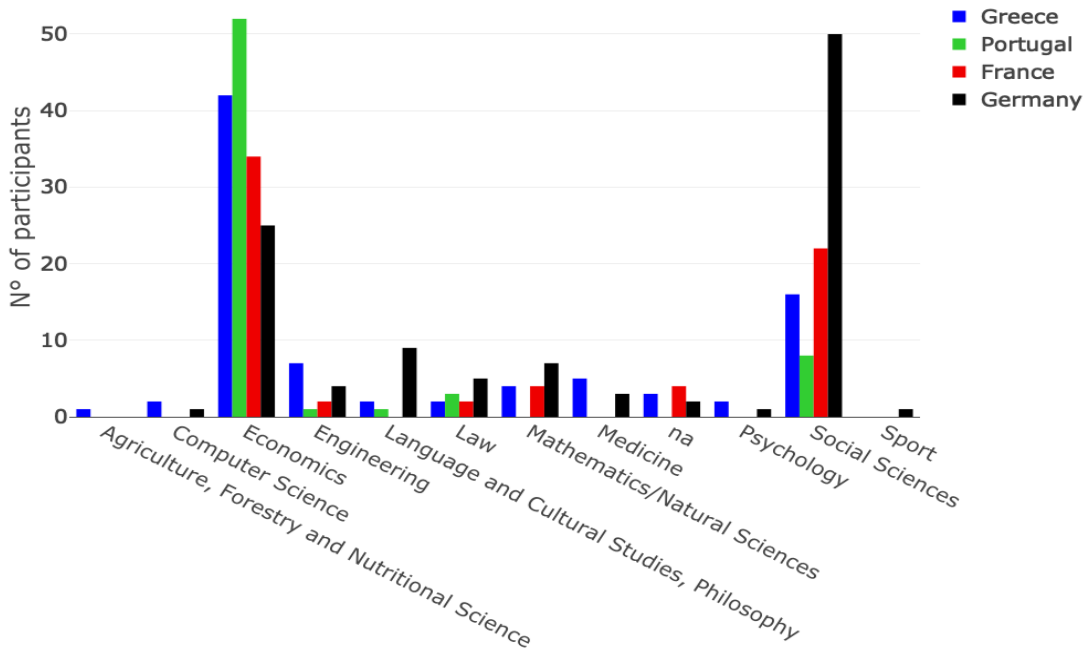
Figure A.6-1-12: Living in the capital.



Source: own calculation. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

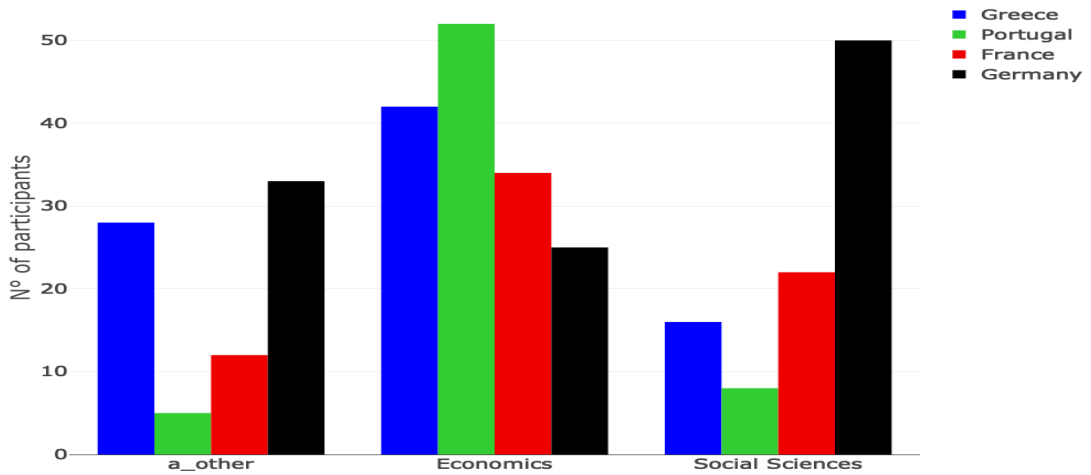
The figures below show the field of study or profession. As intended, most of the participants are from social sciences and economics. However, the dispersion is quite different, also across nationalities. This variable might measure some participants' inherent characteristics, which the game playing variables do not manage to measure. Therefore, I need to check whether I need to include it as a control variable ('economics').

Figure A.6-1-13: Field of study or profession – all.



Source: own calculation.

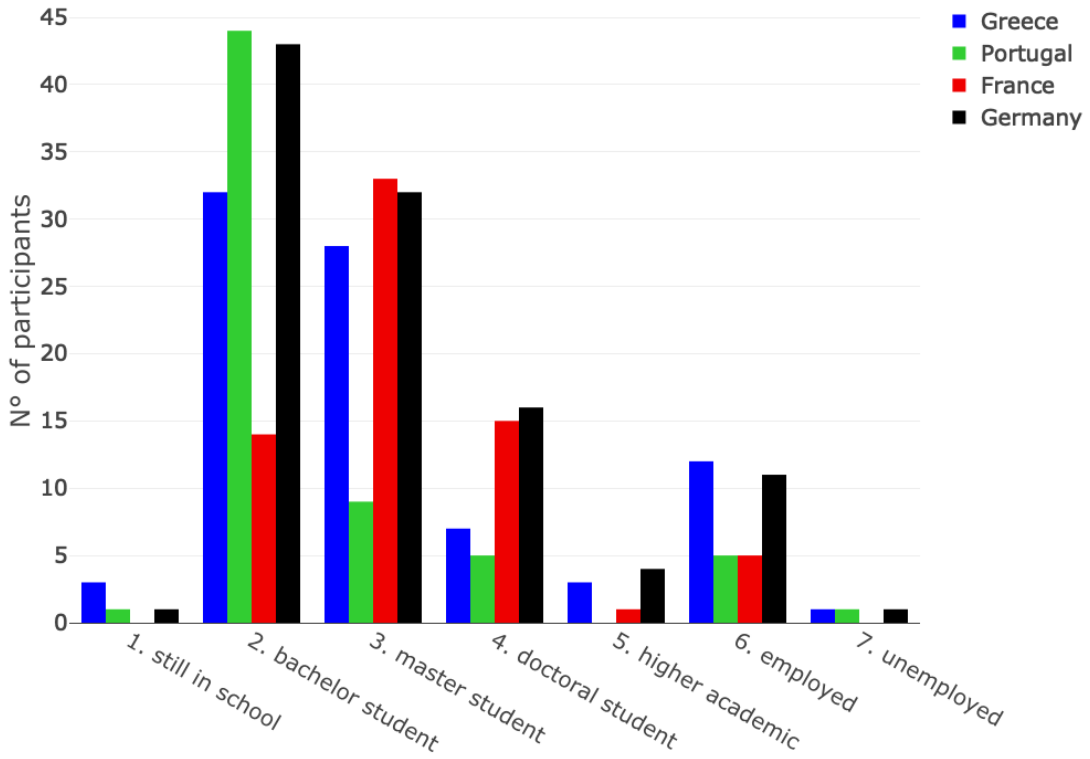
Figure A.6-1-14: Field of study or profession – economics.



Source: own calculation.

Looking at the main occupation of participants, most of them are university students. However, the dispersion is different across nationalities with Greece and Germany following a similar pattern. In contrast, Portugal predominantly comprises bachelor students, and France, master students. Therefore, any potential effect is likely already captured with the variable 'age', which leads to the conclusion that this variable should be excluded from the analysis, otherwise it may cause multicollinearity.

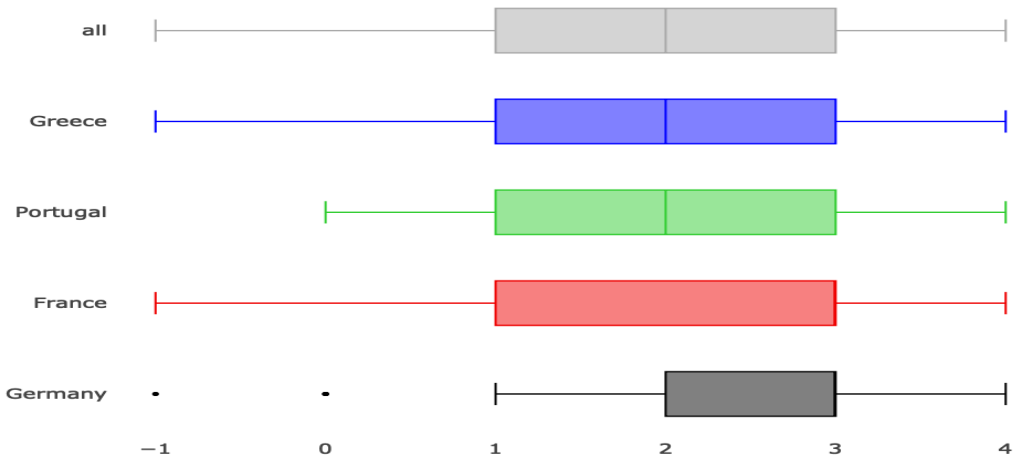
Figure A.6-1-15: Main occupation.



Source: own calculation.

With respect to the political ideological position, many participants considered themselves to be rather in the middle or on the right side of the classic political spectrum. Participants' positioning on the left-right political spectrum is different across countries. Therefore, I need to check in the regression analyses whether I need to include it as a control variable.

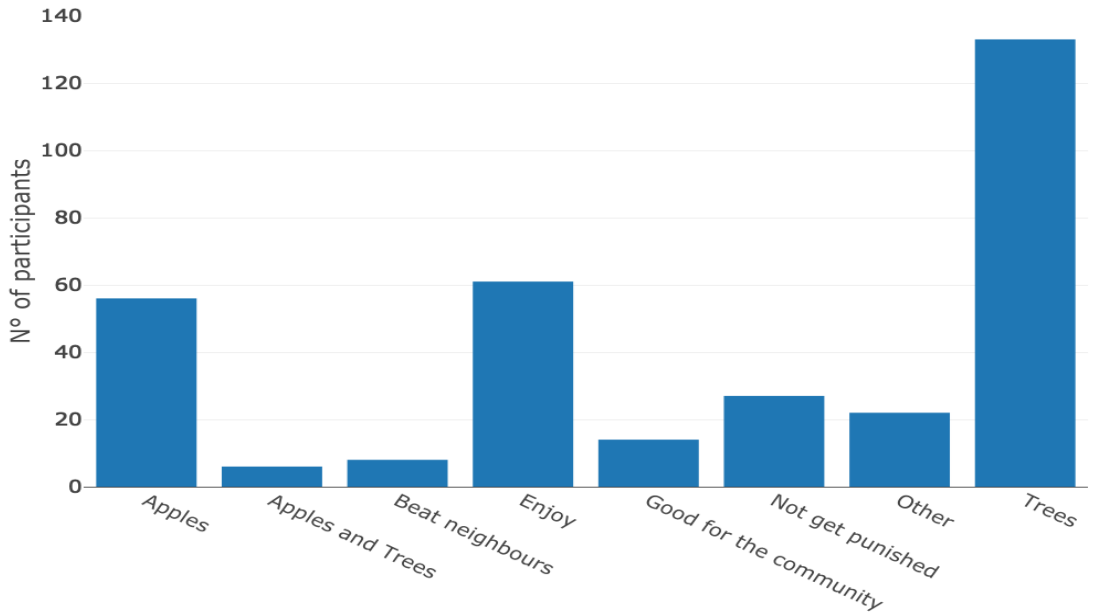
Figure A.6-1-16: Political spectrum from left (0) to right (4).



Source: own calculation. The value '-1' indicates abstentions. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

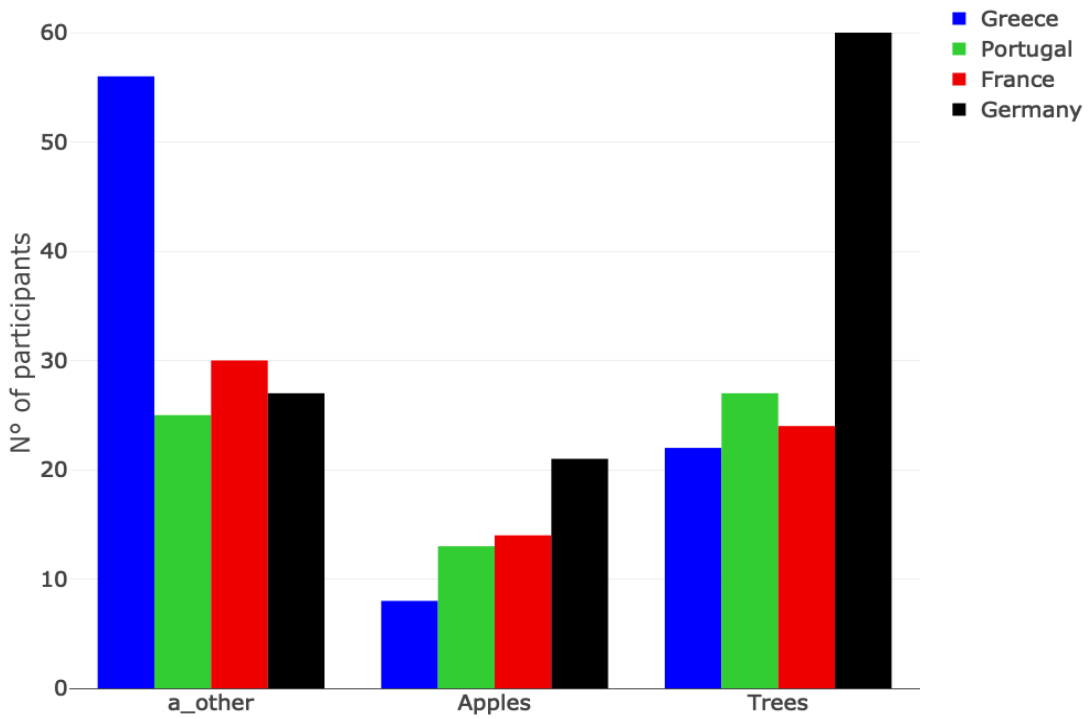
Finally, participants were asked about their beliefs about the purpose of the game. Participants stated their goal differently as the figure below shows. The vast majority sought to have good trees. Across nationalities, the responses also differed with Germans predominantly focusing on the 'trees', and Greeks in other goals. This variable might measure some participant-inherent characteristics, which the game playing variables do not manage to measure, which makes it relevant.

Figure A.6-1-17: Goal – all.



Source: own calculation.

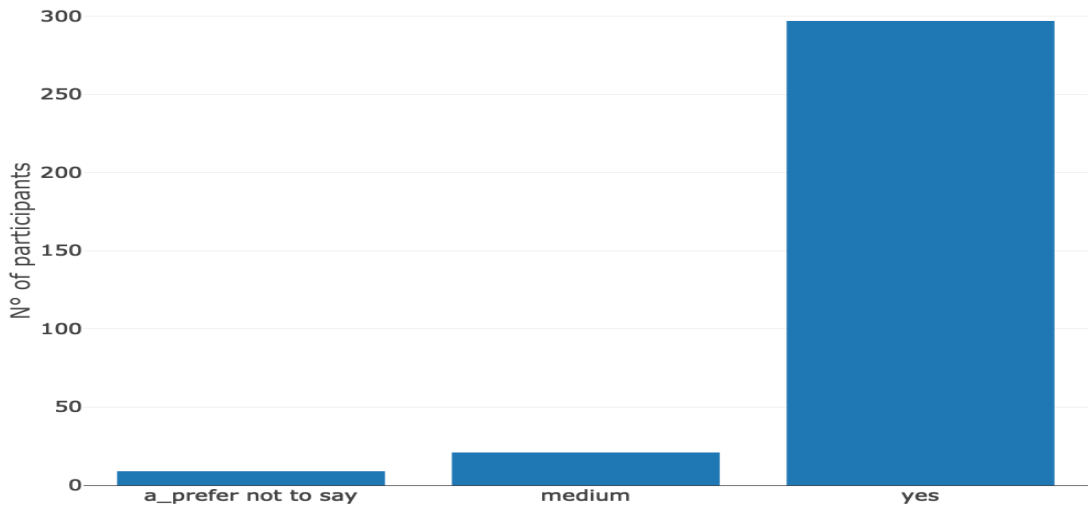
Figure A.6-1-18: Goal – trees.



Source: own calculation; 'a_other' combines all other responses.

The graph below shows the number of participants and whether they said they understood the English language in the game well. There are only a few who indicate 'medium' or did not want to report. Therefore, I do not see a need to further restrict the dataset or include a control variable based on this.

Figure A.6-1-19: English language.



Source: own calculation.

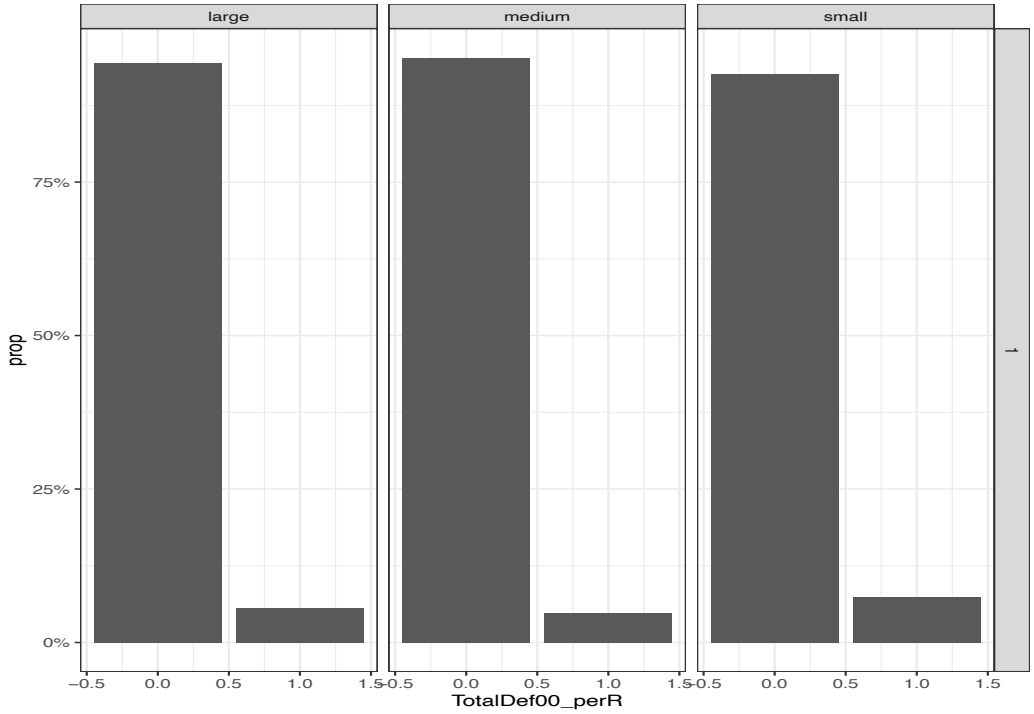
All in all, participation reflects the desired sample criteria for nationality, field of study, and degree. The dataset looks rather balanced with regard to the treatments. In order to account for unbalanced distribution among other typical control variables, such as age and gender, I include them as variables in the analyses.

A.6-1.2.2 Rule compliance by treatments

This section provides more details on the treatment variables 'size' and 'nationality', and their distribution across dependent variables. This serves to understand the relation between the variables; I conclude that it might be useful to consider 'size' and 'nationality' together in the analyses.

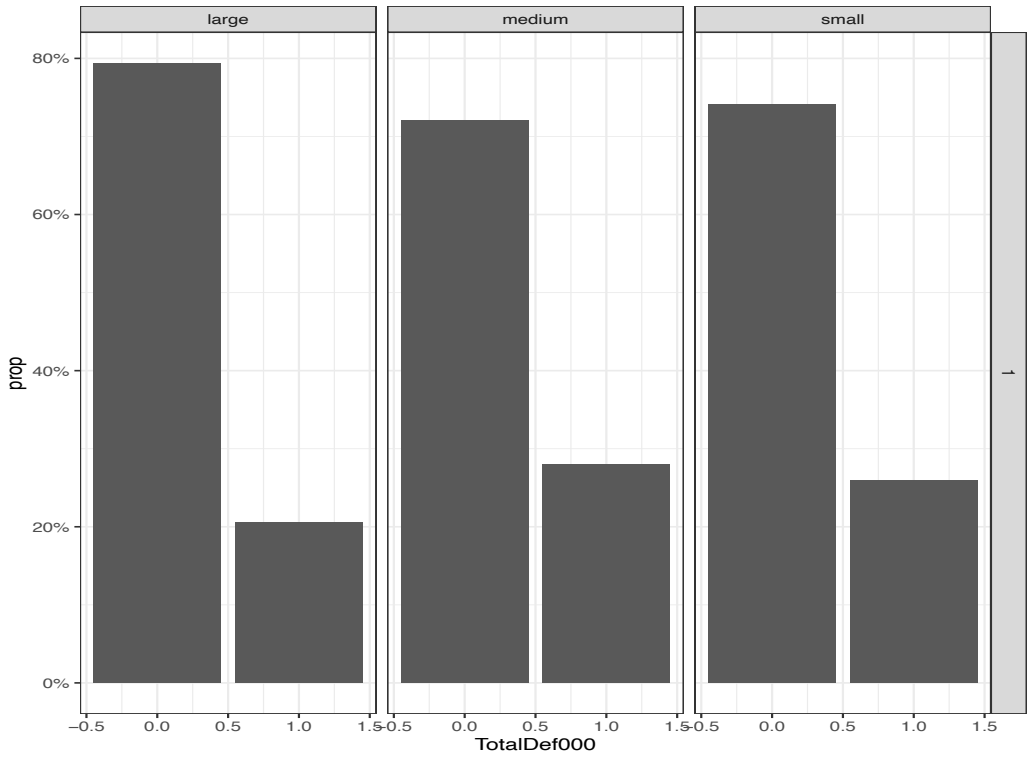
Firstly, we look at the treatment variable 'size'. When looking at the figure below, I do not easily see whether the size of a farmer plays a role for overharvesting. The picture is different whether we look at the per round or the aggregate variable: while for the per round variable 'size' does not seem to matter, we can see that for the total variable, there are proportionally more small- and medium-sized participants who overharvested at least once during the game than large ones.

Figure A.6-1-20: Overharvesting – per size, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large' participant-rounds that overharvested ('1') or not ('0') in each round ('TotelDef00_perR').

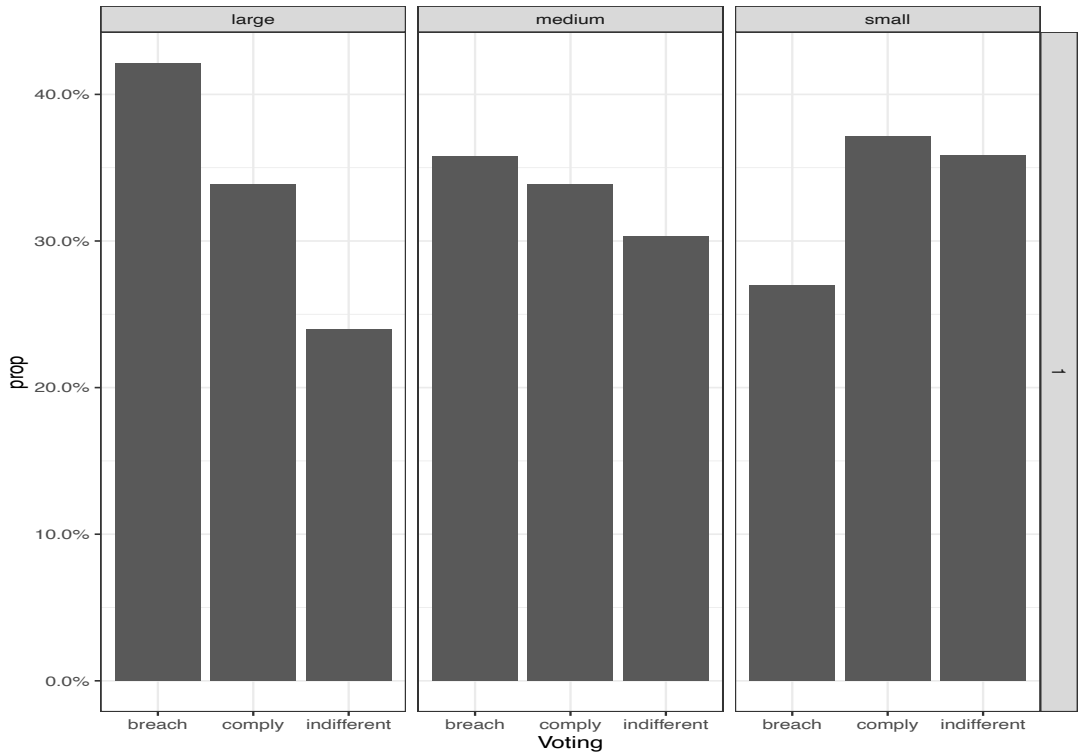
Figure A.6-1-21: Overharvesting – per size, total.



Source: own calculation. The y-axis shows the proportion of e.g. 'large' participants that overharvested at least once ('1') or not at all ('0') during the entire game ('TotelDef000').

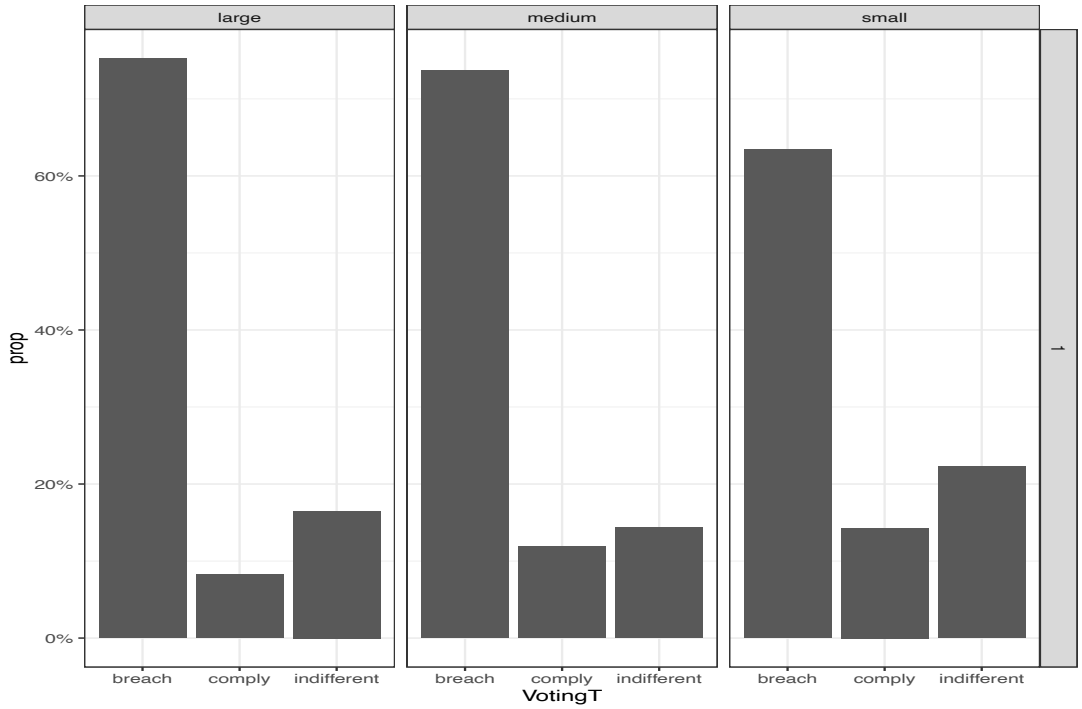
In contrast, 'size' seems to matter for 'voting'. Large farmers breach proportionally more often than medium, and even more than small farmers. Vice versa, small farmers are 'indifferent' and 'comply' in proportionally more participant-rounds than the other farmers. The same picture shows for the aggregate variable.

Figure A.6-1-22: Voting – per size, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large' participant-rounds that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent') in each round.

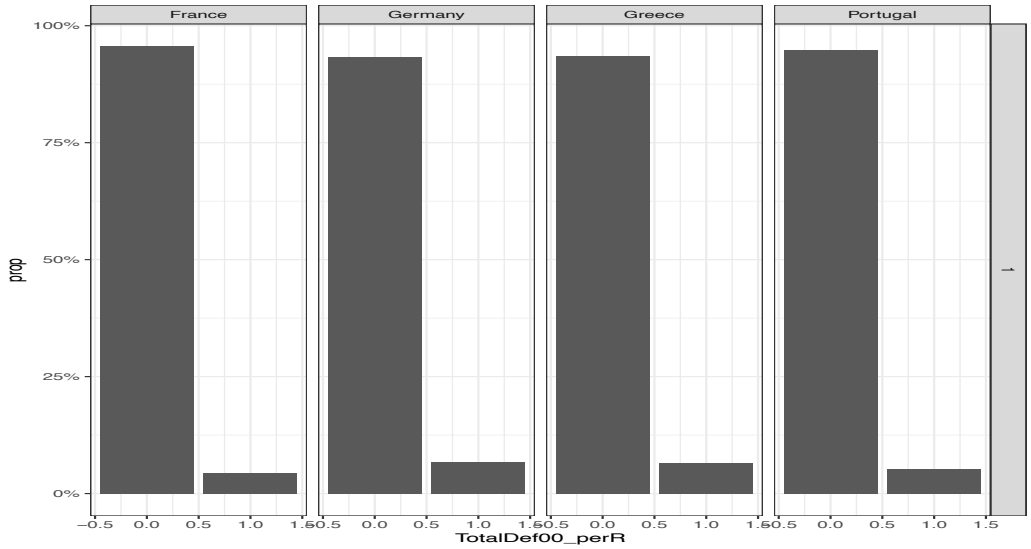
Figure A.6-1-23: Voting – per size, total.



Source: own calculation. The y-axis shows the proportion of e.g. 'large' participants that voted always correctly ('comply'), at least once incorrectly ('breach') or always abstained ('indifferent') during the entire game.

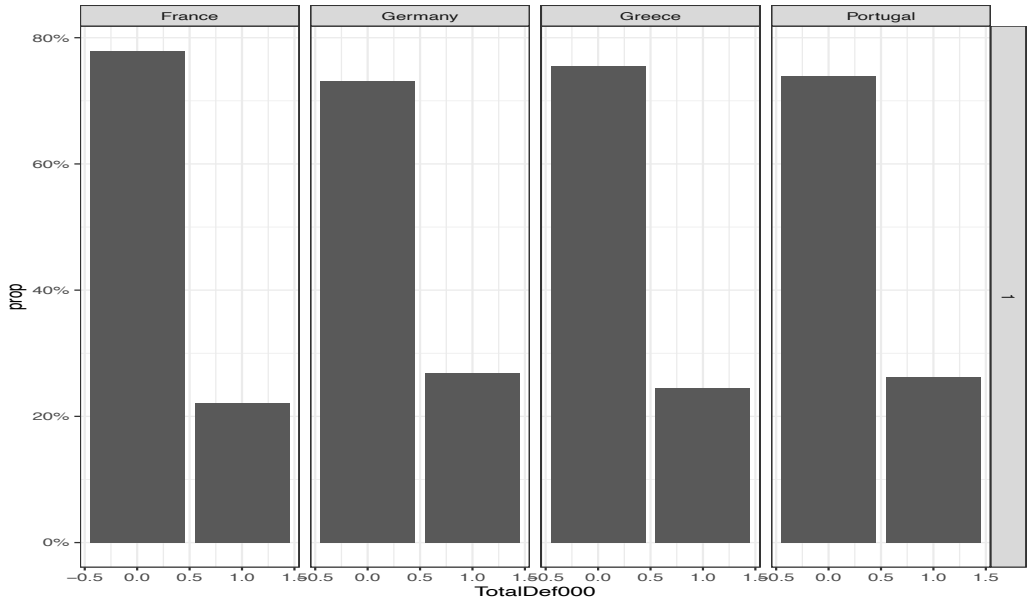
Secondly, we look at the treatment variable 'nationality'. The figures below suggest that there is some indication that nationality plays a role for rule compliance. Participants from France overharvest less often than the others, and participants from Germany more often. Depending on whether we look at per round or aggregate data, participants from Greece and Portugal also overharvest relatively often. Nonetheless, the differences are not that large.

Figure A.6-1-24: Overharvesting – per nationality, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'French' participant-rounds that overharvested ('1') or not ('0') in each round ('TotelDef00_perR').

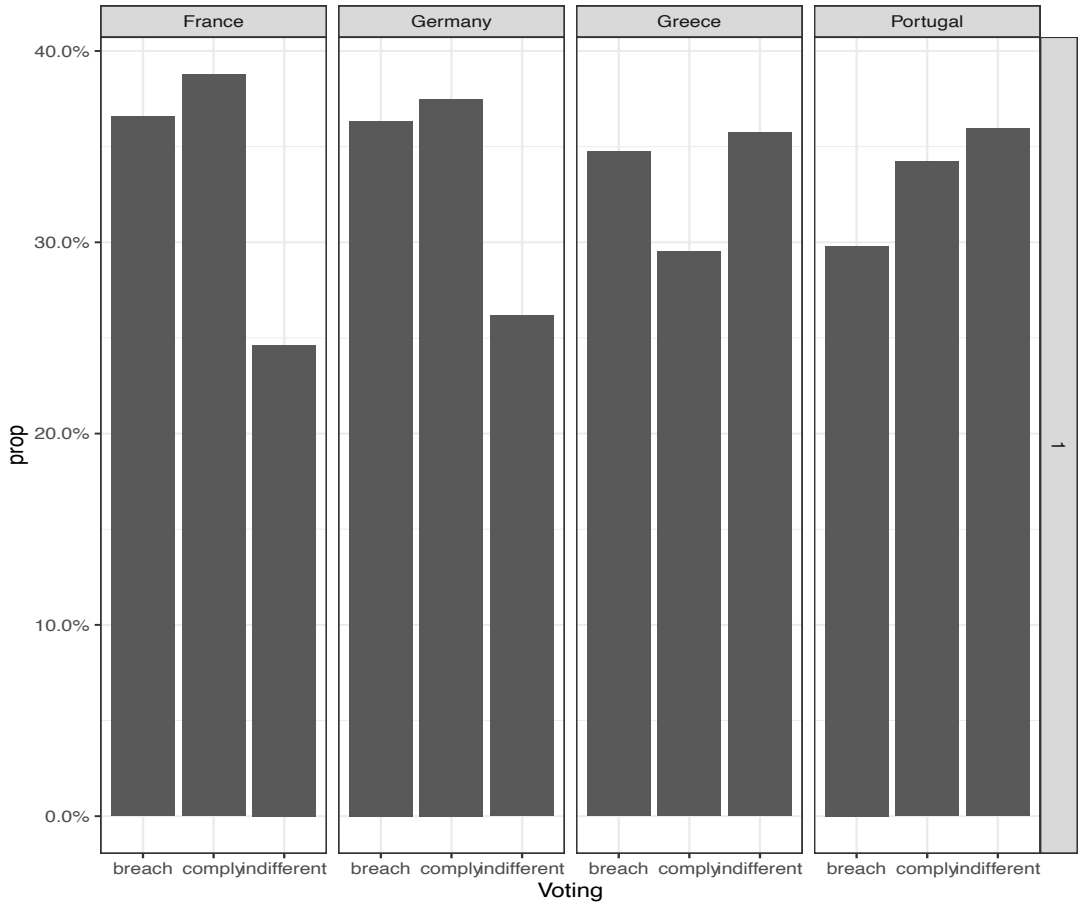
Figure A.6-1-25: Overharvesting – per nationality, total.



Source: own calculation. The y-axis shows the proportion of e.g. 'French' participants that overharvested at least once ('1') or not at all ('0') during the entire game ('TotelDef000').

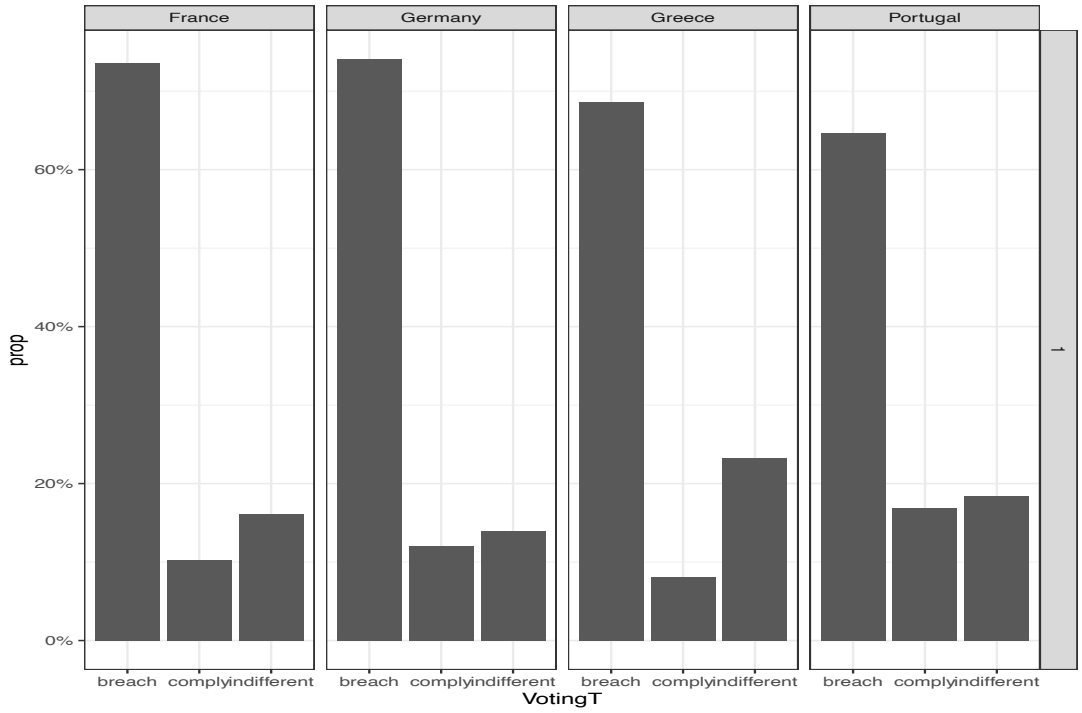
The picture is more nuanced when looking at voting behaviour. For France and Germany, the majority of participant-rounds belongs to 'comply', closely followed by 'breach'. Only a quarter of participants abstains from voting. Participants from Greece abstain in the majority of participant-rounds, closely followed by 'breach' and only roughly a third complies. Again, participants from Portugal are different: while they also abstain in the majority of cases, closely followed by 'comply', only roughly a third breaches. On aggregate, the overwhelming majority of participants from all countries votes incorrectly at least once during the game. The picture is similar for participants from France and Germany, with roughly three out of four participants breaching at least once, about 15% of the participants abstain and roughly every tenth complies. Participants from Greece and Portugal breach relatively less, however at the expense of abstaining. Participants from Greece comply least and abstain most. While participants from Portugal also abstain in roughly one out of five cases, they comply the most.

Figure A.6-1-26: Voting – per nationality, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'French' participant-rounds that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent').

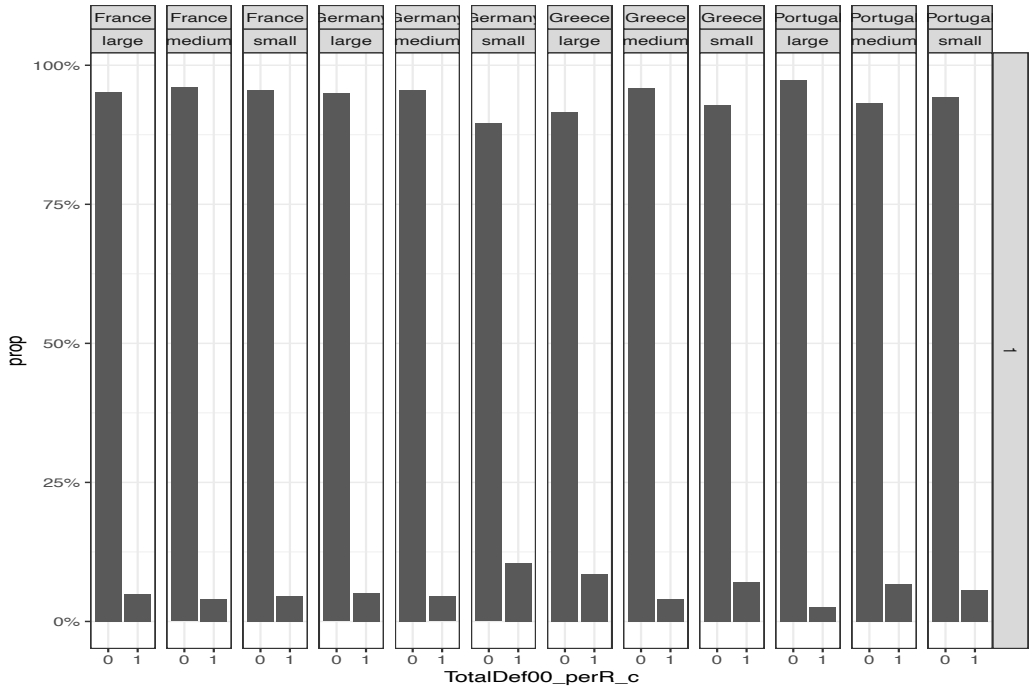
Figure A.6-1-27: Voting – per nationality, total.



Source: own calculation. The y-axis shows the proportion of e.g. 'French' participants that voted always correctly ('comply'), at least once incorrectly ('breach') or always abstained ('indifferent') during the entire game.

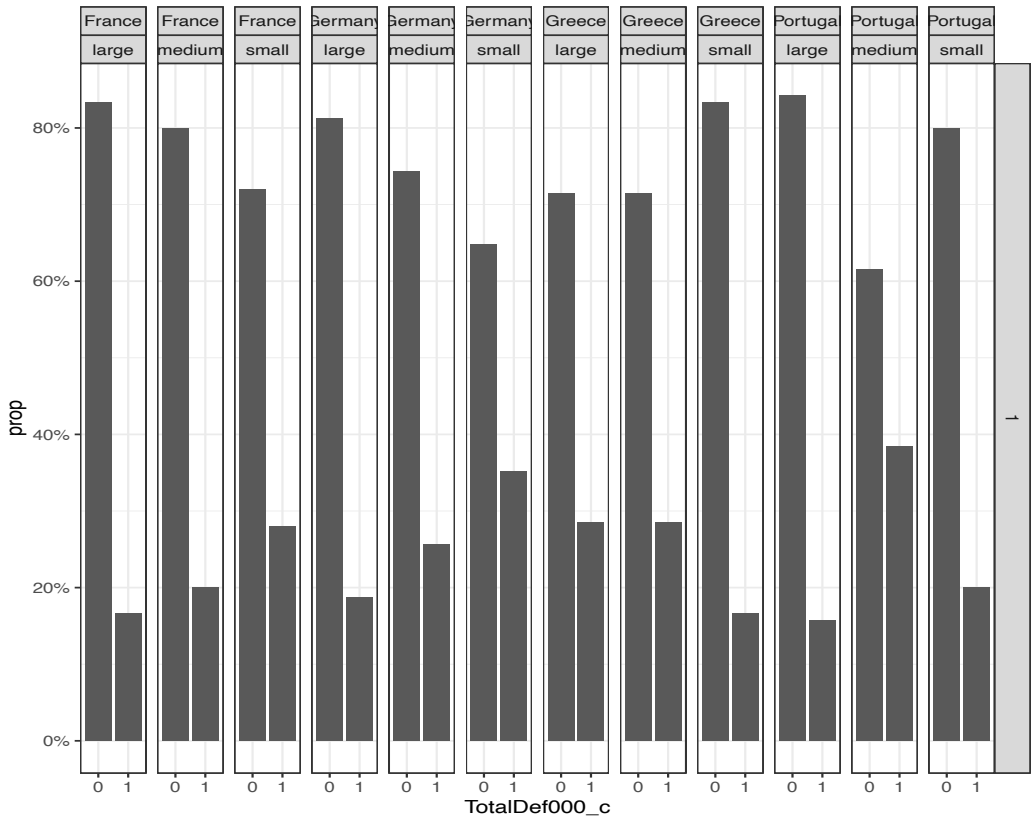
Combining both treatment variables 'size' and 'nationality' provides a more nuanced picture. As regards the per round data, there seems to be no difference for participants from France, as they rank lowest with overharvesting, similar with German large and medium farmers, Greek medium and Portuguese large farmers, while German small farmers overharvest most often, followed by the rest. Considering the French as the baseline, one could conclude that German small, Greek large and medium and Portuguese medium and small overharvest relatively more often. In contrast, large farmers behave similarly across all countries. The aggregate data provides a more nuanced picture: French and German farmers behave similarly: large farmers overharvest the least, followed by medium and every third small farmer overharvests at least once during the game. Participants from Greece and Portugal behave differently, with small Greek farmers complying most and one out of four large and medium farmers overharvesting. Medium farmers from Portugal overharvest most of all in almost 40% of the cases. In contrast, large and small Portuguese farmers range among the lowest, together with large French and German and small Greek farmers. One can conclude that there is quite some difference despite the fact that there are in absolute numbers sometimes only a few participants (see table below).

Figure A.6-1-28: Overharvesting – per size and nationality, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participant-rounds that overharvested ('1') or not ('0') in each round ('TotelDef00_perR_c').

Figure A.6-1-29: Overharvesting – per size and nationality, total.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants that overharvested at least once ('1') or not at all ('0') during the entire game ('TotelDef000_c').

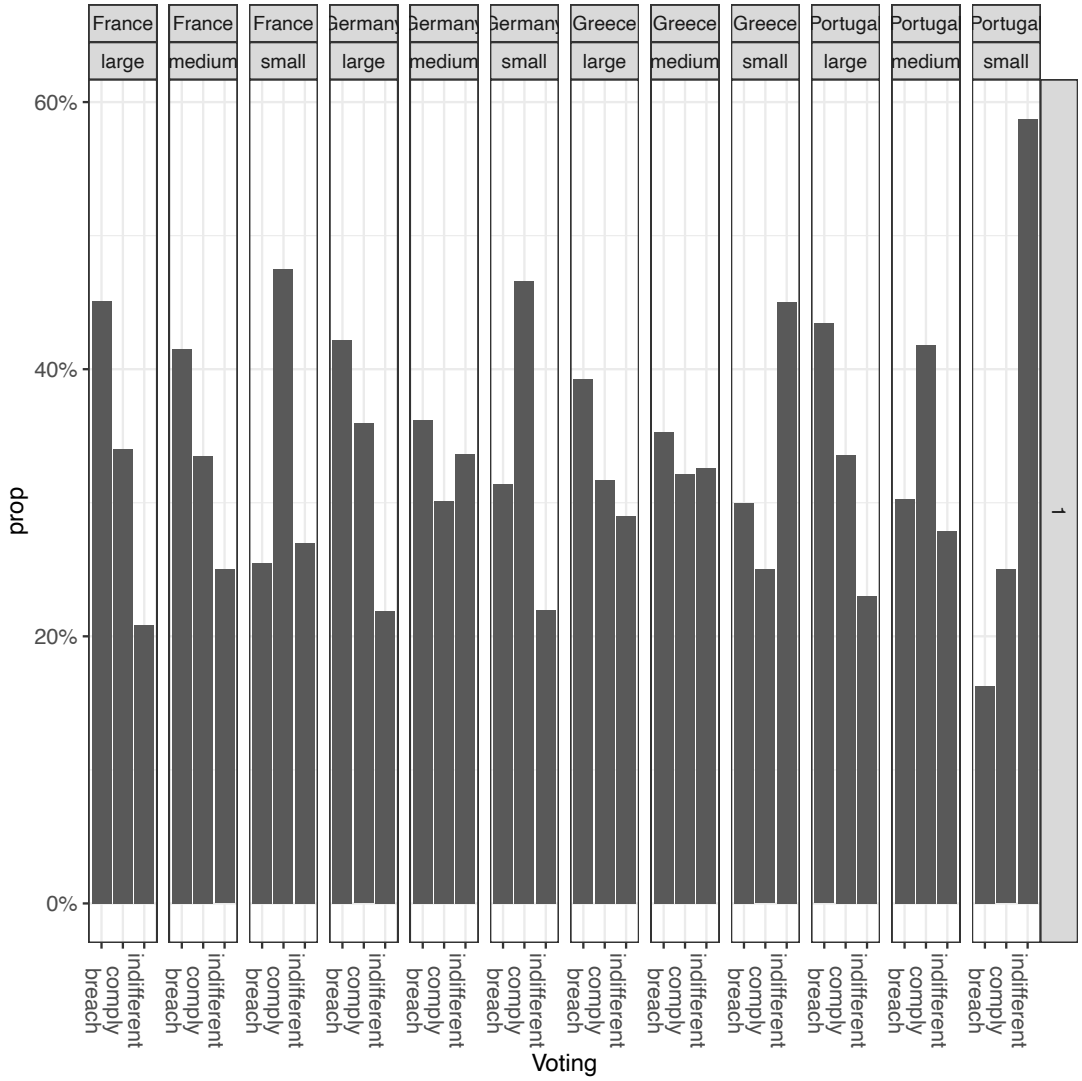
Table A.6-1-30: Overharvesting – per size and nationality, total.

		Country				
		France	Germany	Greece	Portugal	Total
Size (Def000=1)	small	7	13	5	4	29
		28%	35%	17%	20%	26%
	medium	5	10	8	10	33
		20%	26%	29%	38%	28%
	large	3	6	8	3	20
		17%	19%	29%	16%	21%
	Total	15	29	21	17	82
Size (Def000=0)	small	18	24	25	16	83
		72%	65%	83%	80%	74%
	medium	20	29	20	16	85
		80%	74%	71%	62%	72%
	large	15	26	20	16	77
		83%	81%	71%	84%	79%
	Total	53	79	65	48	245

Source: own calculation. The percentages correspond to the respective cells for Def000 to equal '1' and '0'.

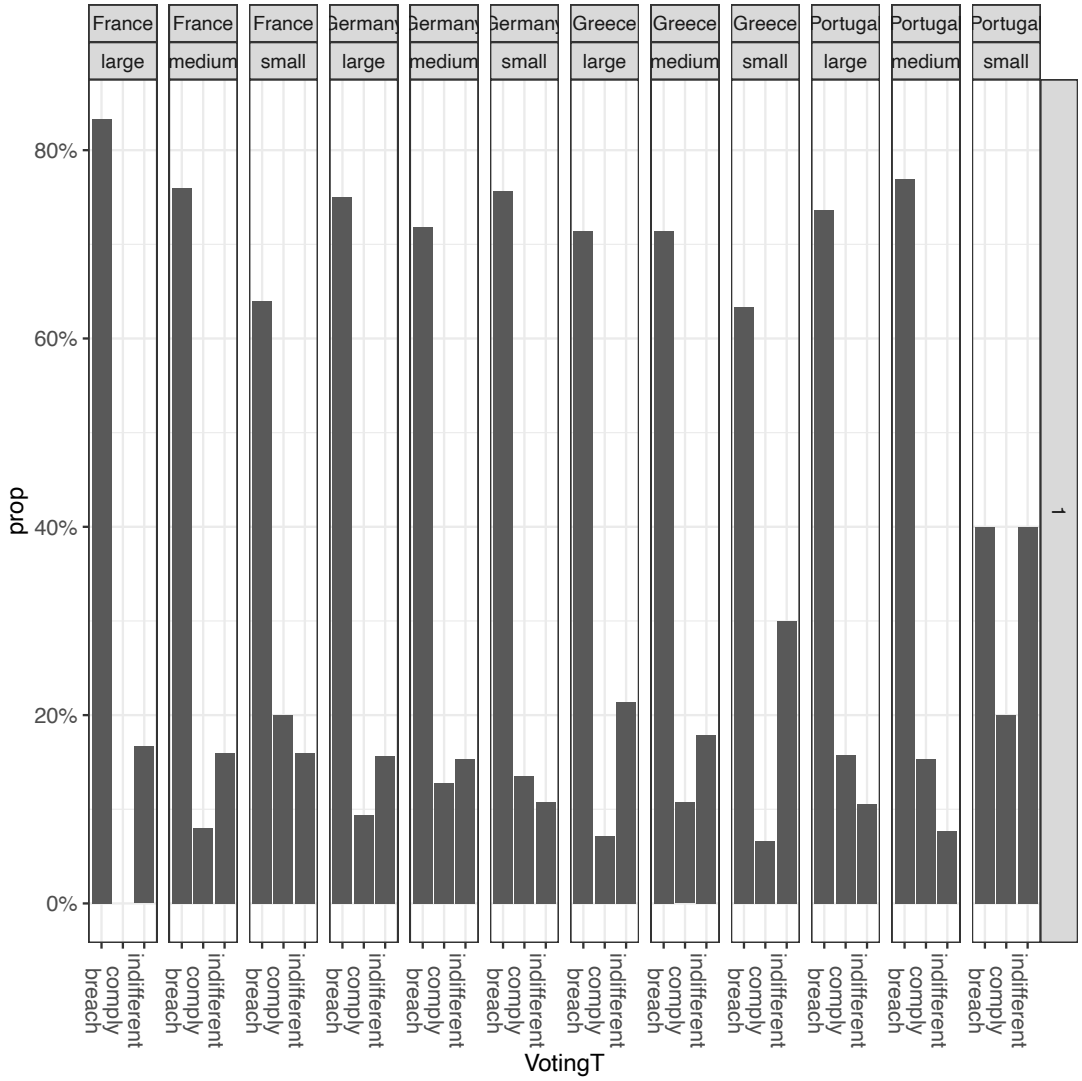
As regards 'voting', one can also see different patterns across nationality and size. Small farmers breach the least and comply the most for French and German participants. Small farmers from Greece and Portugal also breach the least, but at the expense of abstaining and not of complying. Portuguese medium farmers and Greek medium and large farmers comply the most. All large farmers breach most in their respective country groups. Looking at the aggregate data, all small farmers comply the most, and breach the least, in their respective country groups.

Figure A.6-1-31: Voting – per size and nationality, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participant-rounds that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent').

Figure A.6-1-32: Voting – per size and nationality, total.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants that voted always correctly ('comply'), at least once incorrectly ('breach') or always abstained ('indifferent') during the entire game.

The above analysis suggests that both treatment variables 'size' and 'nationality' matter for rule compliance. Moreover, their interaction seems to provide a more nuanced picture and it might be worthwhile to verify the effect in the regression analysis, despite the few cases in some categories. As a result, I define as baseline categories for the variables the following: for size, I use 'large'. Overall, participants from France seem to be the most consistent in comparison with the other countries, and therefore, I define 'France' as baseline for the variable 'EMU'.

A.6-1.3 Independent variables

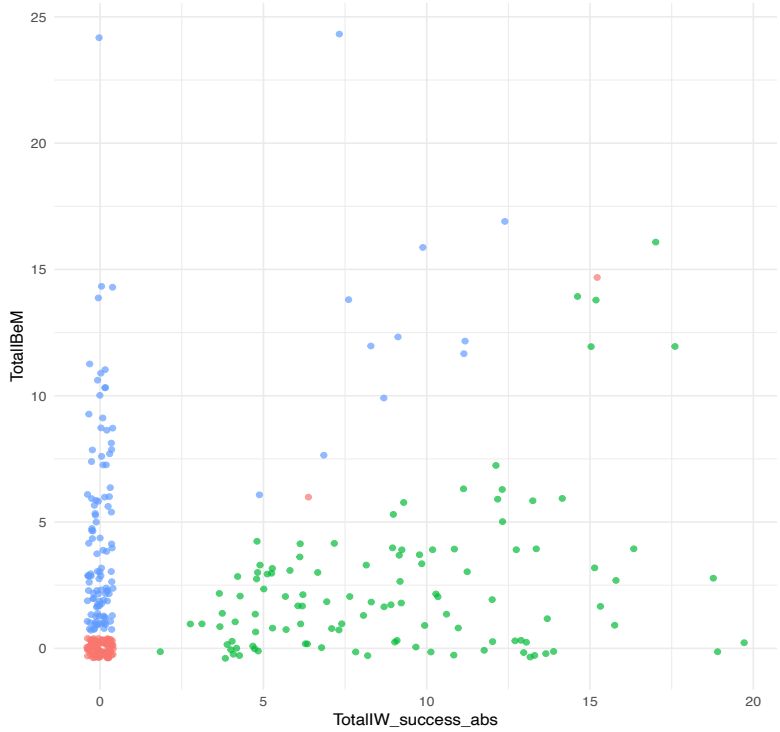
This part serves to provide analyses on the construction of the typologies. At first, I check the plausibility of using the typologies with a view to the corresponding individual variables that are taken from the game playing. Secondly, I analyse the relationship between the typology and the treatments to avoid potential correlations.

A.6-1.3.1 Investment typology

Firstly, I look at the cultivation strategy, and at first at the investment typology. I compare investments in beekeepers and manure ('TotalIBeM'), i.e., 'stimulus'-oriented investments, and in water irrigation systems ("TotalIW_success_abs"), i.e., 'prevention'-oriented investments. For the per round classification, I consider any investment in water irrigation systems ("TotalIW_perR"), and do not distinguish between successful and unsuccessful[10]. Figure A.6-1-33 shows that for the aggregate typology, the categories 'stimulus' and 'prevention' are distinct from each other. Those who invested more in stimulus items (blue dots) hardly ever invested in successful water irrigation systems. 'prevention'-oriented types also invested in stimulus items, but less than in prevention items (green dots). There are only a few that equally invested in both, and many who did not make any such investment (red dots). One can see more of a mix in the per round figure. There are many cases where participants purchase both type of items. However, the aggregate typology is also consistent with the per round classification. In the figure, the dots represent the aggregate type. Red dots are more predominant for participants purchasing prevention items because it is those which do not lead to successful water irrigation systems. One can see few green dots among the part which covers those participant-rounds in which more 'stimulus' items are purchased. Conversely, one can also see a couple of blue dots in participant-rounds where more 'prevention' items are purchased. This shows that aggregate types are not only purchasing items of one type, but follow a mixed strategy. The idea of the typology is only to show the predominant type. I conclude that I can use this construction of the typology.

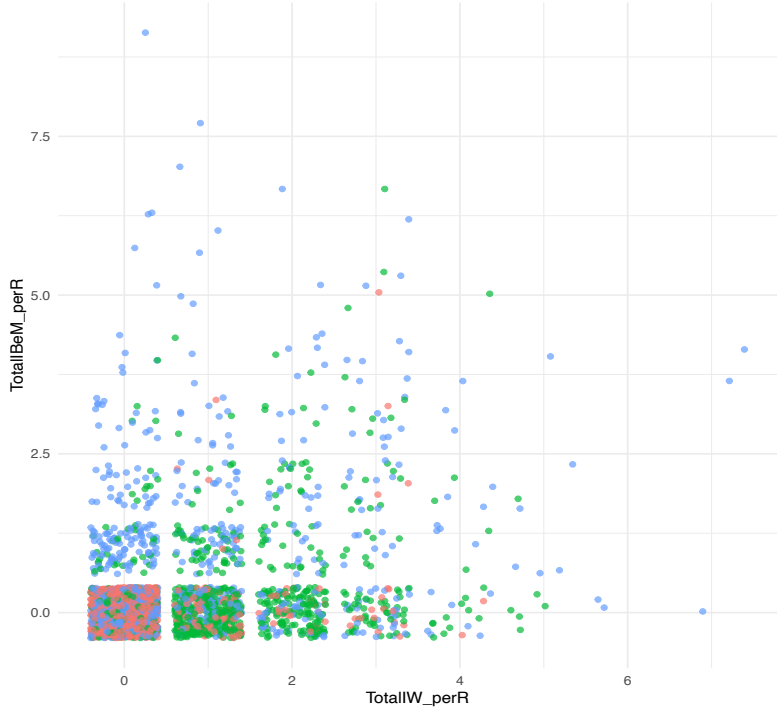
10 This is because I have to assume that during the game, the participant might have had such ambitions, which however, did not work out well.

Figure A.6-1-33: TotalIBeM and TotalIW_success_abs – total.



Source: own calculation. Blue dots show the absolute number of investments in beekeepers and manure ('TotalIBeM') per participant, green dots show investments in successful water irrigation systems ("TotalIW_success_abs"), and red dots show participants that invested in both.

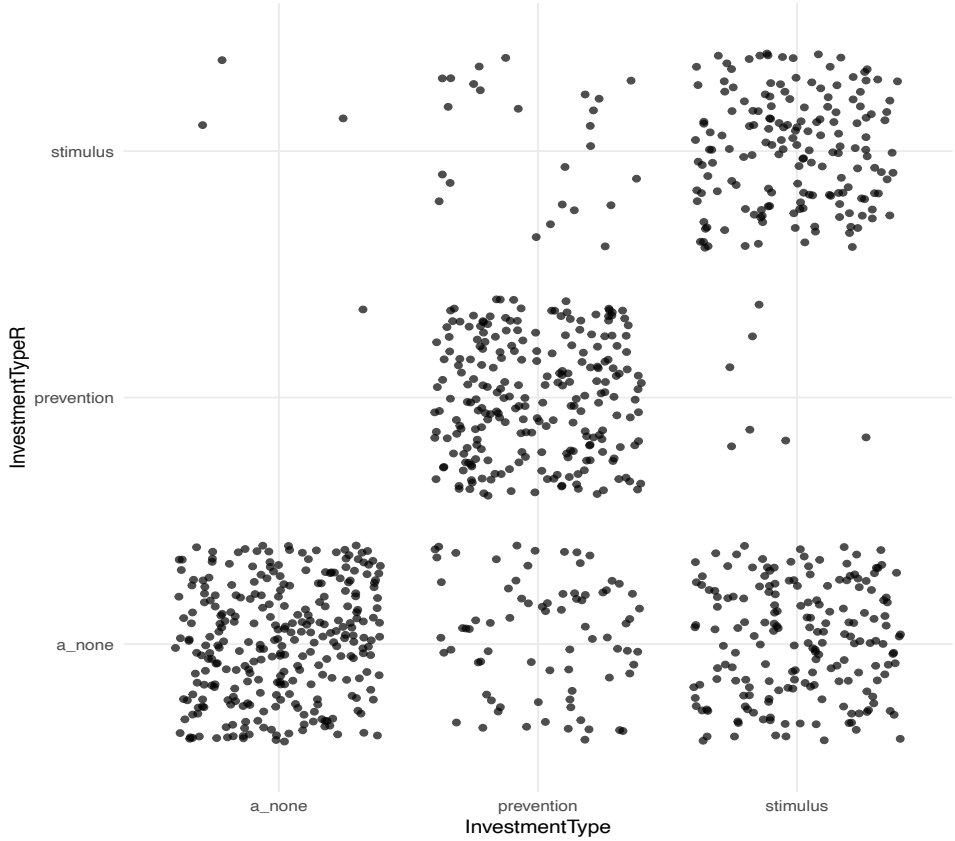
Figure A.6-1-34: TotalIBeM and TotalIW – per round.



Source: own calculation. Blue dots show the absolute number of investments in beekeepers and manure ('TotalIBeM_perR') per participant-round, green dots show investments in parts of water irrigation systems ("TotalIW_perR"), and red dots show participant-rounds with investments in both.

The figure below shows that investment types are consistent both across rounds ("InvestmentTypeR") and on aggregate level ("InvestmentType"). The figure shows a subset of participant-rounds only for bust rounds, as I am interested in whether investment types purchase items according to their types, especially in bust rounds. It shows that the aggregate investment type corresponds well to what type participants play in bust rounds: 'stimulus' types hardly purchase 'prevention' items in bust rounds, and the other way around. Prevention types are even more consistent: there are more participant-bust-rounds in which they purchase prevention items than participant-bust-rounds in which stimulus types purchase stimulus items. Similarly, the aggregate 'no investment type' participants almost never belong to 'stimulus' or 'prevention' type participant-rounds in bust rounds. Therefore, in the following, I only use the aggregate variable, not the per round one, for the investment type. This is also more concise conceptually as the aggregate variable accounts for successful water-irrigation systems.

Figure A.6-1-35: Investment type in total and in bust rounds.

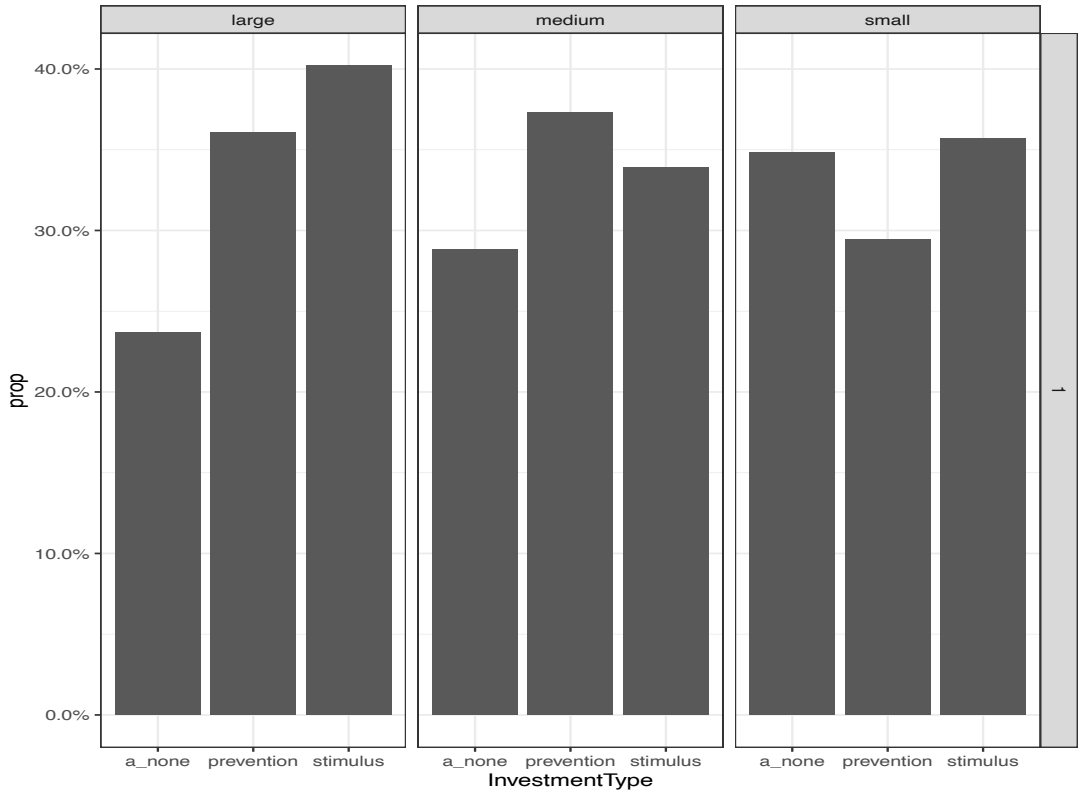


Source: own calculation. The y-axis shows participant-rounds in bust rounds that invested either in 'stimulus' or 'prevention' items and the x-axis shows participants that invested either in 'stimulus' or 'prevention' items over the course of the entire game; 'a_none' represents those that have not invested at all or similarly in both.

In the majority of participant-rounds, participants do not invest in either of the two types of items (435 participant-rounds) or nothing at all (891). In total, there are 560 rounds in which participants purchase more prevention than stimulus items, and 356 rounds the other way around. 'Balanced' happens in 136 participant-rounds.

Checking the role of the typology against the treatment variables, one can see that there is little difference across business cycle rounds. The dispersion of types is similar across all business cycle rounds, with the highest proportion of 'prevention' and 'stimulus' types in bust rounds. In contrast, one can see some difference across size (see Appendix A.6-3-1). Large farmers belong least often to 'no type', and a majority of around 40% belongs to the 'stimulus' type, closely followed by the 'prevention' type. A majority of around 37% of medium farmers belongs to the 'prevention' type, closely followed by the 'stimulus' type. One out of three small farmers belongs to the 'stimulus' type or to 'no type'. Only roughly 29% belong to the 'prevention' type. I might need to consider whether to include an interaction of the two variables to account for this unbalanced distribution.

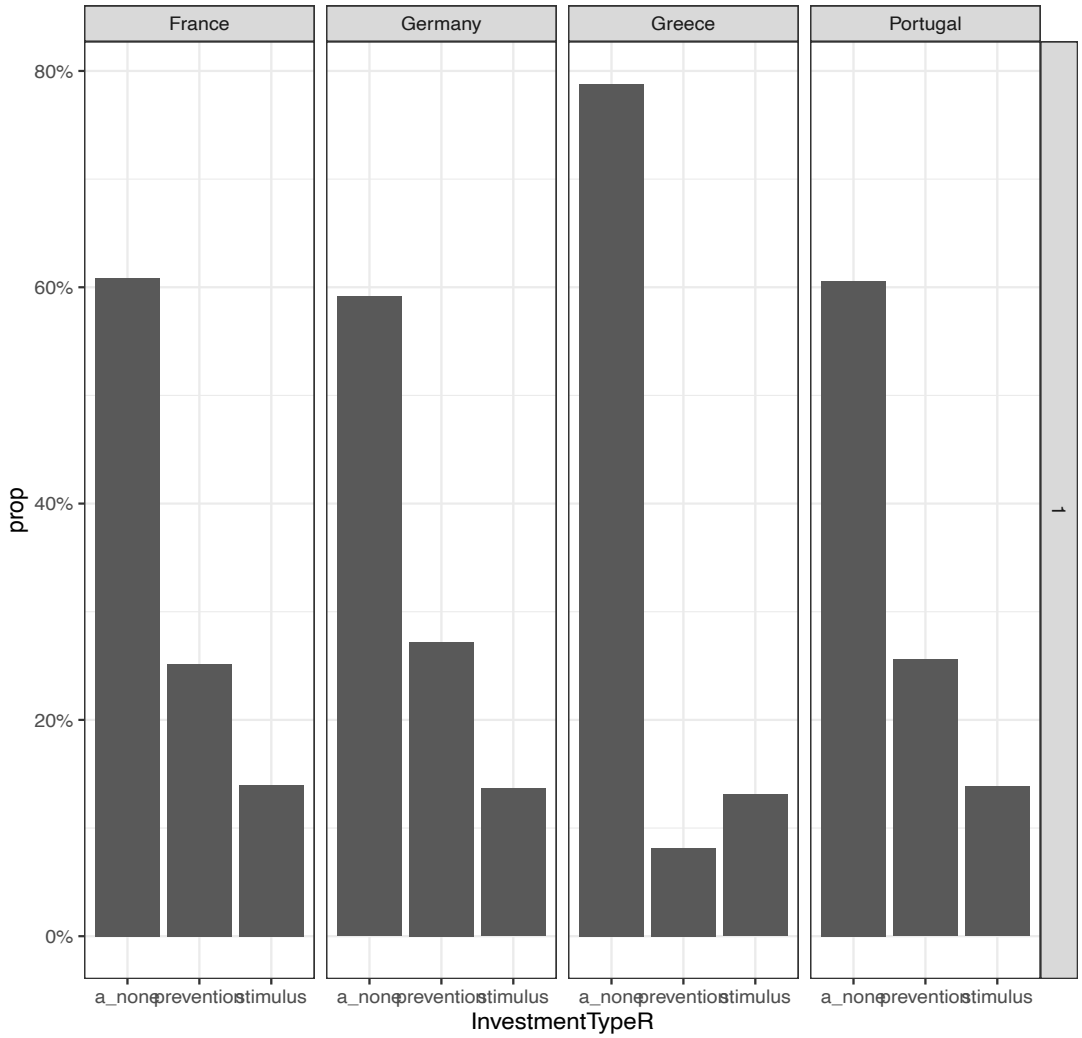
Figure A.6-1-36: Investment type and size.



Source: own calculation. The y-axis shows the proportion of e.g. 'large' participants per investment type over the course of the entire game; 'a_none' represents those that have not invested at all or similarly in both.

As regards the treatment variable, ‘nationality’, one can see almost the same dispersion across France, Germany, and Portugal, with around one out of four participant-rounds belonging to the ‘prevention’ type, and around one out of seven participant-rounds belonging to the ‘stimulus’ type. Only participants from Greece play differently: almost four out of five participant-rounds belong to ‘no type’ at the expense of prevention types, standing at less than 10% of participant-rounds. In contrast, the number of ‘stimulus’ type participant-rounds is similar to the other countries. This is remarkable. Not only do I find similar shares of types for three of the four countries, but also Greek participants invest differently: their share of ‘prevention’ type participant-rounds is 20 percentage points below the share of participants from the other countries.

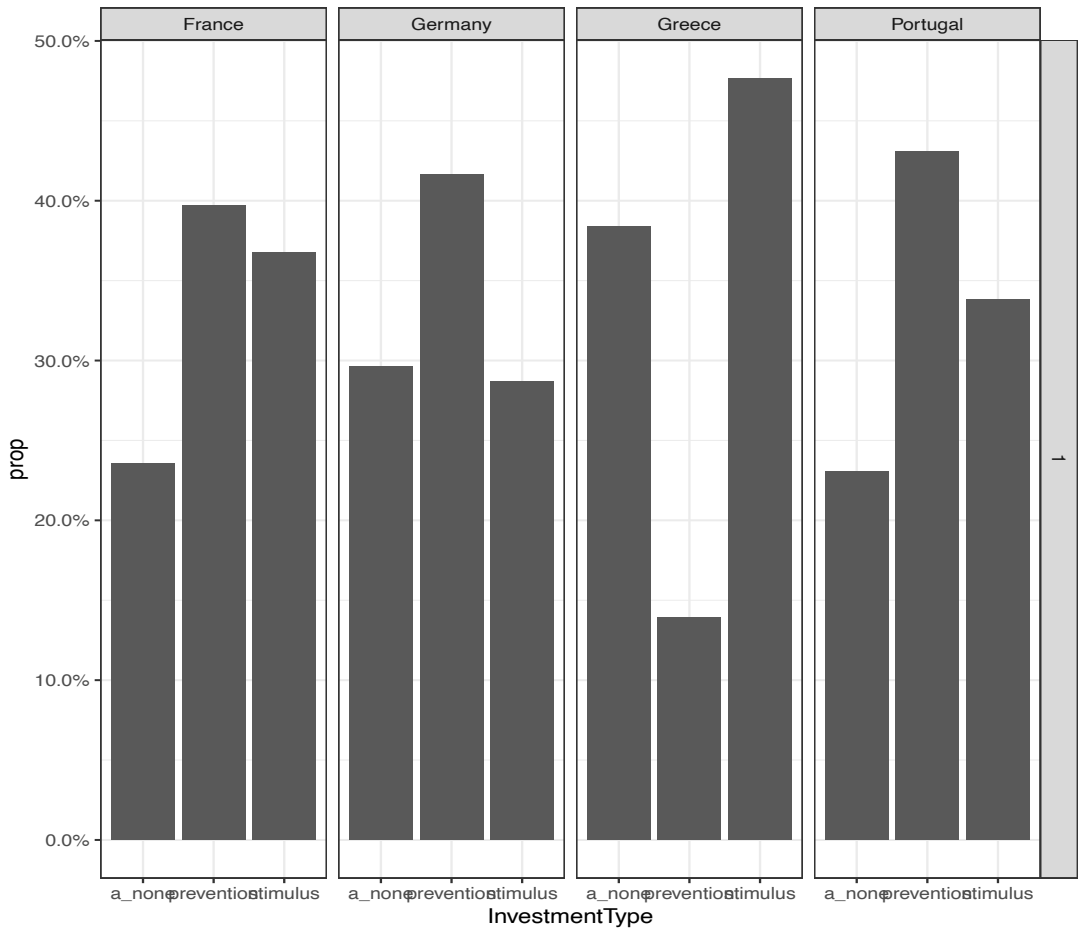
Figure A.6-1-37: Investment type and nationality – per round.



Source: own calculation. The y-axis shows the proportion of e.g. ‘French’ participant-rounds per investment type; ‘a_none’ represents those that have not invested at all or similarly in both.

The figure for the aggregate type shows a more nuanced picture – this might also be because it only considers successful water-irrigation systems. Most participants from France, Germany and Portugal can be classified as 'prevention' types, at around 40% of participants. In contrast, only one out of seven participants from Greece belongs to the 'prevention' type. Almost every other participant from Greece belongs to the 'stimulus' type. The proportion of those who cannot be classified as either type is highest in Greece, at almost 40%, while in Germany, they stand at around 30% and in the other two countries, at around 23%. This shows that there is some interlinkage between the typology and the treatment 'nationality', and I need to understand how this plays out for rule compliance. In specific, I need to know whether the typology carries some explanatory power from the treatment 'nationality'. I might need to include an interaction between the investment type and nationality in the regression analyses to account for this unbalanced distribution.

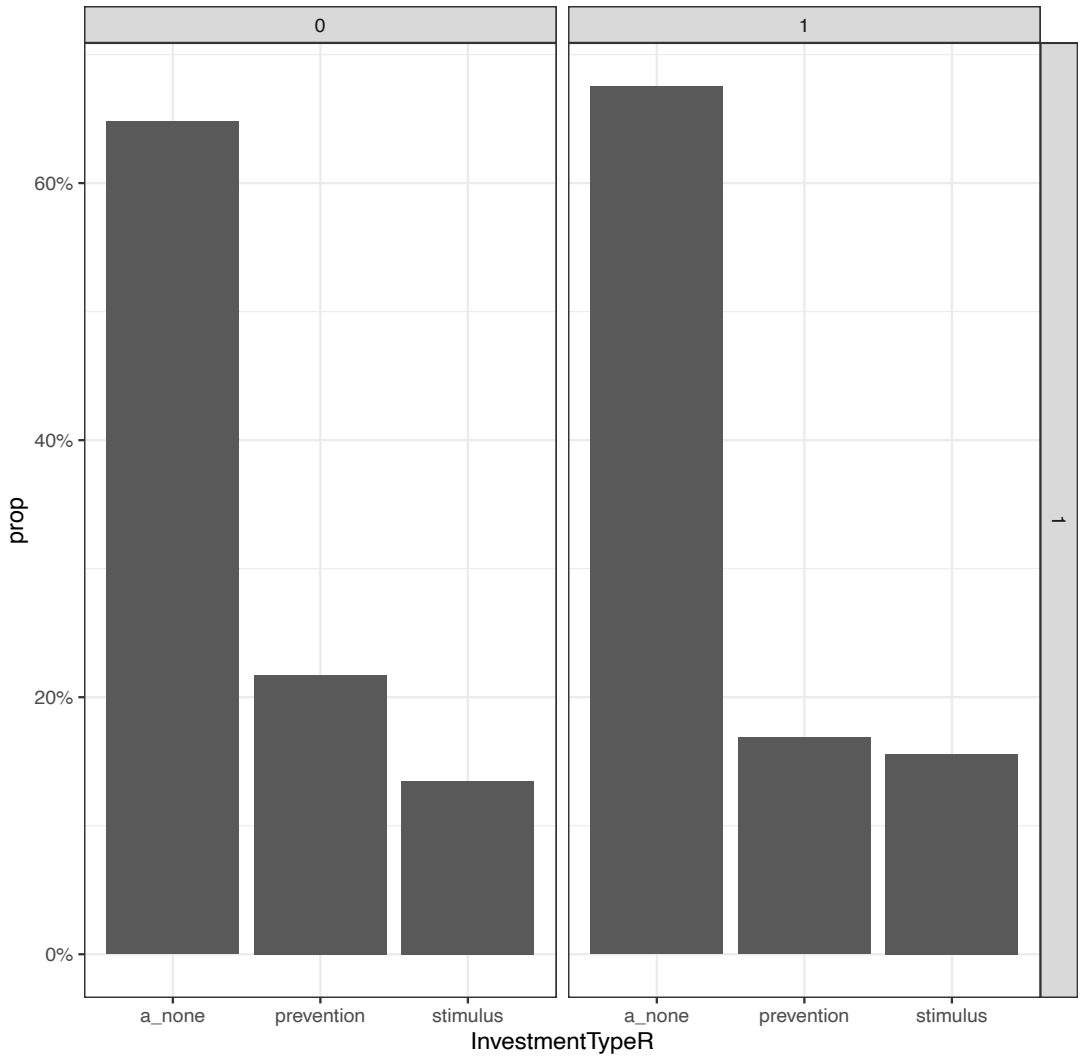
Figure A.6-1-38: Investment type and nationality – total.



Source: own calculation. The y-axis shows the proportion of e.g. 'French' participants per investment type over the course of the entire game; 'a_none' represents those that have not invested at all or similarly in both.

Looking at the role for rule compliance, firstly, one can see that the investment type plays a role for overharvesting: while the per round data show that proportionally I can find more ‘stimulus’ types and ‘no types’ in participant-rounds with overharvesting, there are more ‘prevention’ types in ‘compliance’ than in ‘breach’ participant-rounds.

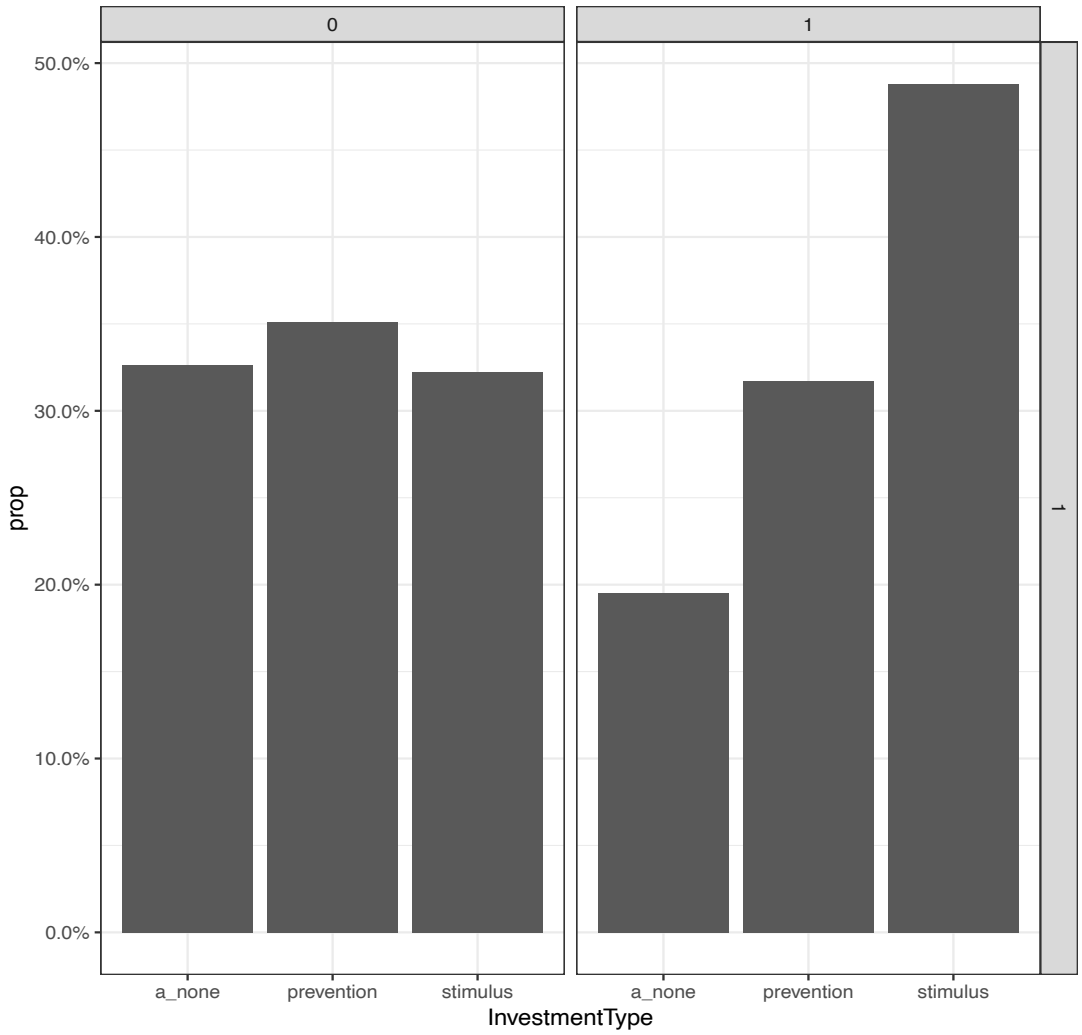
Figure A.6-1-39: Investment type and overharvesting – per round.



Source: own calculation. The y-axis shows the proportion of participant-rounds per investment type where either no overharvesting (‘0’) or overharvesting (’1’) took place; ‘a_none’ represents those that have not invested at all or similarly in both.

The aggregate data provides a more nuanced picture: participants who overharvest at least once during the game predominantly belong to the ‘stimulus’ type. ‘Prevention’ type participants can be found equally among participants who do and do not overharvest. This shows that the ‘prevention’ type are likely unable to explain their decision to overharvest. In contrast, the proportion of participants of neither type is least among those who overharvest, compared to those who do not overharvest.

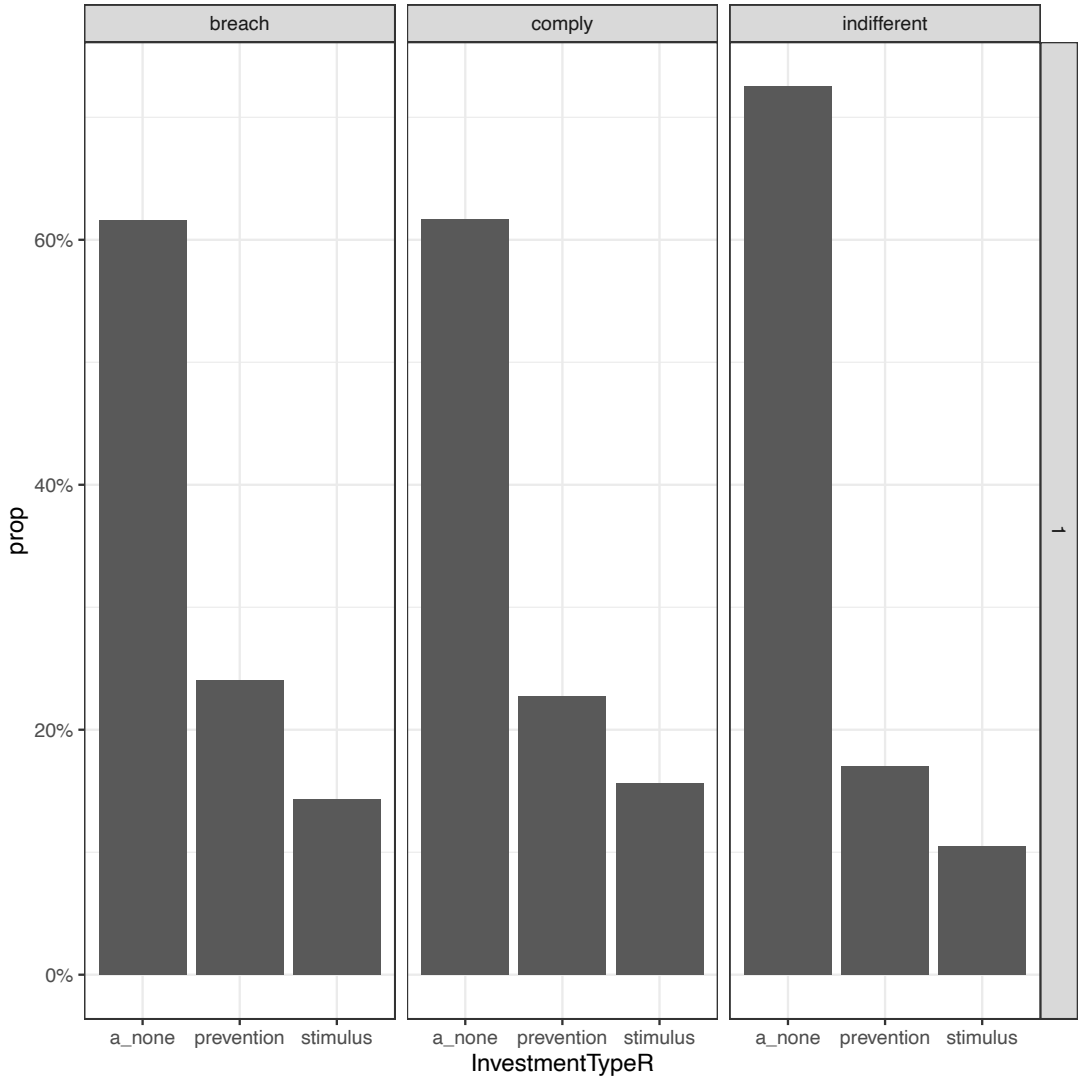
Figure A.6-1-40: Investment type and overharvesting – total.



Source: own calculation. The y-axis shows the proportion of participants per investment type over the course of the entire game where either no overharvesting (‘0’) or overharvesting (’1’) took place; ‘a_none’ represents those that have not invested at all or similarly in both.

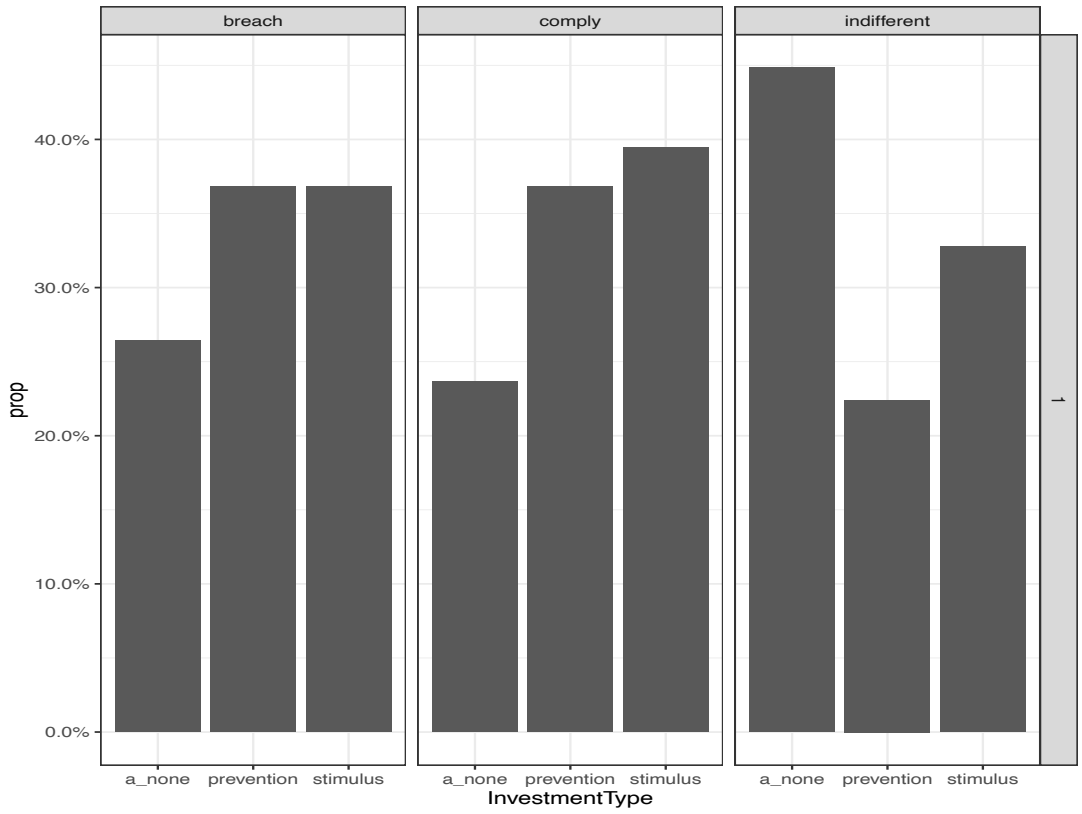
In contrast, the investment typology does not seem to have a specific effect on voting. Per round data shows little difference between ‘stimulus’ and ‘prevention’ type participant-rounds. There are just more participant-rounds with ‘no type’ for ‘indifferent’. Similarly, aggregate data shows that there is little difference between ‘comply’ and ‘breach’ categories. One can see a slightly higher share of ‘stimulus’ type participants among participant-rounds in which they comply to the voting rules. The only remarkable difference belongs to the ‘indifferent’ category where the proportion of participants belonging to ‘no type’ is highest, and the proportion of ‘prevention’ type participants lowest. This is remarkable given the fact that I sought this typology to reflect the main explanatory power. However, maybe I am missing an additional effect.

Figure A.6-1-41: Investment type and voting – per round.



Source: own calculation. The y-axis shows the proportion of participant-rounds per investment type that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent'); 'a_none' represents those that have not invested at all or similarly in both.

Figure A.6-1-42: Investment type and voting – total.

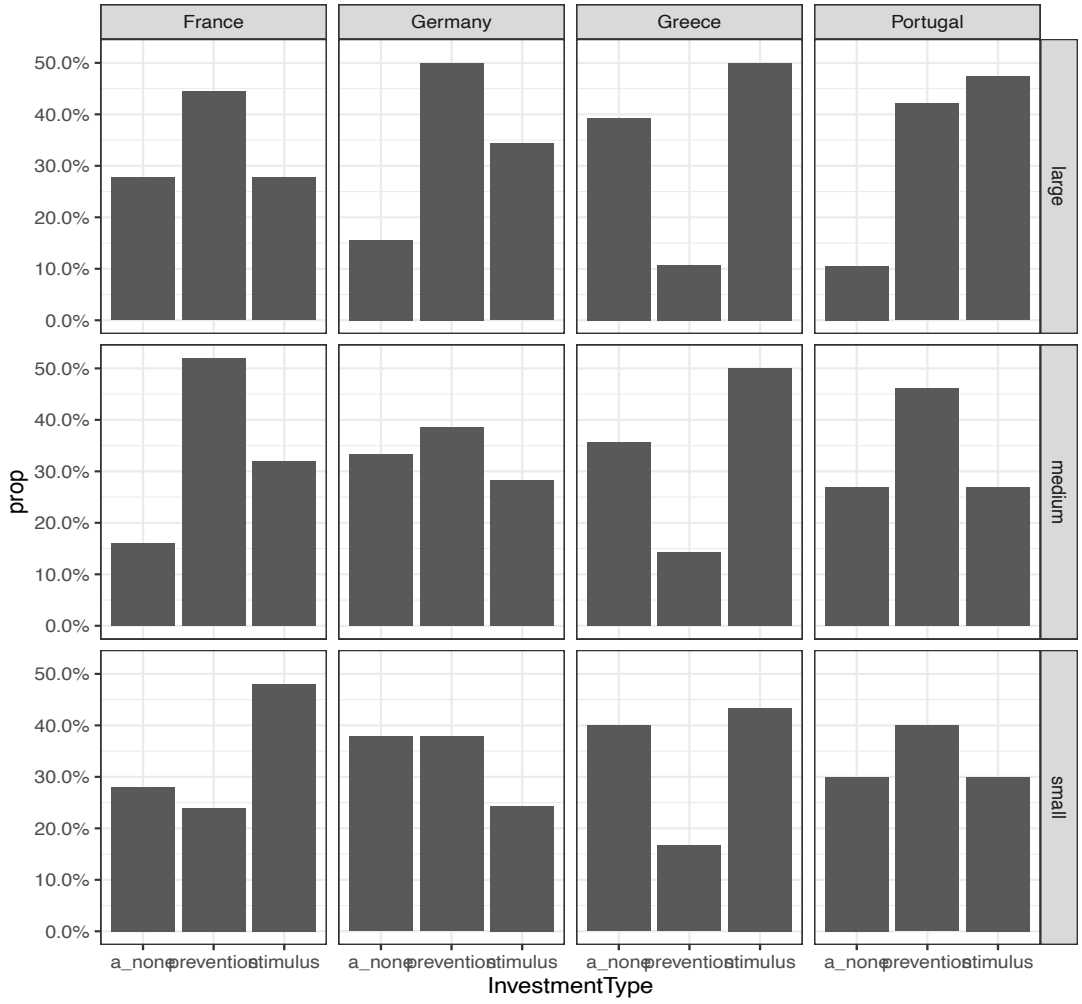


Source: own calculation. The y-axis shows the proportion of participants per investment type that voted always correctly ('comply'), at least once incorrectly ('breach') or always abstained ('indifferent') during the entire game; 'a_none' represents those that have not invested at all or similarly in both.

The figure below shows participants per nationality, size and investment type (I continue with using only the aggregate type as argued above) as proportions per block. Looking at the columns, one can easily detect that almost every other participant from France belongs to the 'prevention' type, except for small farmers; every other participant belongs to the 'stimulus' type, and only one out of four belongs to the 'prevention' type. Shares of participants from Germany are similar for small and medium farmers, with one out of three participants belonging to the 'prevention' type, and one out of four to the 'stimulus' type. In contrast, every other large farmer from Germany belongs to the 'prevention' type at the expense of 'no type', meaning that large farmers are more distinct than the other two sizes. Participants from Greece appear to show little difference according to their size. Roughly every other participant belongs to the 'stimulus' type, irrespective of size. Around 40% belong to neither type, whereas only around 10% belong to the 'prevention' type. Across all sizes, around 40% of participants from Portugal belong to the 'prevention' type. For small and medium farmers, the other two categories stand at similar levels. However, almost

every other large farmer belongs to the ‘stimulus’ type and only 10% to ‘no type’. This picture of clear investment types is similar to German large farmers and French medium farmers. The picture for Portuguese medium and small farmers is similar to French large farmers. The highest proportion of ‘stimulus’ types can be found among small French, large Portuguese and all Greek farmers. It is remarkable that the preferences reflected in the investment type, and broken down by nationality, are mediated by the size of a farmer (for instance in the case of Portuguese participants). However, this only holds true for some nationalities. For instance, in the Greek case, ‘size’ does not seem to matter at all. One has to keep in mind that the below combinations might entail few participants in some of the three-way combinations as all variables are on an aggregate level. This indicates that I might ideally need to include a three-way-interaction among these variables.

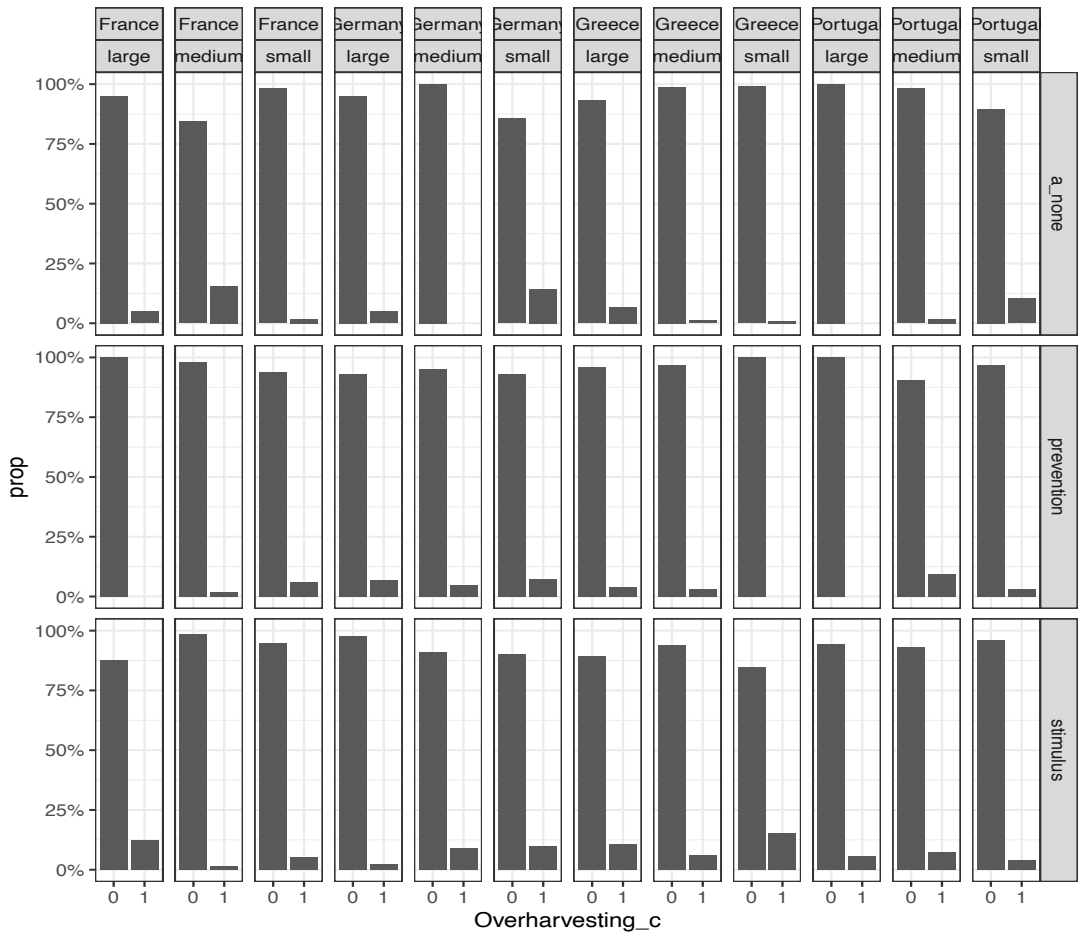
Figure A.6-1-43: Investment type, nationality and size – total.



Source: own calculation. The y-axis shows the proportion of e.g. ‘large French’ participants per investment type; ‘a_none’ represents those that have not invested at all or similarly in both.

Finally, we look at the combination of all three variables and overharvesting. The figure below for overharvesting per round shows some important differences. The combinations with proportionally the most participant-rounds with overharvesting are for small German and Portuguese farmers, and medium French farmers with ‘no type’, for large French, medium and small German and large and small Greek farmers with ‘stimulus’ type, and for medium Portuguese farmers with ‘prevention’ type. In turn, the following combinations do not have any participant-round in which there is overharvesting: medium German and large Portuguese farmers with ‘no type’, and large French and Portuguese and small Greek farmers with ‘prevention’ type. This shows that it is important to take into account the combination of all three variables. However, for aggregate data, there are too few cases for such combinations. Therefore, the figure below shows the absolute numbers and not the proportion.

Figure A.6-1-44: Investment type and overharvesting – per nationality and size, per round.

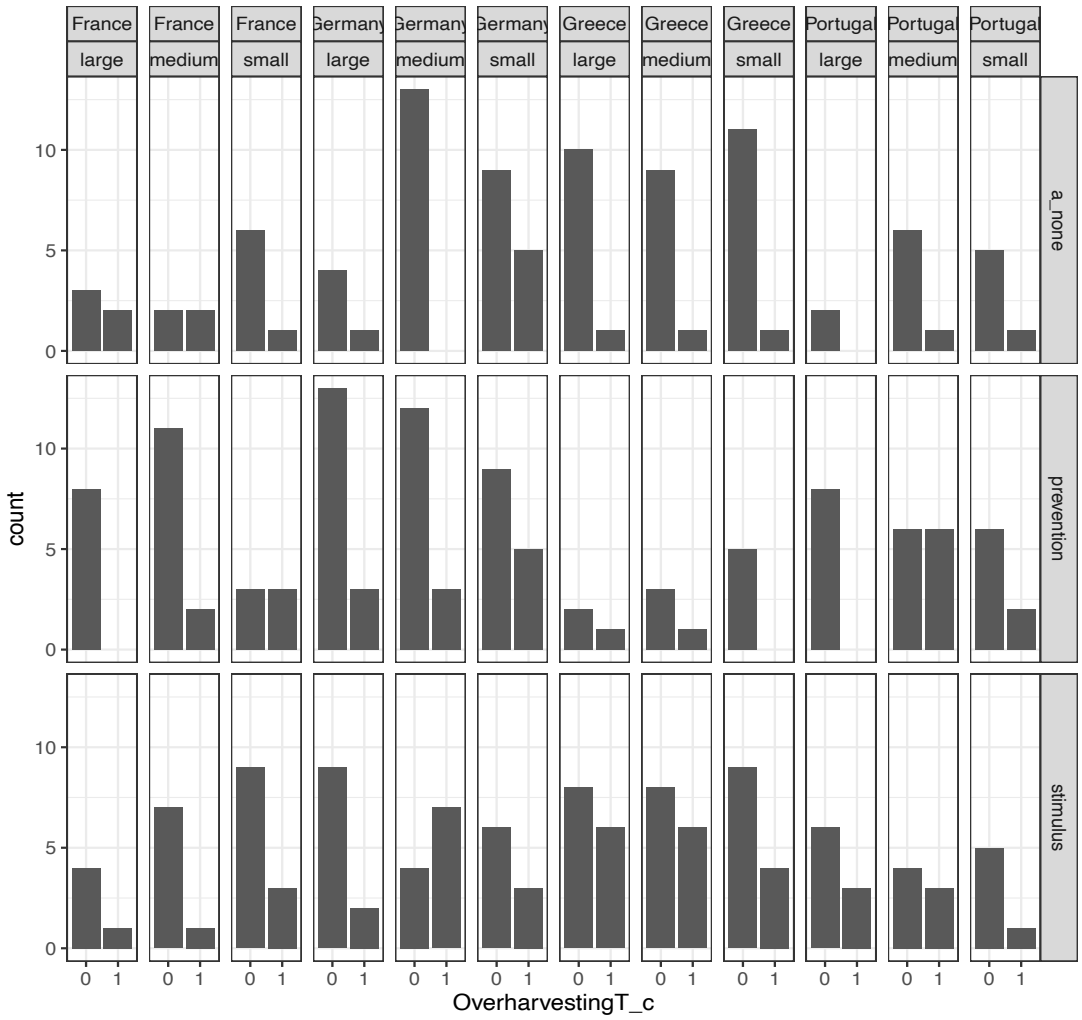


Source: own calculation. The y-axis shows the proportion of e.g. ‘large French’ participant-rounds per investment type that overharvested (‘1’) or not (’0’) in each round (‘Overharvesting_c’); ‘a_none’ represents those that have not invested at all or similarly in both.

One can see that there is quite some difference across the variables' combinations. What is most obvious is that the following combinations show no overharvesting at all: German medium farmers with no investment type, French large, Greek small and Portuguese large with 'prevention' type. In contrast, German small farmers, Greek 'stimulus' type participants and German medium 'stimulus' type farmers and Portuguese medium 'prevention' type farmers overharvest most often.

Looking at all the French boxes shows a different picture across variables. There are many large and medium participants with 'prevention' type and no overharvesting, while every other small participant with 'prevention' type overharvests. In general, small French participants seem to overharvest more than large and medium French participants. The proportion of German participants who overharvest seem not to matter for the investment type for small farmers. Proportionally speaking, large farmers with 'prevention' type overharvest less than the other types. Medium 'stimulus' type farmers overharvest most in relative terms, while no medium farmer with 'no type' overharvests at all. The figures across Greek farmers of all sizes look very similar. The distinction is by investment type where overharvesting is predominantly found with 'stimulus' type participants. The figures for Portuguese participants look very different across all variables. Overharvesting mostly takes place for medium farmers with either 'stimulus' or 'prevention' type, and a couple of large farmers with 'stimulus' type. While small farmers behave similarly across investment types, there is a majority of eight large 'prevention' type participants among whom none overharvest.

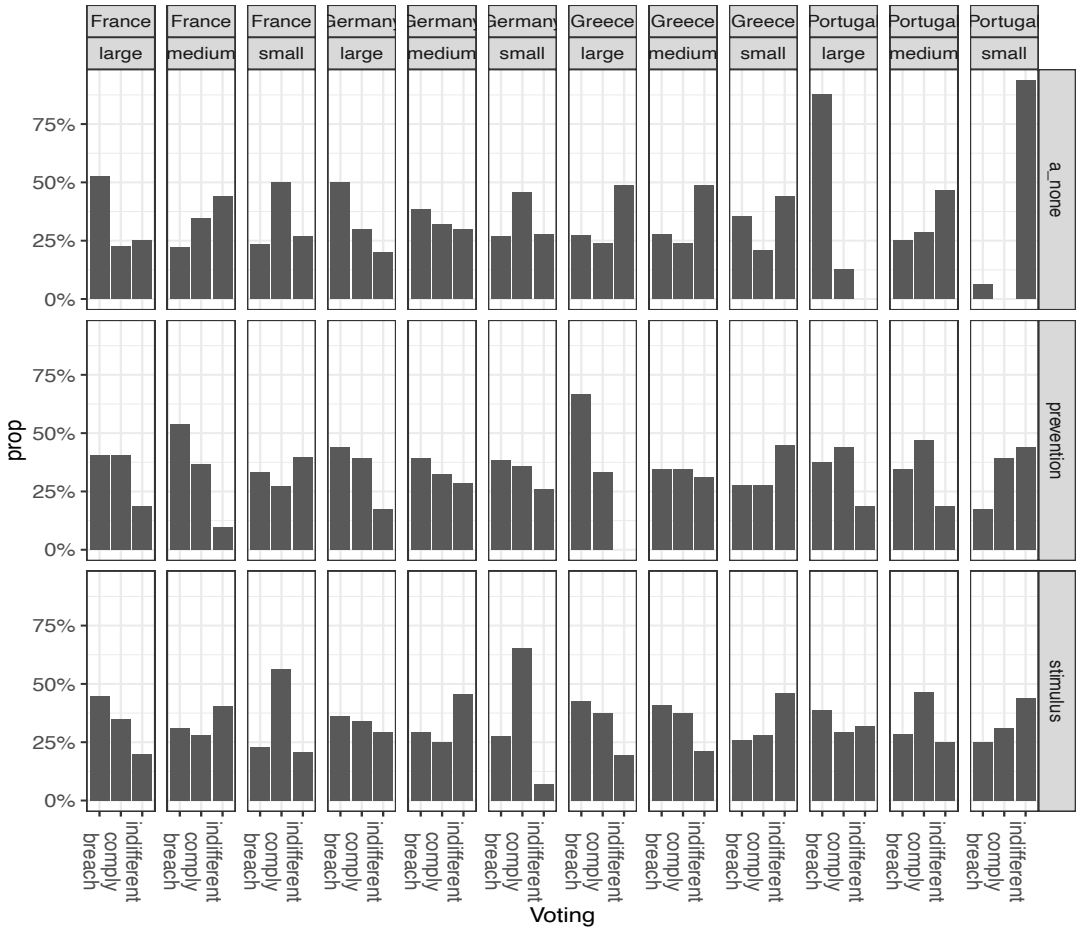
Figure A.6-1-45: Investment type and overharvesting – per nationality and size, total.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants per investment type that overharvested at least once ('1') or not at all ('0') during the entire game ('OverharvestingT_c'); 'a_none' represents those that have not invested at all or similarly in both.

The picture is similarly mixed regarding voting. The figure below shows voting per round and differences in proportion are, on average, 25 percentage points, which shows quite some difference. There are even some extreme cases, such as large Portuguese participant-rounds with 'no type' in which none abstain, and the vast majority breaches. The opposite happens for small Portuguese participant-rounds with 'no type'. Similarly, there is no large Greek participant-rounds with 'prevention' type where they abstain. Breaches happen in roughly three out of four participant-rounds. In contrast, almost three out of four small German participant-rounds with 'stimulus' type comply, followed by small French participant-rounds with 'stimulus' type for which compliance happens in every other participant-round.

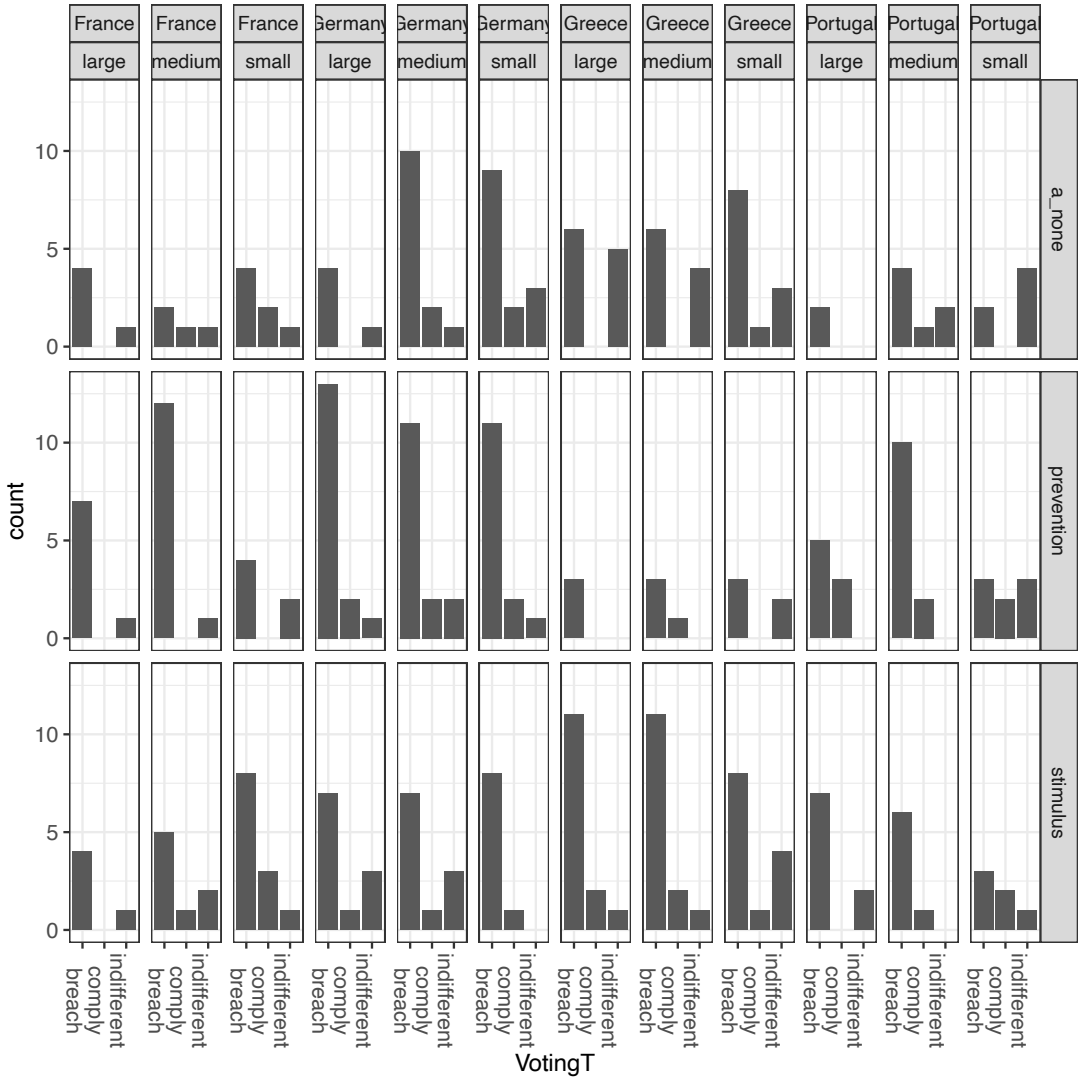
Figure A.6-1-46: Investment type and voting – per nationality and size, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participant-rounds per investment type that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent'), ('Voting'); 'a_none' represents those that have not invested at all or similarly in both.

Looking at the aggregate figure, one can see again a diverse picture. Looking at participants from France shows that no large farmers across all investment types comply. Across all sizes, no French 'prevention' type complies. Small French farmers comply most often – for 'stimulus' and 'no type'. German farmers breach most often, mostly with "prevention" type and no investment type – with the exception of large farmers with 'no type'. In relative terms, however, across all sizes, 'prevention' type participants and also medium and small participants with 'no type' comply most compared to 'stimulus' type participants. Of all participants from Greece, 'stimulus' type participants are almost the only ones who comply compared to the other investment types. There is only one 'prevention' type and one with no investment type who comply. In contrast, for Portuguese participants, compliance takes place almost only among 'prevention' type participants, while Portuguese medium participants with 'prevention' type breach most often.

Figure A.6-1-47: Investment type and voting – per nationality and size, total.



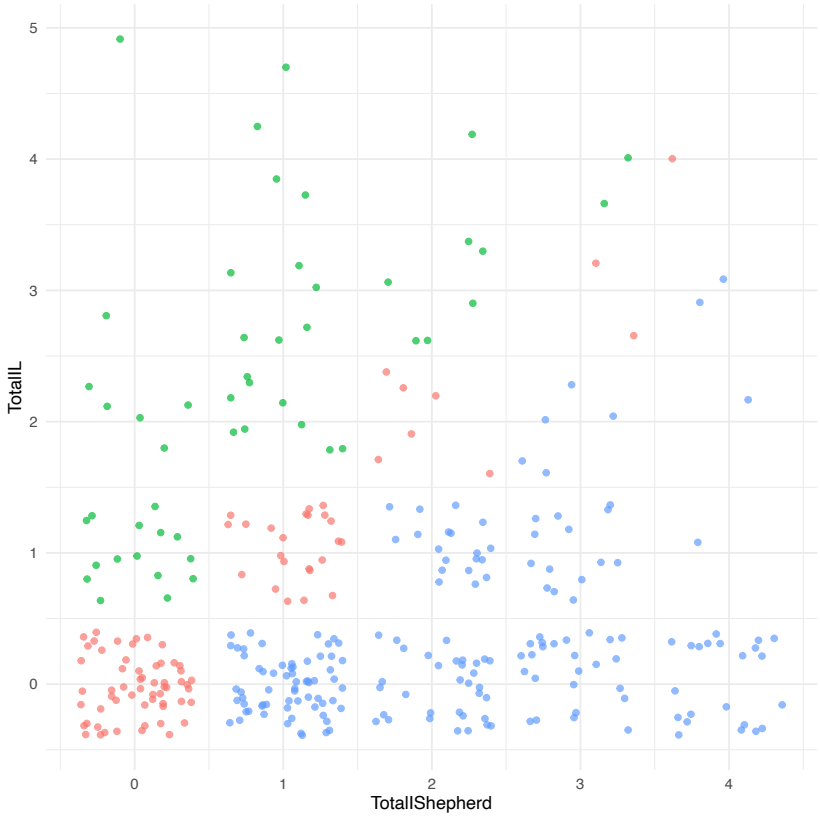
Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants per investment type that voted always correctly ('comply'), at least once incorrectly ('breach') or always abstained ('indifferent') during the entire game ('VotingT'); 'a_none' represents those that have not invested at all or similarly in both.

The above figures show that the distinction between all three variables seems necessary to understand overharvesting and voting. I cannot simply conclude that small participants overharvest more than medium and large ones, or that 'prevention' type participants vote incorrectly less often than the other two types, or that participants from Portugal overharvest less than participants from the other countries. The figures show that the relation is very mixed across all variables. However, analysing the combination of all three independent variables for rule compliance is tricky given the low number of cases in some categories.

A.6-1.3.2 Risk-aversion typology

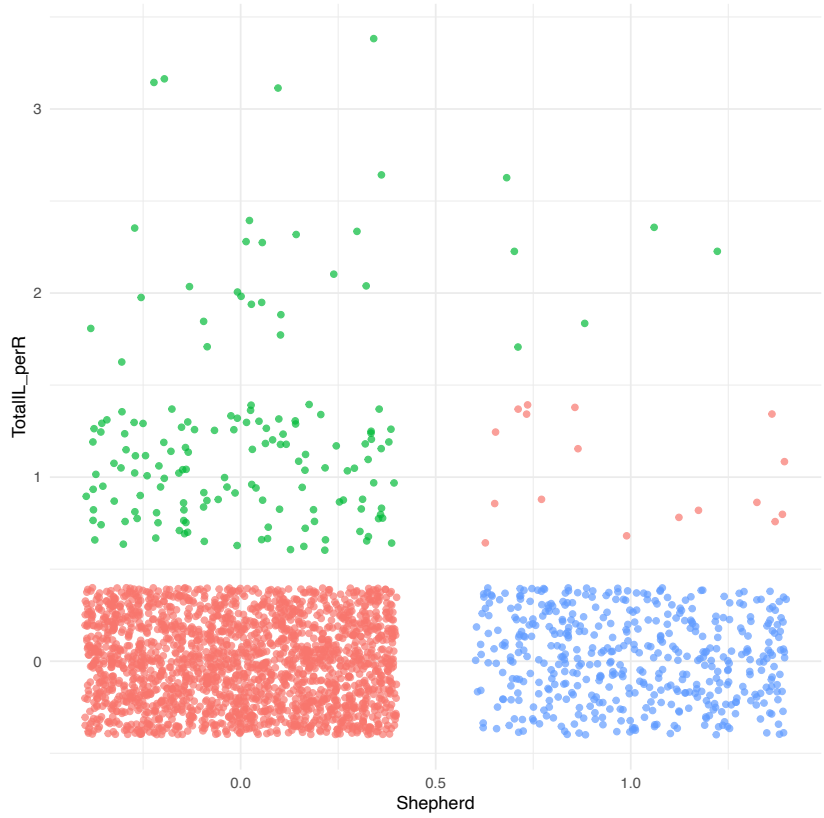
Secondly, we look at the risk-aversion typology, which is also part of the cultivation strategy. I compare investments in ladders, i.e., risky investments that require patience, and in shepherds, i.e., risk-averse investments that reflect impatience. The figure below shows that for the aggregate typology, the categories 'patient/risk-taking' and 'impatient/risk-averse' are distinct from each other. Most of those who invested in shepherds (blue dots) have not purchased any ladder. In contrast, those who invested more in ladders (green dots) also invested in shepherds. There are a couple of participants who invested equally in both, and several who did not make any such investment (red dots). In the figure for the per round variables, one can see a similar picture. Therefore, I conclude that I can use this construction of the typology.

Figure A.6-1-48: Ladders and shepherds – total.



Source: own calculation. Blue dots show the absolute number of investments in shepherds ('TotalShepherd') per participant, green dots show investments in ladders ("TotalIL"), and red dots show participants that invested in both.

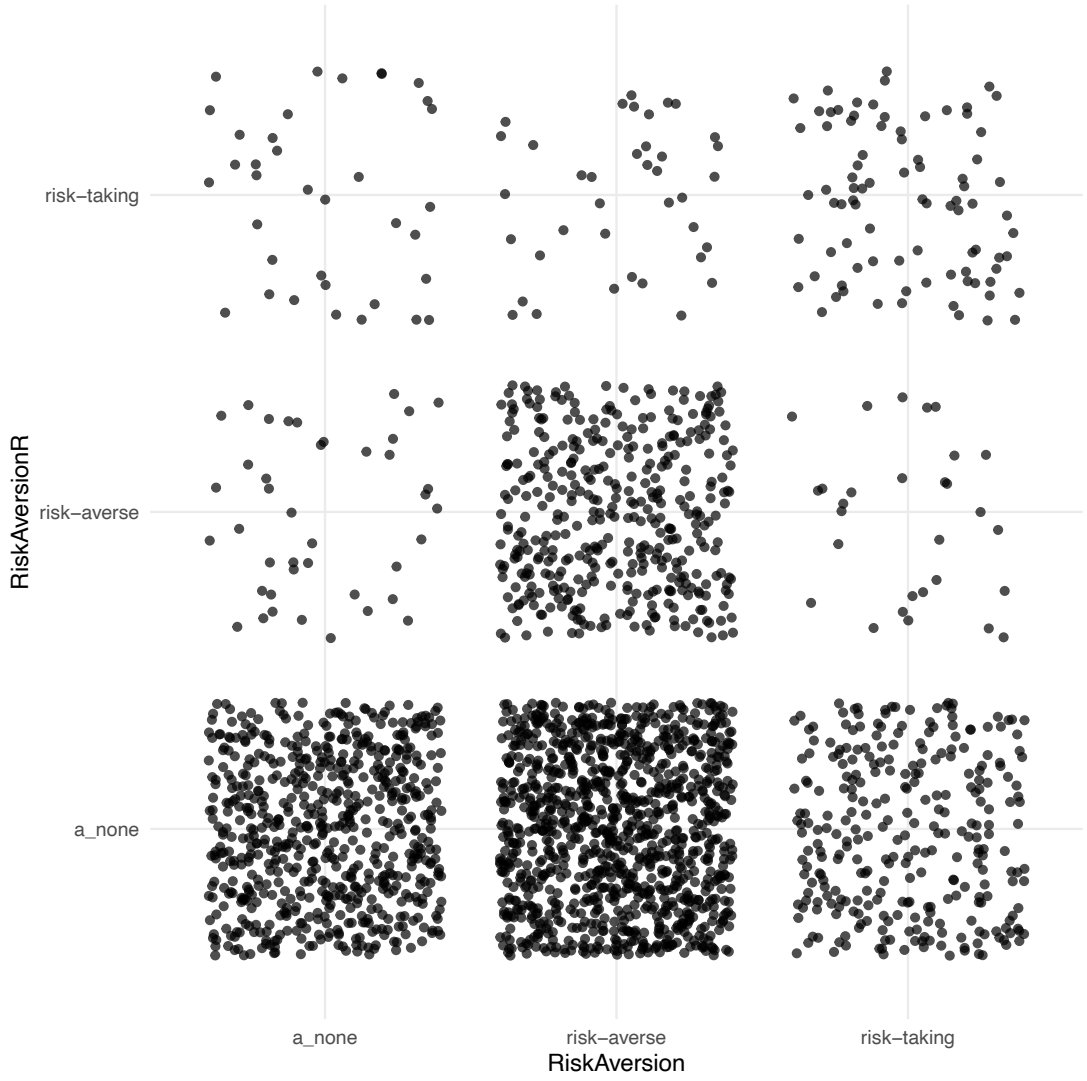
Figure A.6-1-49: Ladders and shepherds – per round.



Source: own calculation. Blue dots show the absolute number of investments in shepherds ('Shepherd') per participant-round, green dots show investments in ladders ("TotalIL_perR"), and red dots show participant-rounds that invested in neither or in both.

The figure below shows that 'risk aversion' types are consistent both across rounds and on aggregate level. It shows that the aggregate type corresponds to what type participants play per round: 'risk-averse' types hardly purchase 'risk-taking' ladders. For 'risk-taking' types, however, there are also several participant-rounds in which they purchase 'impatient' shepherds. The aggregate 'no type' participants hardly ever belong to 'risk-taking' or 'risk-averse' type participant-rounds. Therefore, in the following, I only use the aggregate variable, and not the per round one for the 'risk aversion' type.

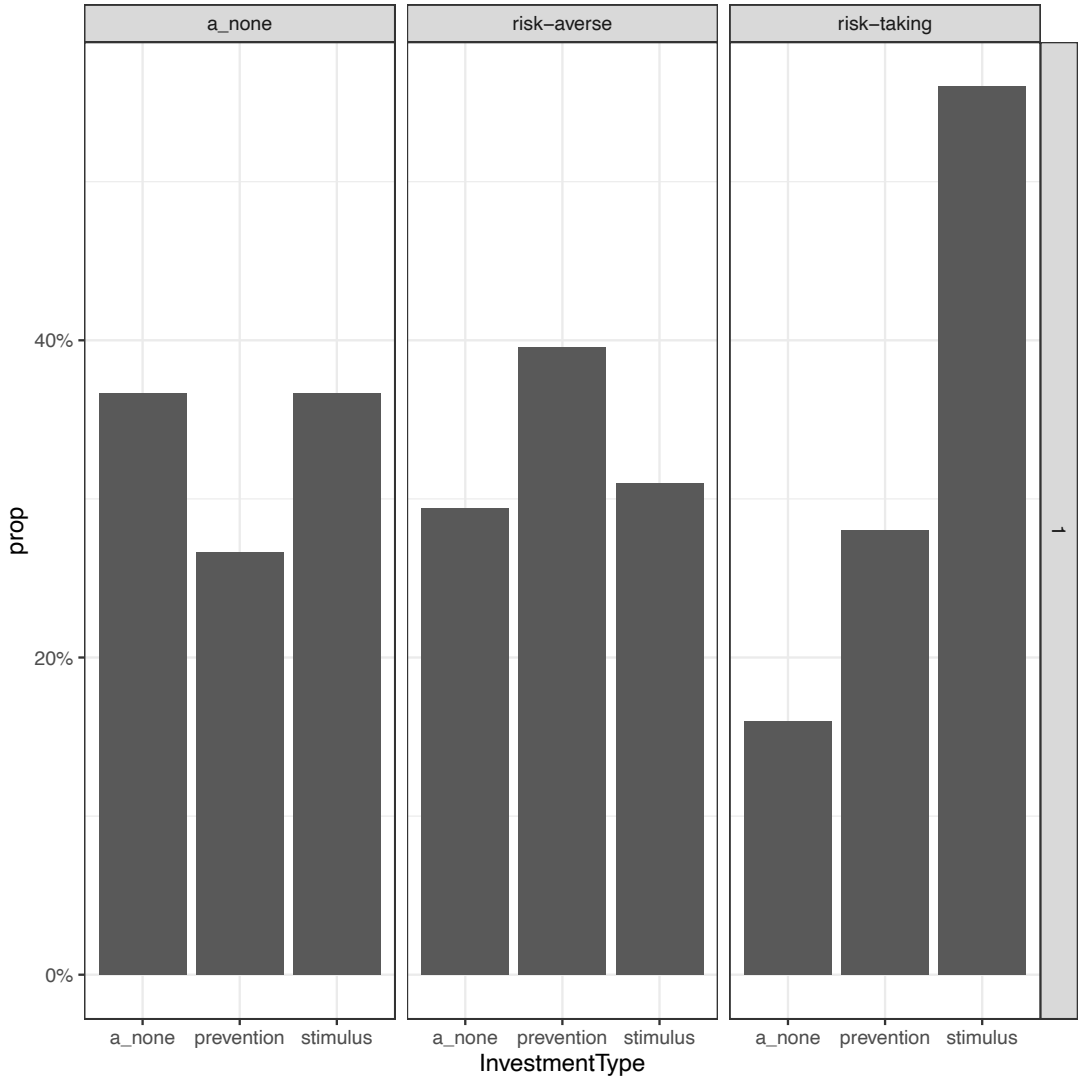
Figure A.6-1-50: Risk aversion type in total and per round.



Source: own calculation. The y-axis shows the risk aversion type per round and the x-axis shows the risk aversion type over the course of the entire game, 'a_none' represents those that have not invested at all or similarly in both.

The figure below shows that the relation between the 'risk aversion' type and the investment type is not straightforward. For 'risk aversion', the 'no type' and the 'risk-averse' type, there are roughly equal in participant numbers for each of the investment type categories. One can see a slight tendency of 'risk-averse' types towards the 'prevention' type, and this is reasonable given their commonality in their preference for risk aversion. Similarly, sharing their preference for riskiness, more than every other 'risk-taking' participant belongs to the 'stimulus' investment type (at the expense of no investment type compared to the other 'risk aversion' types). This shows that I should not use a combination of these two typologies, and instead use them as separate variables in the analysis.

Figure A.6-1-51: Risk aversion type and investment type – total.

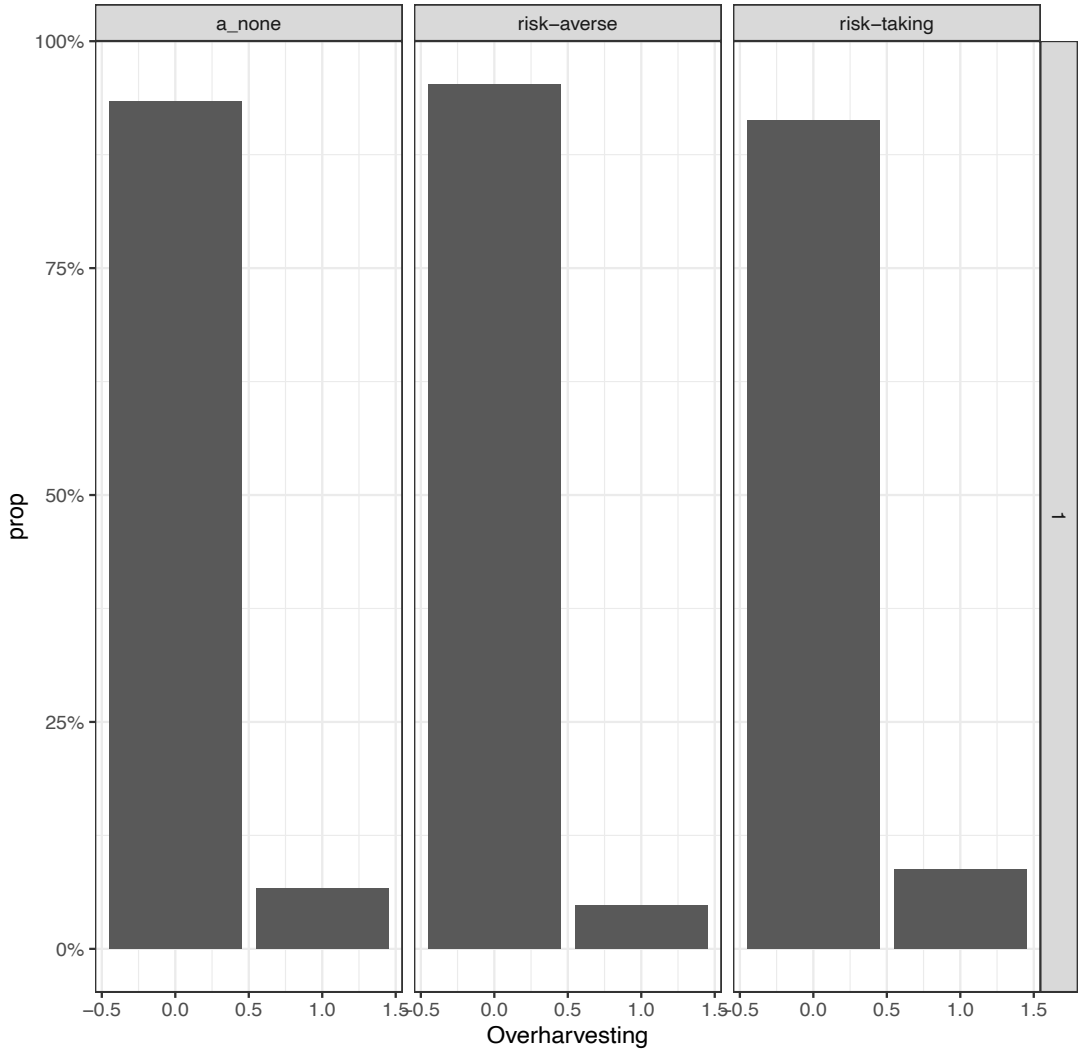


Source: own calculation. The y-axis shows the proportion of e.g. 'risk-averse' participants per investment type; 'a_none' represents those that have not invested at all or similarly in both.

Checking the role of the typology against the treatment variables, one can see that there is little difference across business cycle rounds (see Appendix A.6-3-2). The dispersion of types is similar across all business cycle rounds, with the exception of a large majority of 'no type' in bust rounds. There is little difference across 'size', with most of the participants belonging to the 'risk-averse' type: around two out of three large and medium, and every other small participant (see Appendix A.6-3-3). Similarly, there is little difference across nationalities (see Appendix A.6-3-4). The dispersion is similar where the proportion of 'risk-taking' types is roughly the same across countries, with the dispersion of 'risk-averse' types highest in Germany and Portugal (around 60%) and lowest in Greece (around 50%).

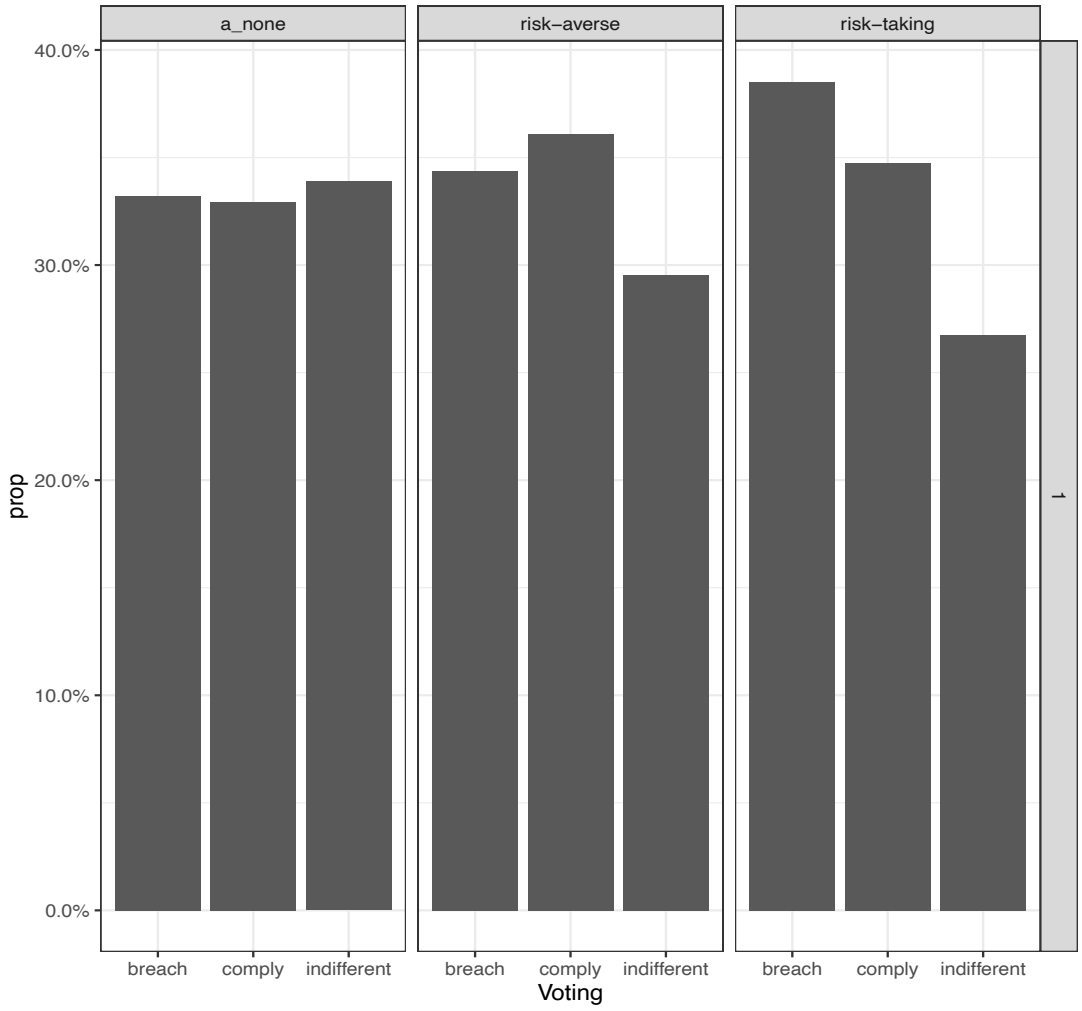
The figure below show the relation between the ‘risk aversion’ typology and overharvesting and voting. Here, I only use the aggregate variable for the ‘risk aversion’ typology and the dependent variables as per round variables to keep it more concise. This should suffice to get an idea about the correlations. Firstly, one can see that ‘risk-taking’ type participants overharvest in most participant-rounds, followed by ‘no type’ ‘risk-averse’ participants that breach least. This is reasonable given their respective preferences for risky or low-risk options, respectively. Accordingly, one can see that compliance with the voting rules is highest with ‘risk-averse’ type participants and, vice versa, breaches are highest with ‘risk-taking’ type participants. However, the differences are not large.

Figure A.6-1-52: Risk aversion type and overharvesting – per round.



Source: own calculation. The y-axis shows the proportion of e.g. ‘risk-averse’ participants that overharvested (‘1’) or not (’0’) in each round (‘Overharvesting’). The risk aversion type refers to the type taken over the course of the game and is on aggregate level; ‘a_none’ represents those that have not invested at all or similarly in both.

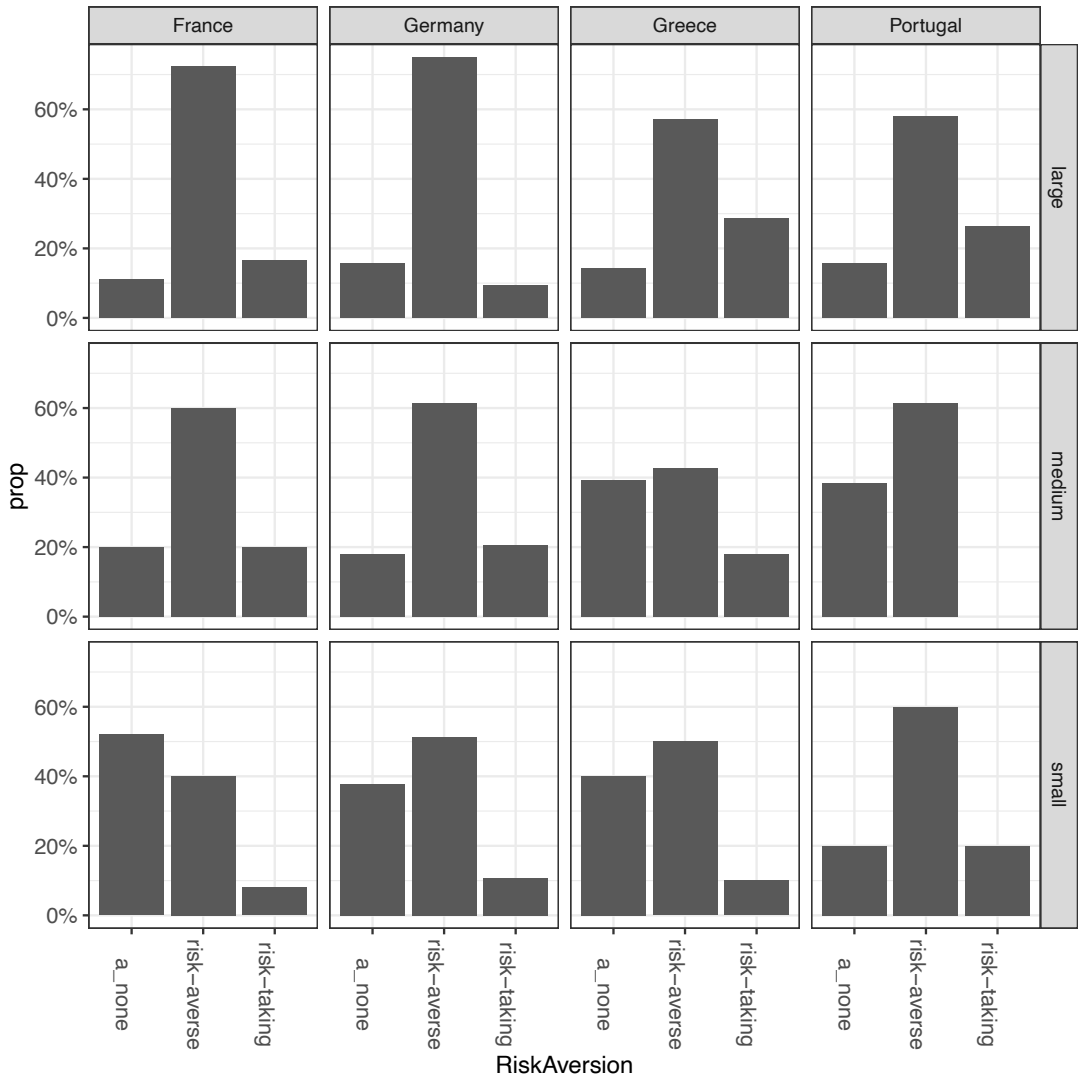
Figure A.6-1-53: Risk aversion type and voting – per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'risk-averse' participants that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent') in each round ('Voting'). The risk aversion type refers to the type taken over the course of the game and is on aggregate level; 'a_none' represents those that have not invested at all or similarly in both.

The figure below shows participants per nationality, size and the 'risk aversion' type as proportions per block. At first sight, one can recognise that the dispersion across types is similar for most boxes: the 'risk-averse' type ranges highest around 50% to 70%, and 'risk-taking' and 'no type' range at similar levels around 10% to 20% (see, for instance, the box for large French participants). There is a second pattern where the 'risk-averse' type and 'no type' both stand at around 40%. This is the case for small German, small and medium Greek, and also medium Portuguese participants. Finally, there are small French participants of which the majority has 'no type', followed by almost every other one who has the 'risk-averse' type and very few of the 'risk-taking' type. The highest proportion of 'risk-taking' type participants can be found among Greek and Portuguese large participants.

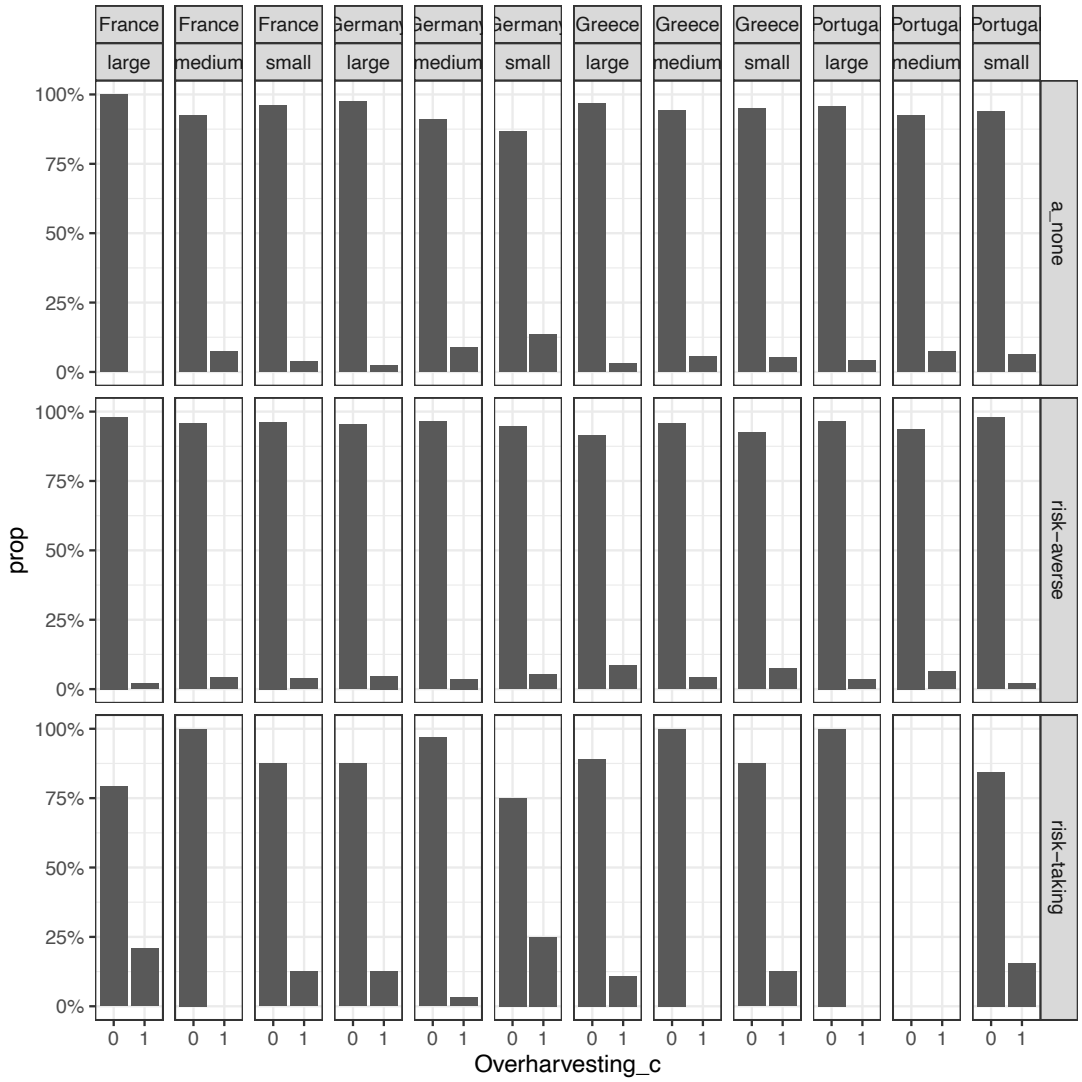
Figure A.6-1-54: Risk aversion type, nationality and size – total.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants per risk aversion type; 'a_none' represents those that have not invested at all or similarly in both.

The figures below show that the relation between the 'risk aversion' type and rule compliance is different per nationality and size. One can see the largest dispersion among 'risk-taking' type participants: medium participants across all nationalities almost never overharvest, while small and large participants across all nationalities (except Portugal) are highest in breaching across all other categories – together with small German participants with 'no type'.

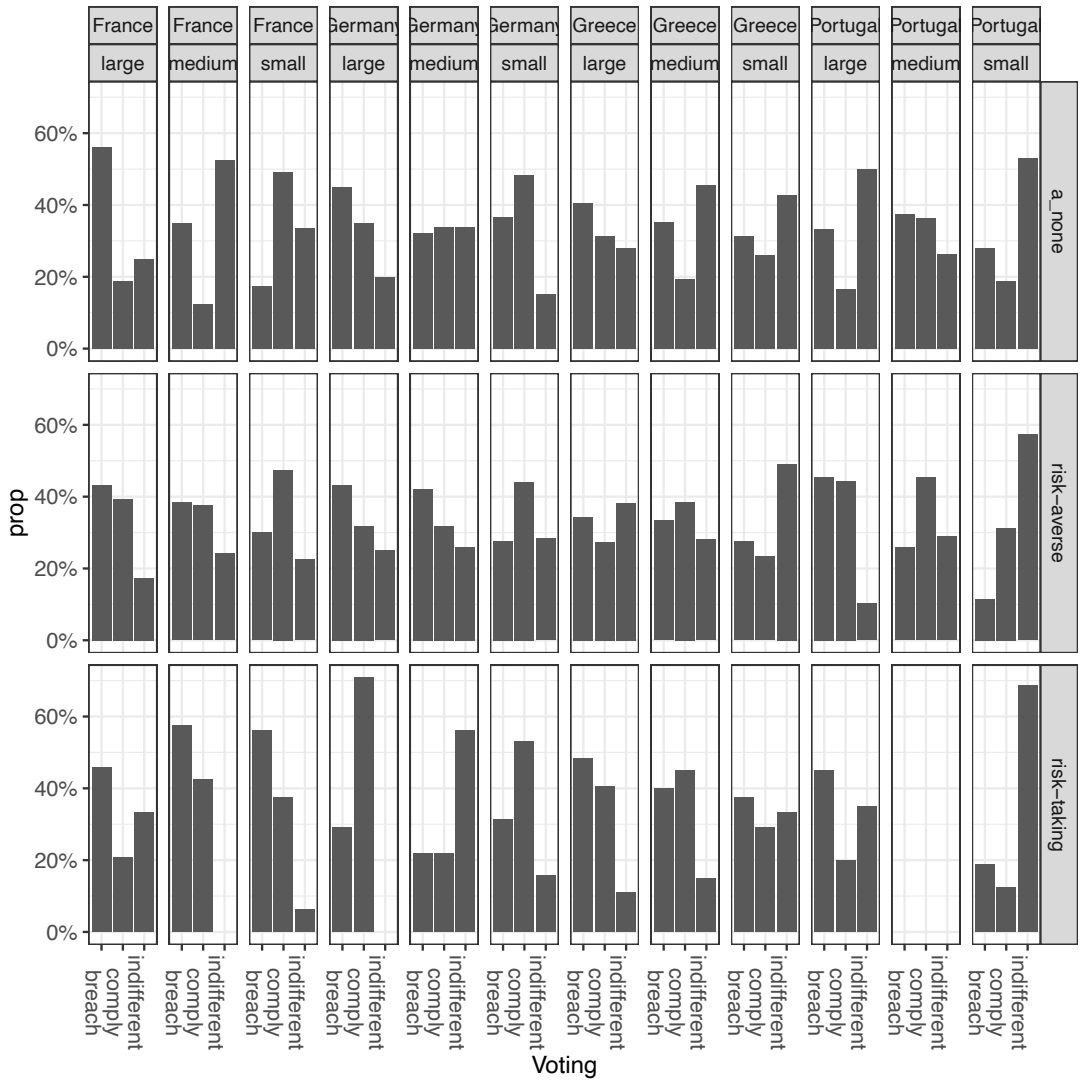
Figure A.6-1-55: 'Risk aversion' type and overharvesting – per nationality and size, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participant-rounds per risk aversion type that overharvested ('1') or not ('0') in each round ('Overharvesting_c'). The risk aversion type refers to the type taken over the course of the game and is on aggregate level; 'a_none' represents those that have not invested at all or similarly in both.

Similarly for voting, one can see the largest dispersion across 'risk-taking' type participants. Compliance is proportionally highest for large German participants with 'risk-taking' type, followed by small German and French participants with 'no type'. Breaching is highest for large French and German participants with 'no type', and small and medium French and large Greek and Portuguese participants with 'risk-taking' type.

Figure A.6-1-56: 'Risk aversion' type and voting – per nationality and size, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participant-rounds per risk aversion type that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent') in each round ('Voting'). The risk aversion type refers to the type taken over the course of the game and is on aggregate level; 'a_none' represents those that have not invested at all or similarly in both.

In conclusion, I will use the 'risk aversion' typology as an independent variable instead of the individual variables for the investment items. Moreover, the above analysis supports the idea of using a variable that combines nationality and size.

A.6-1.3.3 Sustainable harvesting

Thirdly, we look at sustainable harvesting, which is also part of the cultivation strategy. I build a variable that displays sustainable harvesting with always leaving

two apples on the ground on each owned tree ("TotalSustF_O")[11] and never harvesting a small apple from both own and shared trees ("TotalHSSh").[12] I also have a less strict variable where I allow 10% of available small apples for harvest to be still considered as "sustainable". The table below shows the frequencies. One out of five participants harvests in a strictly sustainable way in all rounds, and almost every other participant harvests sustainably under the less strict definition. Given the relatively high numbers, I will not use the less strict, but only the strict definition. This shows the pure effect of sustainable harvesting on rule compliance, and the principled behaviour behind this.

Table A.6-1-57: Sustainable – per round and total.

		Sustainable					
		per round			total		
		yes (1)	no (0)	Total	yes (1)	no (0)	Total
Definition	strict	1453	1163	2616	70	257	327
		56%	44%		21%	79%	
	less strict	1726	890	2616	146	181	327
		66%	34%		45%	55%	

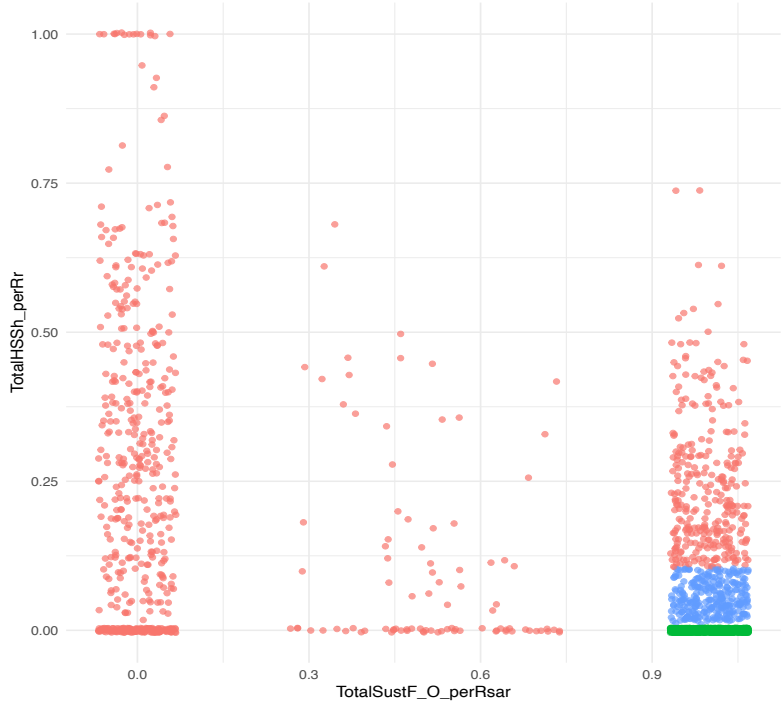
Source: own calculation.

The figures below display the relation between both harvesting variables and the variable 'sustainable'. Green dots represent the strict definition, blue the less strict definition and red dots, all others. One can see that there is a declining linear relationship between both, and the correlation is -0.49 for per round variables and -0.69 for aggregate variables. This supports using both variables to construct the typology. Moreover, I use the aggregate and not the per round variable because conceptually, I need the aggregate typology, which only solidifies over the course of the game. Therefore, in the following, I use the aggregate variable.

11 For leaving two apples on the ground, we have to look at own trees only. If we also looked at shared trees, the dependent variable 'overharvesting' would correlate with this variable.

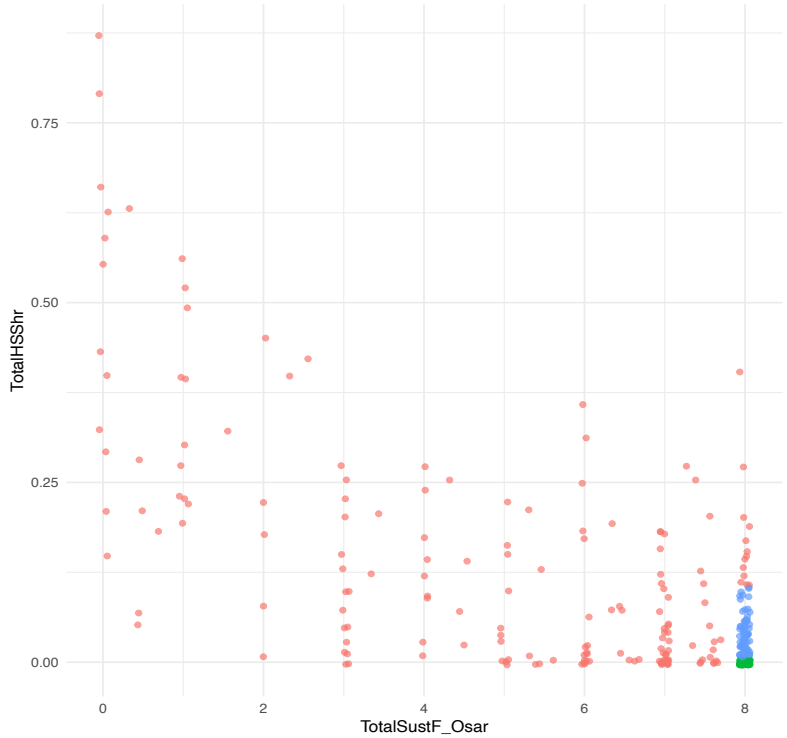
12 These are quite hard conditions, however necessary to make the analysis most straightforward. There is no other strict boundary, e.g., we could not say: once not leaving two apples on the ground is okay, but twice is not okay. Secondly, if this variable appears significant, also less strict conditions would show significant, while we cannot assume this to be the case the other way around.

Figure A.6-1-58: TotalHSSh and TotalSustF_O – per round.



Source: own calculation. The figure displays the relationship between both harvesting variables ('TotalHSSh_perRr' and 'TotalSustF-O_perRsar') and the variable 'sustainable' per participant-rounds. Green dots represent the strict definition, blue the less strict definition and red dots, all others.

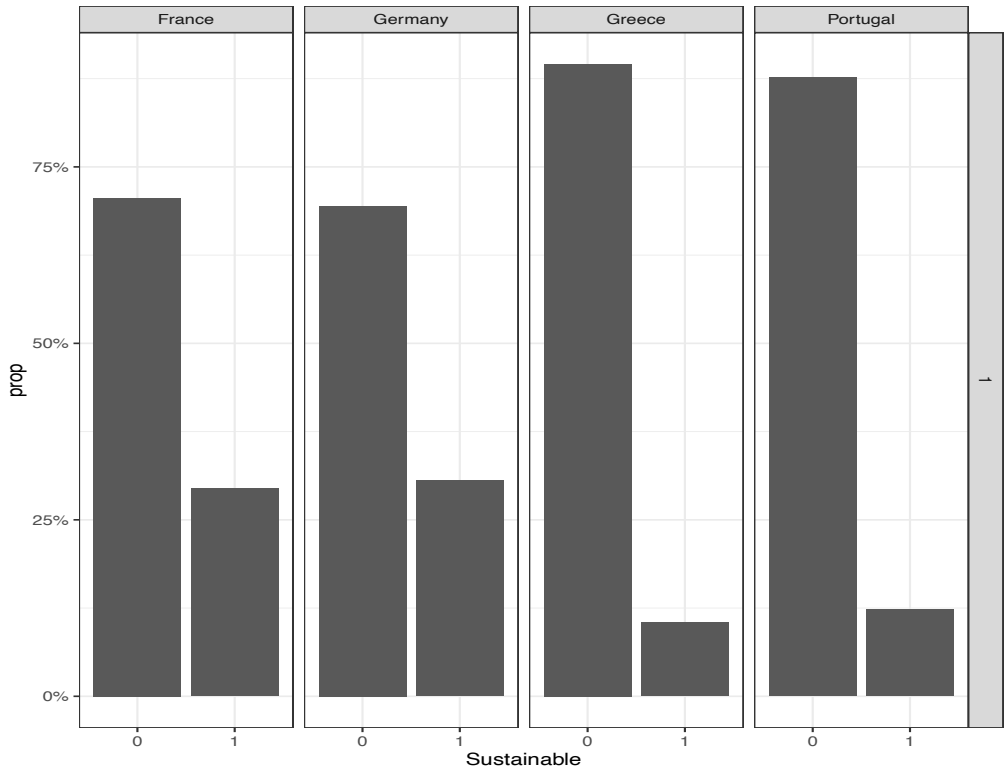
Figure A.6-1-59: TotalHSSh and TotalSustF_O – total.



Source: own calculation. The figure displays the relationship between both harvesting variables ('TotalHSSh_perRr' and 'TotalSustF-O_perRsar') and the variable 'sustainable' per participants. Green dots represent the strict definition, blue the less strict definition and red dots, all others.

Checking the role of the typology against the treatment variables, one can see that there is no difference across size (see Appendix A.6-3-5). However, one can see some difference across business cycle rounds (see Appendix A.6-3-6): In bust and recovery rounds, sustainable participant-rounds are at almost equal levels. In contrast, in boom rounds, almost 70% of all participant-rounds belong to 'sustainable'. There is a remarkable difference across nationalities as the figure below shows. Almost 90% of Greek and Portuguese participants do not belong to 'sustainable', whereas almost one out of three French and German participants does.

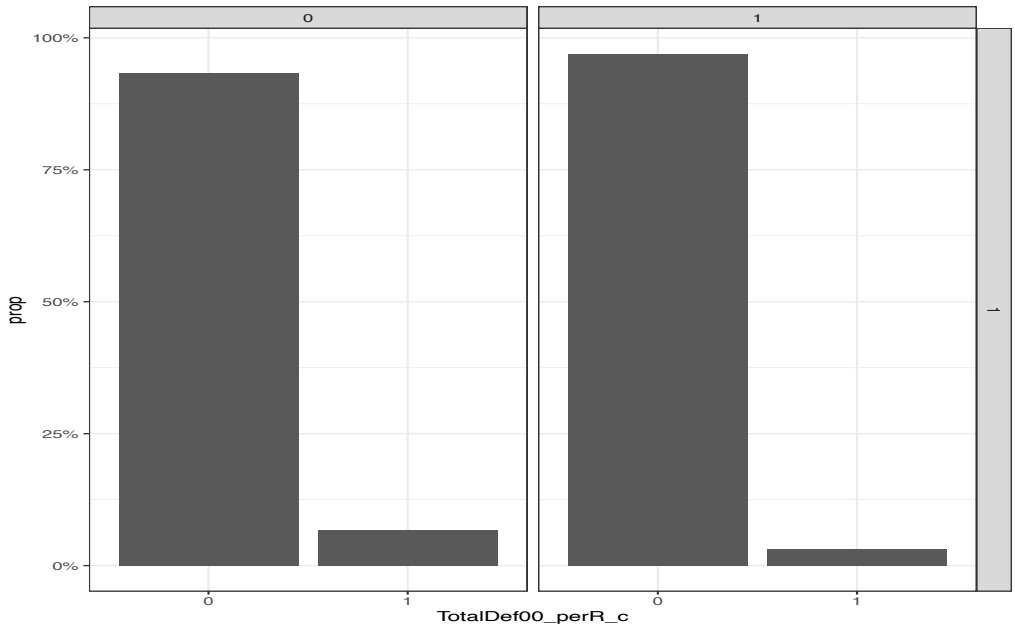
Figure A.6-1-60: Sustainable type and nationality.



Source: own calculation. The y-axis shows the proportion of e.g. 'French' participants that always harvested sustainably ('1') or not at all ('0') during the entire game ('Sustainable').

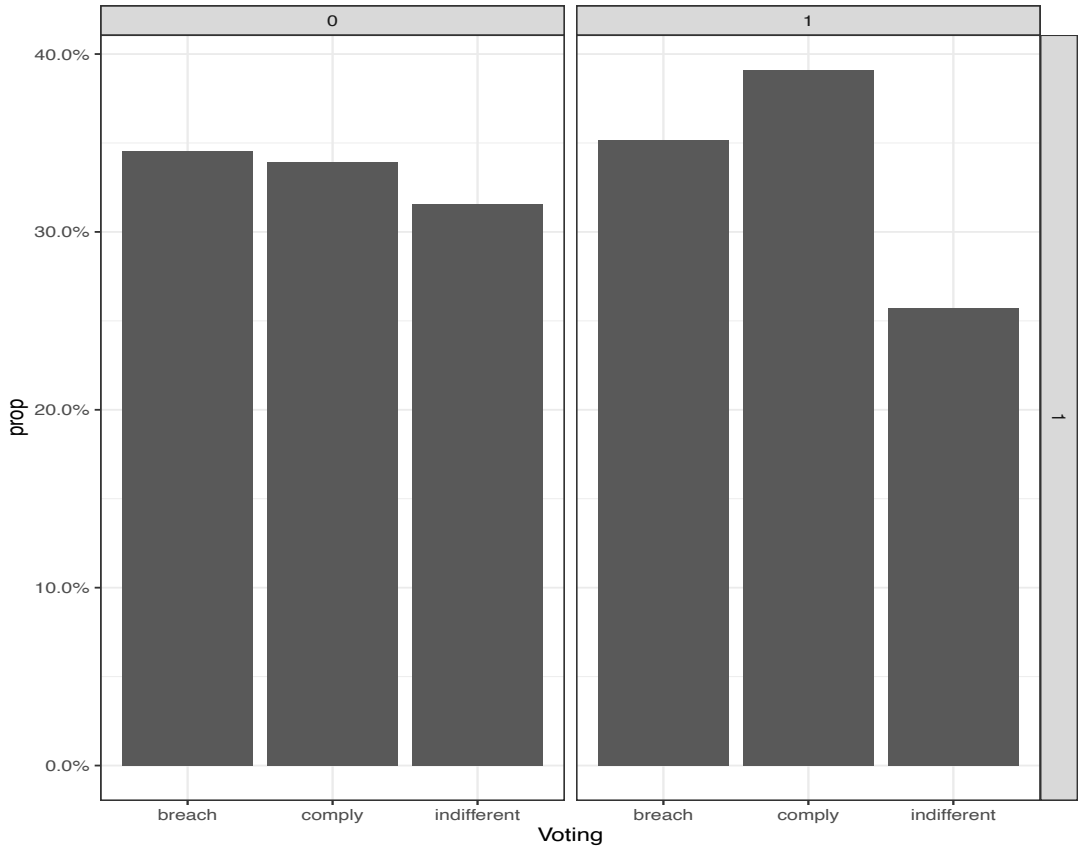
The figures below show the relation between the sustainable typology and overharvesting and voting. One can see that 'sustainable' type participants overharvest in very few participant-rounds. Accordingly, one can see that compliance with the voting rules is highest with 'sustainable' type participants, while breaches remain at unchanged levels. However, the differences are not large.

Figure A.6-1-61: Sustainable type and overharvesting – per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'sustainable' participant-rounds ('1') that overharvested ('1') or not ('0') in each round ('TotelDef00_perR_c').

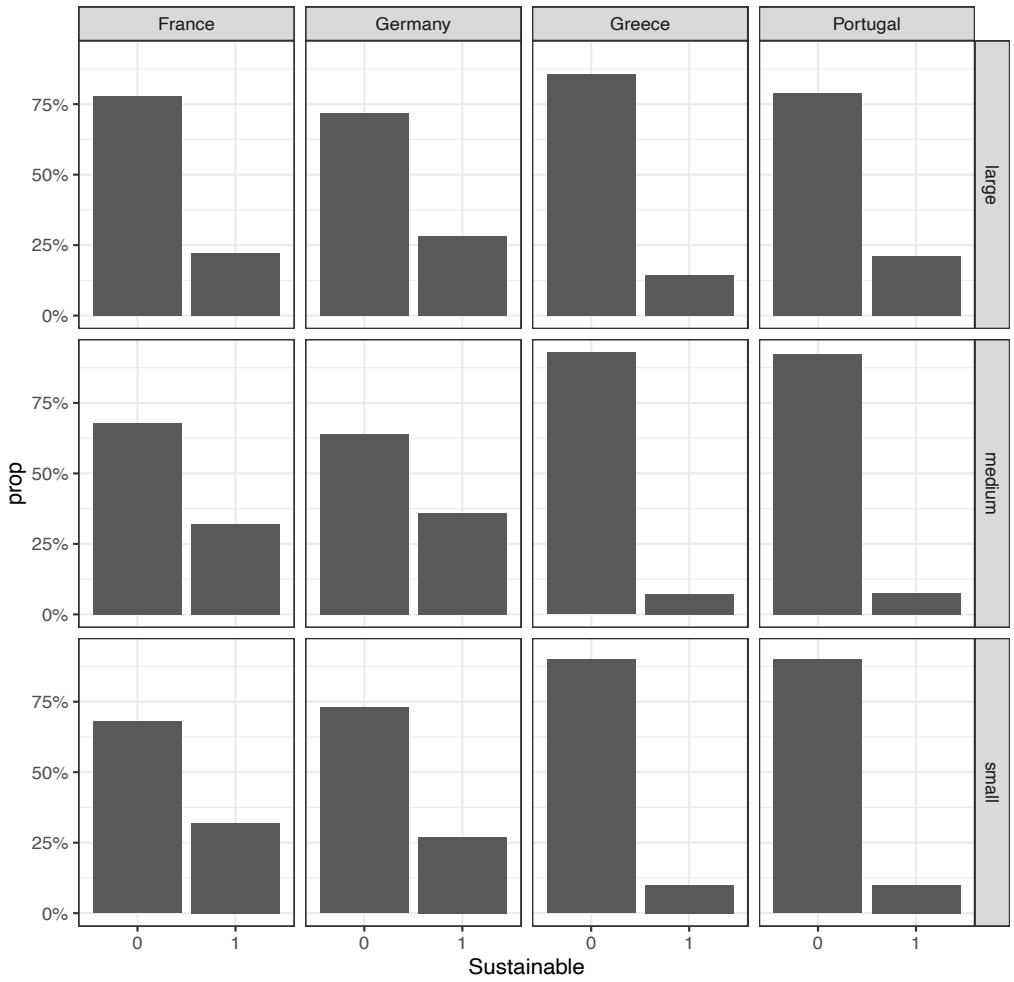
Figure A.6-1-62: Sustainable type and voting – per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'sustainable' participant-rounds ('1') that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent') in each round ('Voting').

The figure below shows participants per nationality, size and the 'risk aversion' type as proportions per block. One can see again the different patterns for French and German participants, on the one hand, and Greek and Portuguese participants on the other. Medium French and German participants most often belong to 'sustainable' – in contrast to medium Greek and Portuguese participants who least often belong to 'sustainable' of all categories. This opposite pattern is the same for small and large participants, with the latter belonging, least and most often, to 'sustainable' among French and German participants, and Greek and Portuguese participants, respectively. This shows a moderating effect from combining nationality and size for 'sustainable', which would have been neglected otherwise.

Figure A.6-1-63: Sustainable type, nationality and size – total.

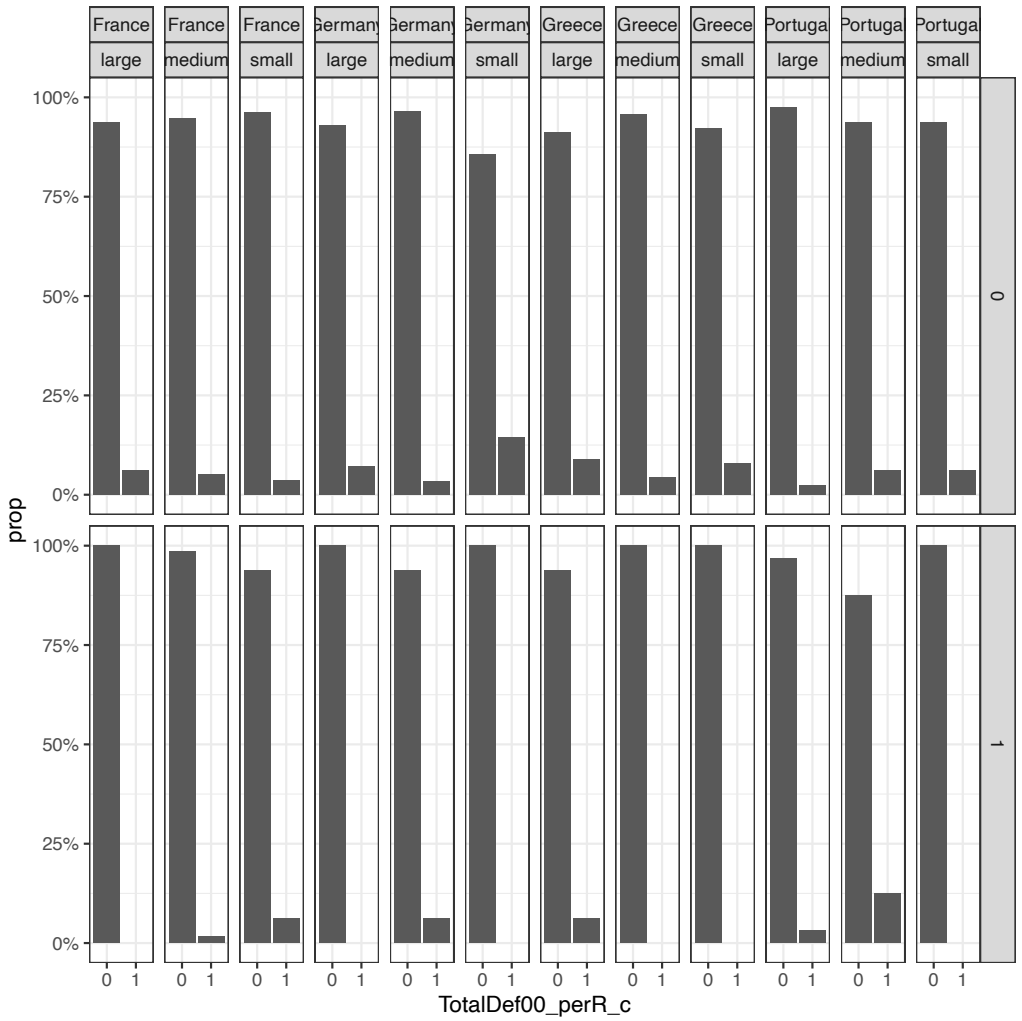


Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants that harvested sustainably ('1') or not at all ('0') during the entire game ('Sustainable').

The figures below show that the relation between 'sustainable' and rule compliance is different per nationality and size. One can see more evenly spread overharvesting for

participants who do not belong to ‘sustainable’ (‘0’), with small German participants ranging highest compared to all other combinations. However, one can also see overharvesting among participants that do belong to ‘sustainable’, but predominantly only for small French, medium German, large Greek and medium Portuguese.

Figure A.6-1-64: Sustainable type and overharvesting – per nationality and size, per round.

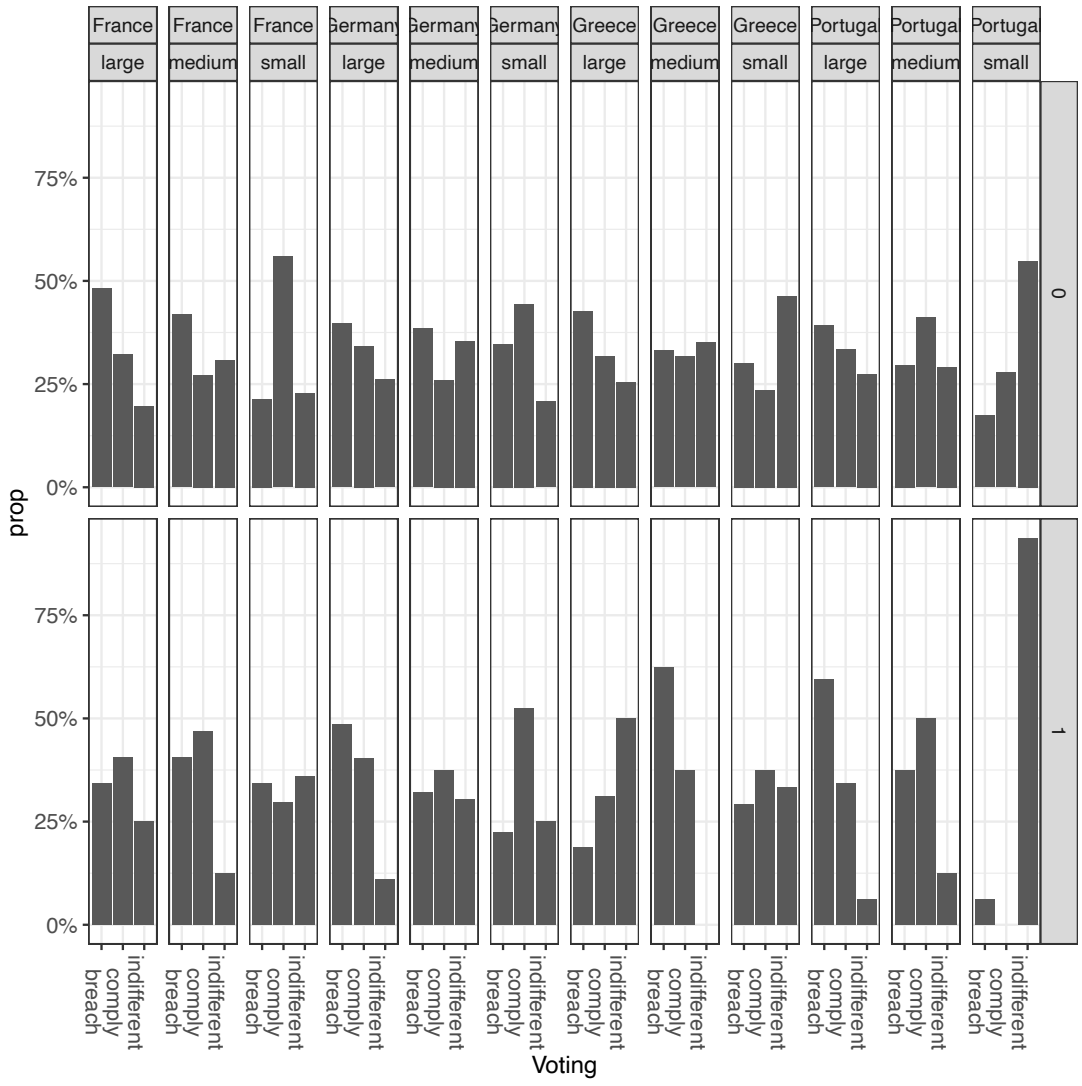


Source: own calculation. The y-axis shows the proportion of e.g. ‘large French’ participant-rounds per sustainability type that overharvested (‘1’) or not (’0’) in each round (‘TotelDef00_perR_c’).

For voting, we see a mixed picture. Small French participants that do not belong to ‘sustainable’ comply proportionally most often, closely followed by small German and medium Portuguese participants who belong to the ‘sustainable’ type. Overall, one can see higher proportions of compliance among participants who belong to ‘sustainable’. In contrast, medium Greek and large Portuguese participants who belong to

'sustainable' breach most often. One can see that the picture is mixed, and that regression analysis is needed to disentangle the pure effect of 'sustainable'.

Figure A.6-1-65: Sustainable type and voting – per nationality and size, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participant-rounds per sustainability type that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent') in each round ('Voting').

In conclusion, I will use the sustainable typology as an independent variable at the aggregate level. Again, the above analysis supports the idea of using an interaction that combines nationality and size.

A.6-1.3.4 Co-operation typology

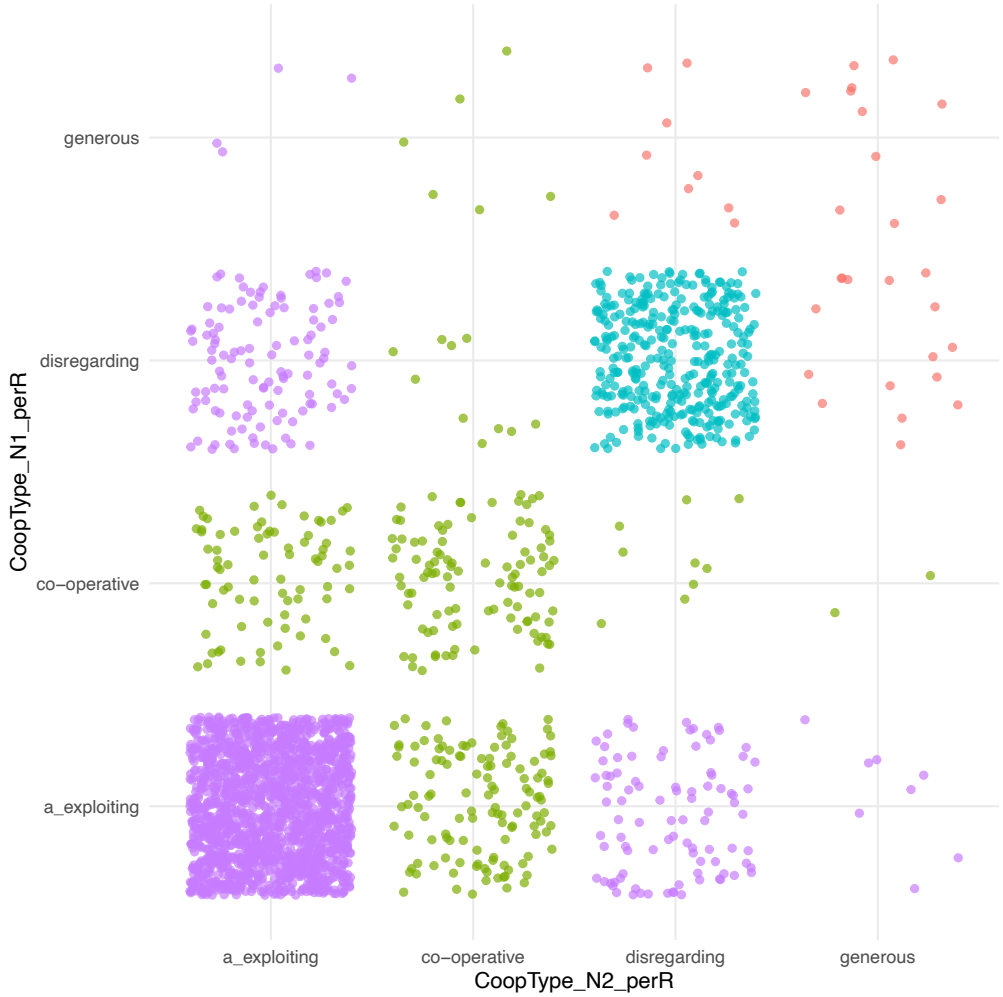
Fourthly, we look at the co-operation typology. The variable is categorical and takes one of four values that define whether or not the participant has harvested any apple

of any kind from any of the shared trees, and whether or not the participant has invested in any of the shared trees (see Table 5.3-3 in the body of the thesis). It is defined across all shared trees and both neighbours. 'Harvesting' is defined as having harvested at least one apple of any kind (small, ripe, fallen) on any tree. 'Investing' is defined as having purchased at least one item for any of the shared trees[13]. The aggregate variable is calculated in the same way using the respective aggregate variables of 'harvesting' and 'investing'. As described before, the variable could not just use the type which prevailed in most rounds to avoid false second round interpretations. Finally, I restrict the variable to only show 'exploiting' and 'co-operative' types, since the other two types occur very rarely. Accordingly, 'generous' (1 participant) and 'disregarding' (3 participants) are assigned to 'co-operative' since they at least do not exploit the shared trees.

The figure below shows the combination as colours and co-operation with each of the neighbours on the x- and the y-axis. In most participant-rounds, participants harvest from shared trees, but do not invest in shared trees ('exploiting', violet dots). There are also many participant-rounds where neither happens ('disregarding', blue dots), a few where participants invest, but do not harvest ('generous', red dots) and numerous that do both ('co-operative', green dots). The second figure shows the aggregate types where one can hardly see any 'disregarding' or 'generous' type participants. In order to make the variable more concise, I classify them as 'co-operative' since they at least do not exploit shared trees. Overall, there are roughly the same numbers of 'exploiting' and 'co-operative' type participants. The figures show that both types are distinct from each other and that the aggregate type corresponds to what type participants play per round, i.e., they are consistent. Therefore, I conclude that I can use this construction of the typology. Moreover, in the following, I only use the aggregate variable, and not the per round one, for the co-operation type.

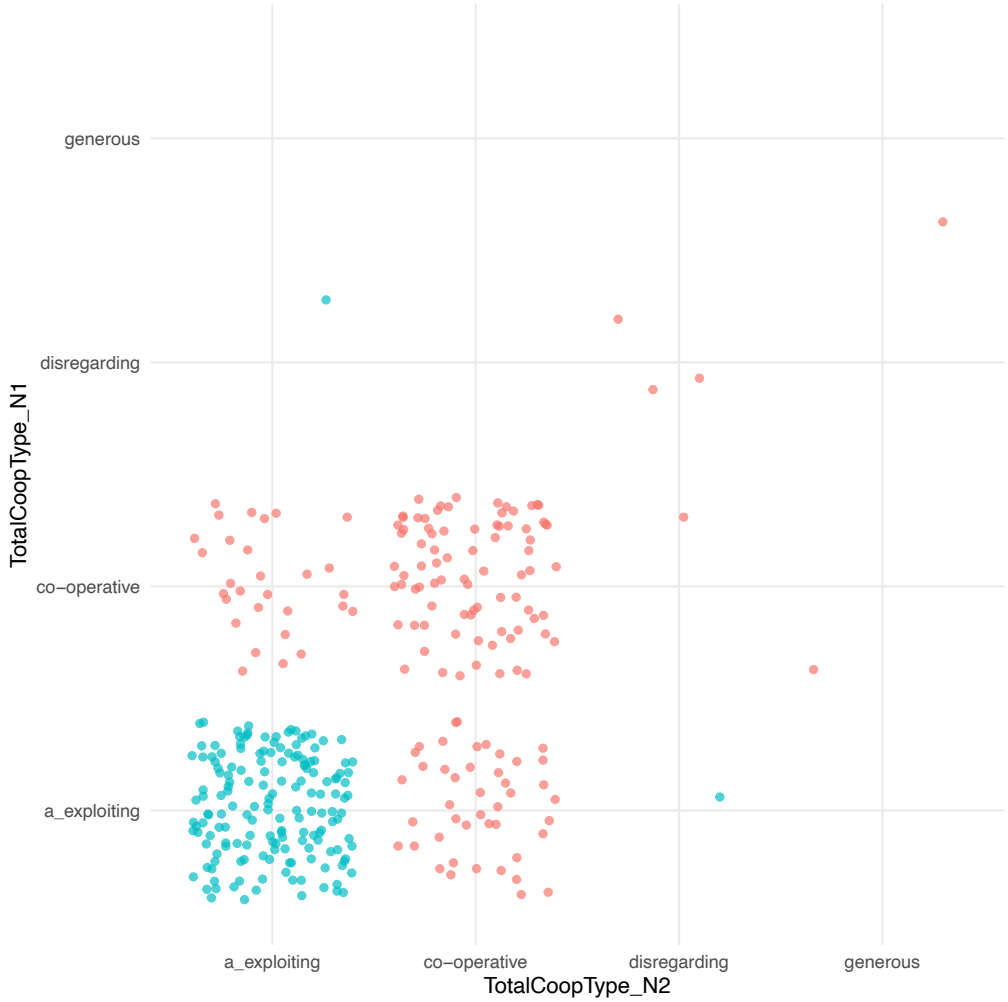
13 First, this is calculated separately per neighbour and then aggregated across both neighbours. When thy type was different for each neighbour, the choice was made for the most relevant type, e.g., 'co-operative' instead of 'disregarding'. For details, see programming scripts.

Figure A.6-1-67: CoopType_N1 and CoopType_N2 – per round.



Source: own calculation; 'CoopType' stands for 'co-operation type' towards either neighbour 1 (N1) or neighbour 2 (N2). Violet dots show participant-rounds in which participants harvest from shared trees, but do not invest in shared trees ('exploiting'). Blue dots show participant-rounds in which neither happens ('disregarding'), red dots in which participants invest, but do not harvest ('generous') and green dots in which participants do both ('co-operative').

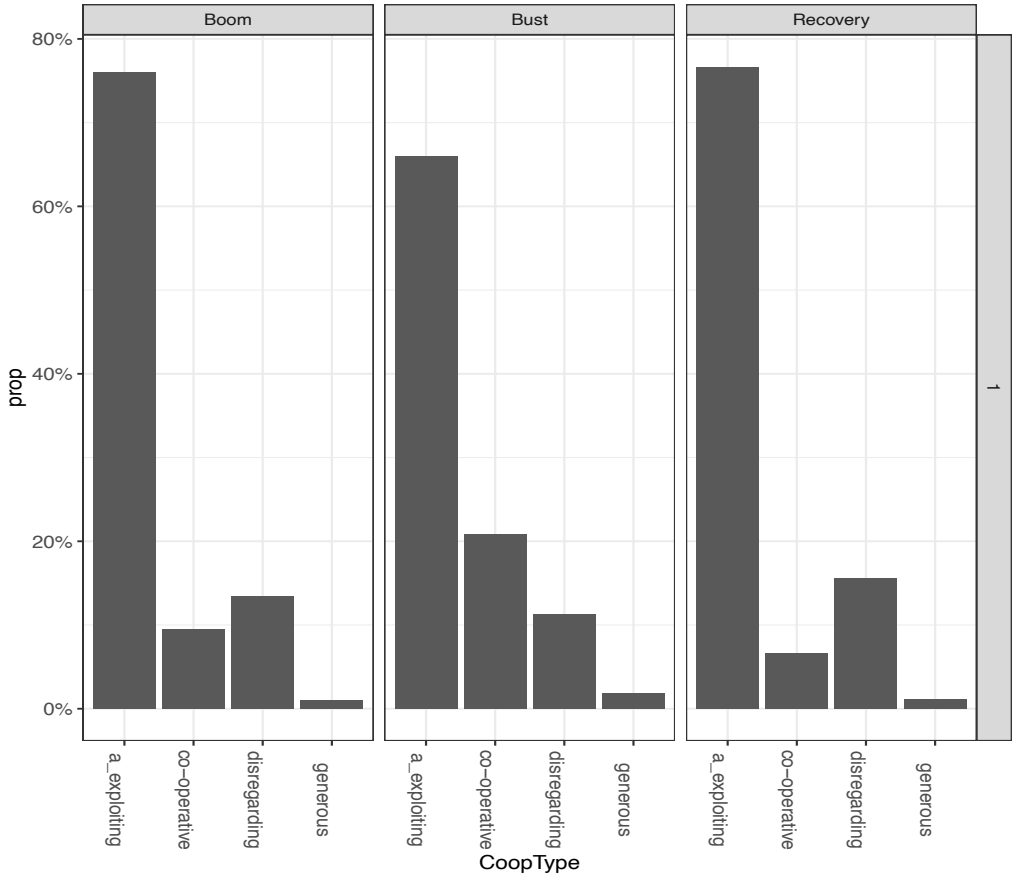
Figure A.6-1-68: CoopType_N1 and CoopType_N2 – total.



Source: own calculation; 'CoopType' stands for 'co-operation type' towards either neighbour 1 (N1) or neighbour 2 (N2). Blue dots show participants that over the course of the game have at least harvested once from shared trees but did not invest at all in shared trees ('exploiting'). Red dots show participants which do both ('co-operative'). There are few participants that belong to the 'disregarding' or 'generous' type. They are classified as 'co-operative'.

Checking the role of the typology against the treatment variables, one can see that there are some differences. Firstly, the figure below shows the vast majority of participant-rounds belongs to 'exploiting'. However, in bust rounds, the proportion drops by around 10 percentage points in favour of 'co-operative' and also 'generous' types. This means that in bust rounds, participants not only harvest from shared trees, but also invest.

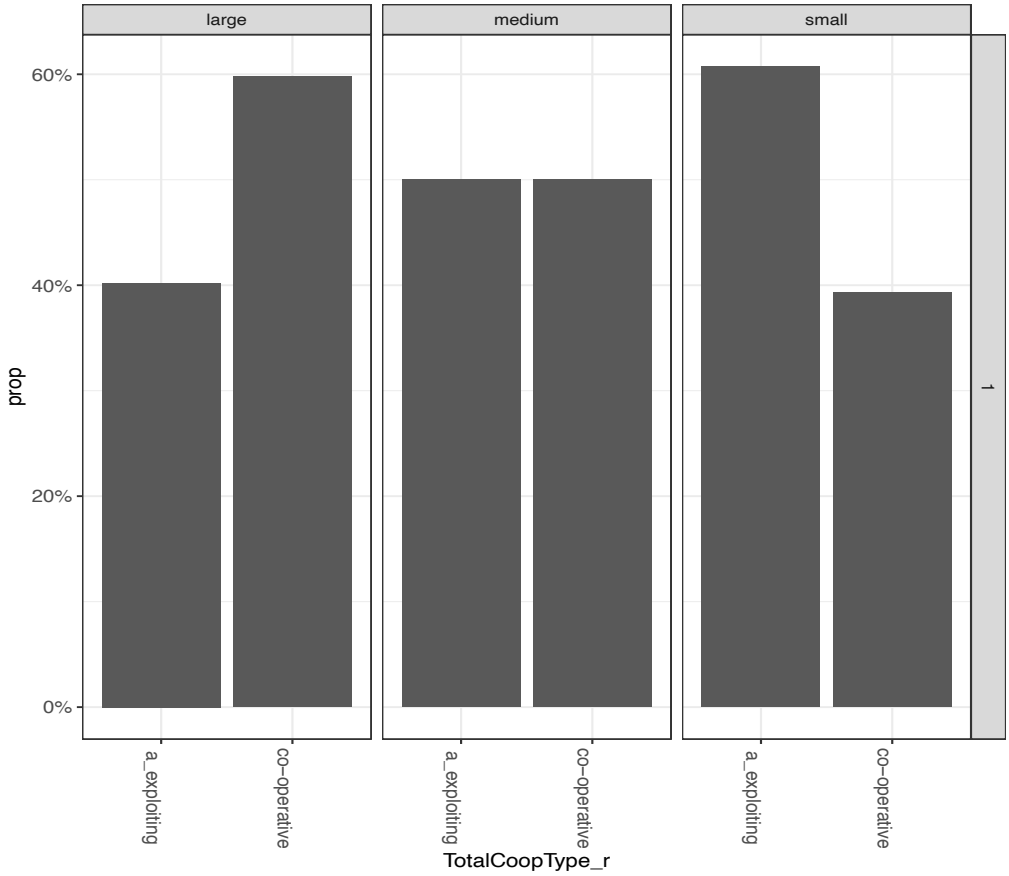
Figure A.6-1-69: Co-operation type and business cycle rounds – per round.



Source: own calculation. The y-axis shows the proportion of participant-rounds in e.g. 'boom' rounds per co-operation type ('CoopType'). The co-operation type refers to the type taken over the course of the game and is on aggregate level.

The figure below shows quite some differences across 'size' indicating that especially small farmers seem to need the extra apples but – in contrast to large farmers – do not have the means to invest in these trees. The dispersion among medium participants is identical with every other participant belonging to either one of the two types.

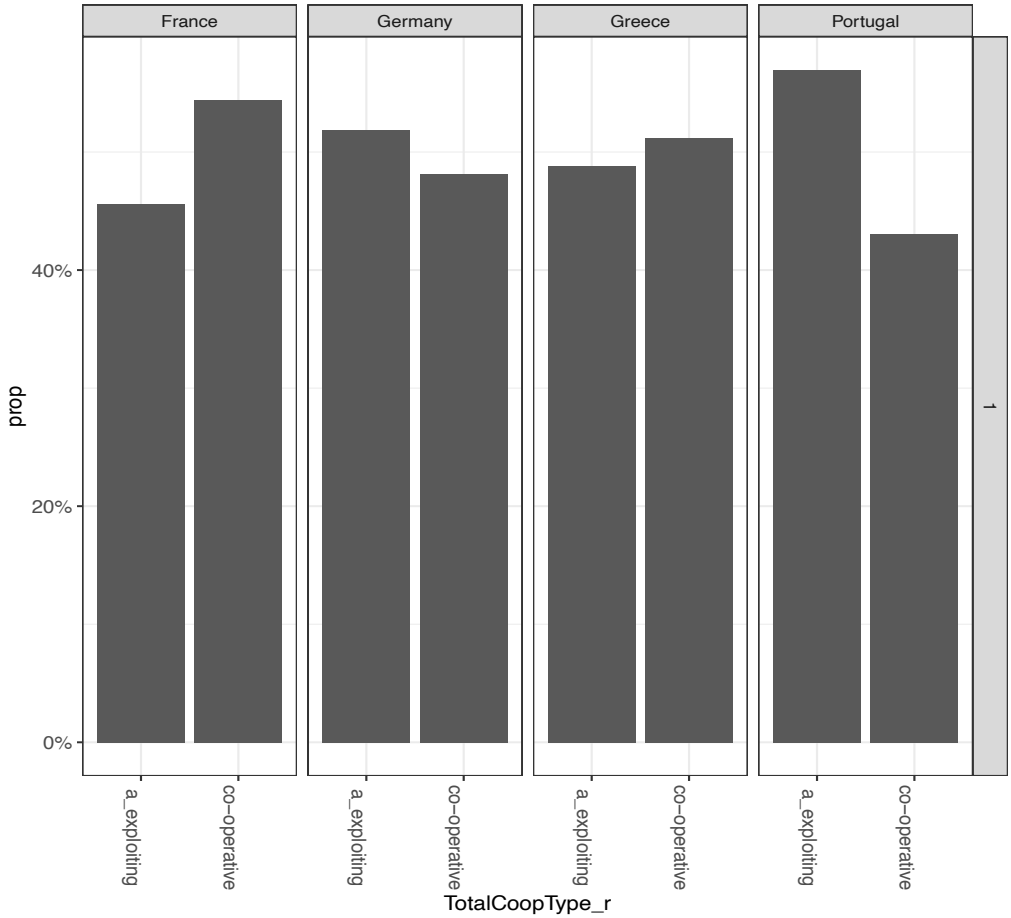
Figure A.6-1-70: Co-operation type and size – total.



Source: own calculation. The y-axis shows the proportion of e.g. 'large' participants per co-operation type ('TotalCoopType_r'). The co-operation type refers to the type taken over the course of the game and is on aggregate level.

The dispersion across nationalities follows roughly the one for medium participants: every other German and Greek participant belongs to either of the two groups, with the former having a slight tendency towards the 'exploiting' and the latter towards the 'co-operative' type. In contrast, there are roughly 10 percentage points more French participants belonging to the 'co-operative' type, and roughly 15 percentage points more Portuguese people belonging to the 'exploiting' type.

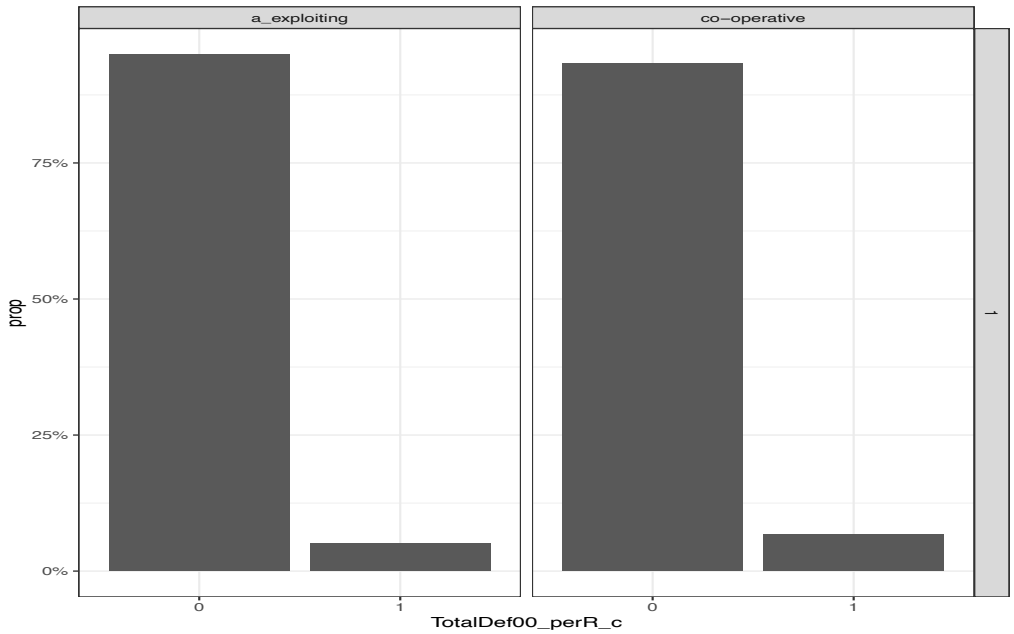
Figure A.6-1-71: Co-operation type and nationality – total.



Source: own calculation. The y-axis shows the proportion of e.g. 'French' participants per co-operation type ('TotalCoopType_r'). The co-operation type refers to the type taken over the course of the game and is on aggregate level.

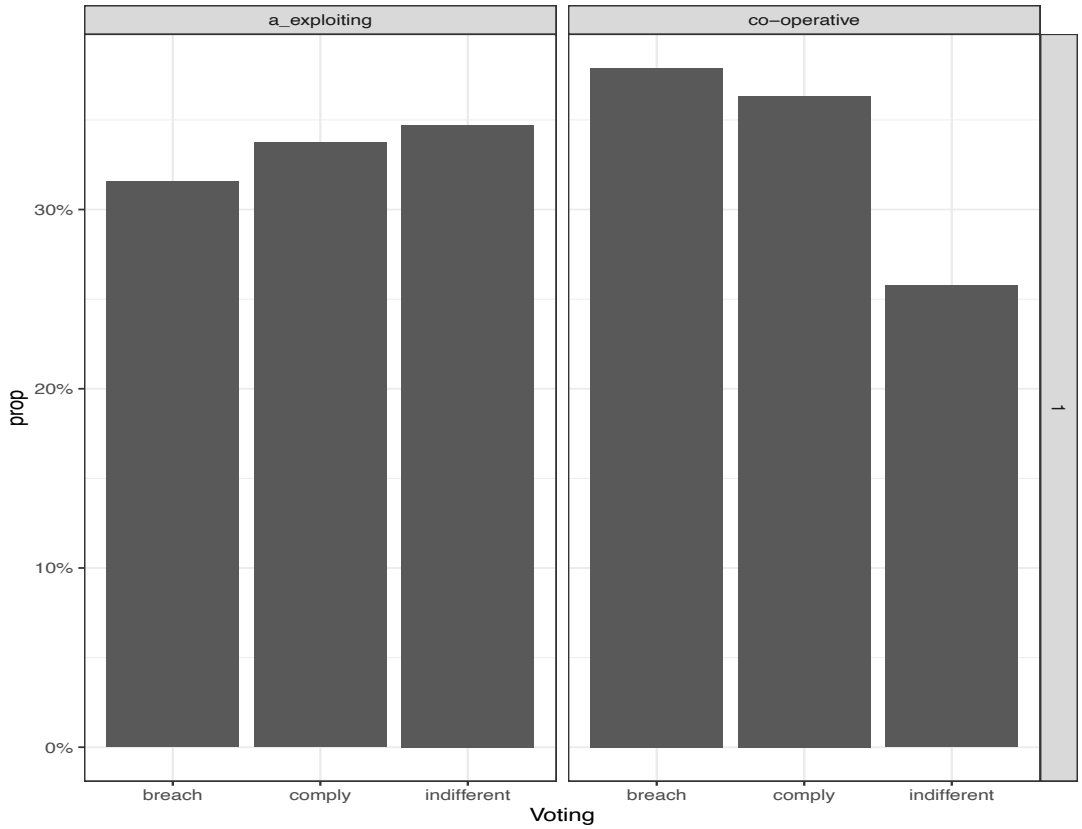
The figure below show the relation between the co-operation typology and overharvesting and voting. Firstly, one can see that 'co-operative' type participants overharvest in slightly more participant-rounds than 'exploiting' type participants. One can see some more differences as regards compliance with the voting rules: while 'exploiting' type participants roughly spread evenly across all three voting types, 'co-operative' type participants breach proportionally more by about five percentage points, but also slightly comply more – at the expense of abstaining. However, the differences are not large.

Figure A.6-1-72: Co-operation type and overharvesting – per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'exploiting' participant-rounds that overharvested ('1') or not ('0') in each round ('TotelDef00_perR_c'). The co-operation type refers to the type taken over the course of the game and is on aggregate level.

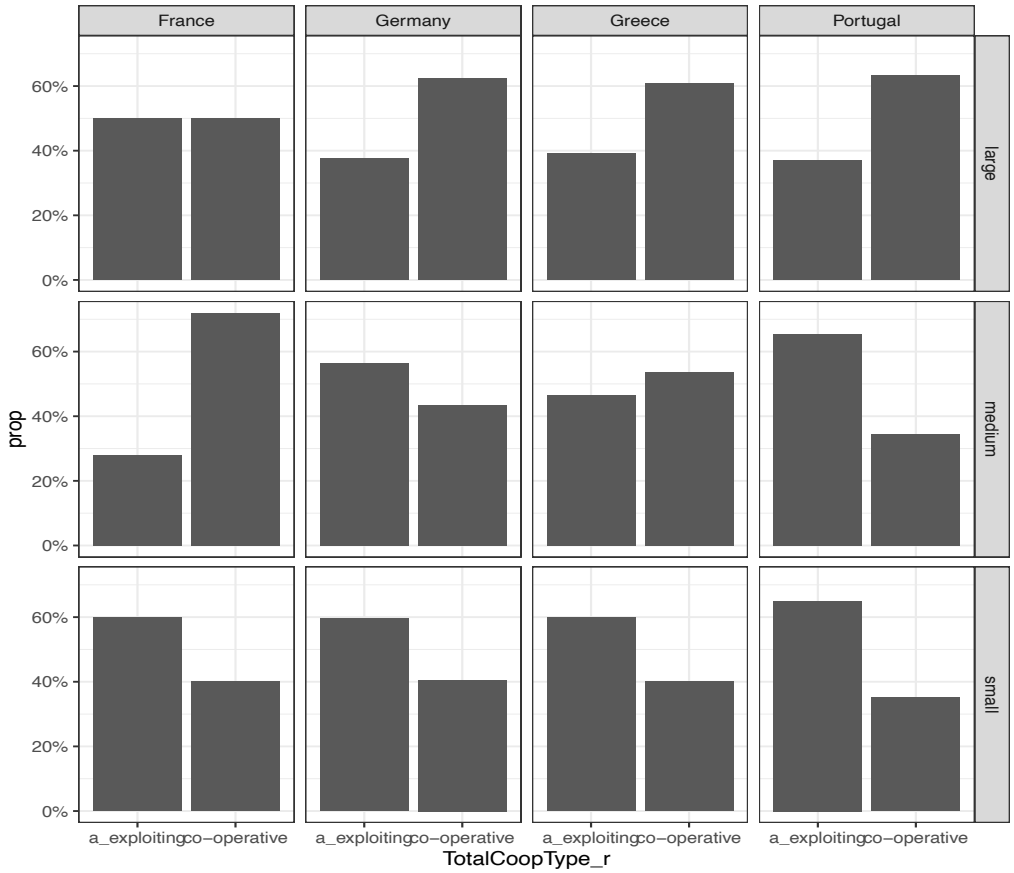
Figure A.6-1-73: Co-operation type and voting – per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'exploiting' participant-rounds that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent') in each round ('Voting'). The co-operation type refers to the type taken over the course of the game and is on aggregate level.

The figure below shows participants per nationality, size and the co-operation type as proportions per block. One can see that the dispersion for small participants is almost identical across all nationalities, and a little more pronounced for Portuguese participants: two out of three belong to the 'exploiting' type, and one out of three to the 'co-operative' type. The inverse dispersion is for large participants across all nationalities, except for French participants, where the proportion is 50%. The picture for medium participants diverges across nationalities: on the one end, almost three out of four French participants belong to the 'co-operative' type; on the other end, only one out of three Portuguese participants belongs to that type. Greek and German participants are more in the middle with a tendency towards the 'exploiting' type for the former and the 'co-operative' type for the latter. Proportionally, French participants belong most often to the 'co-operative' type (except for small participants), and Portuguese participants most often to the 'exploiting' type (with the exception of large participants).

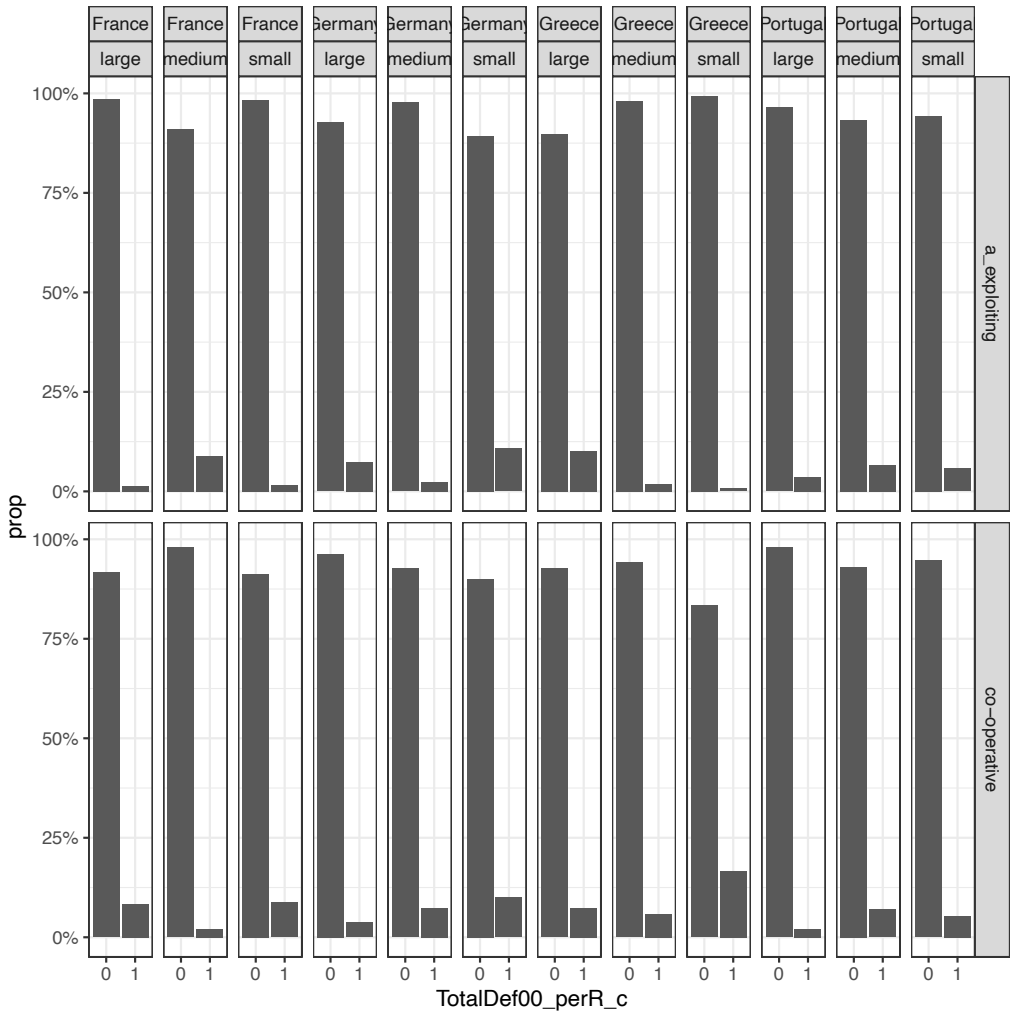
Figure A.6-1-74: Co-operation type, nationality and size – total.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants per co-operation type ('TotalCoopType_r'). The co-operation type refers to the type taken over the course of the game and is on aggregate level.

The figure below show that the relation between the co-operation type and rule compliance is different per nationality and size. While one can roughly see equal levels of overharvesting for small German, large Greek and all Portuguese participants, disregarding the co-operation type, one can see more overharvesting for the 'exploiting' type for medium French and large German participants. Moreover, one can see more overharvesting also for the 'co-operative' type for small and large French, medium German and mostly for small Greek participants.

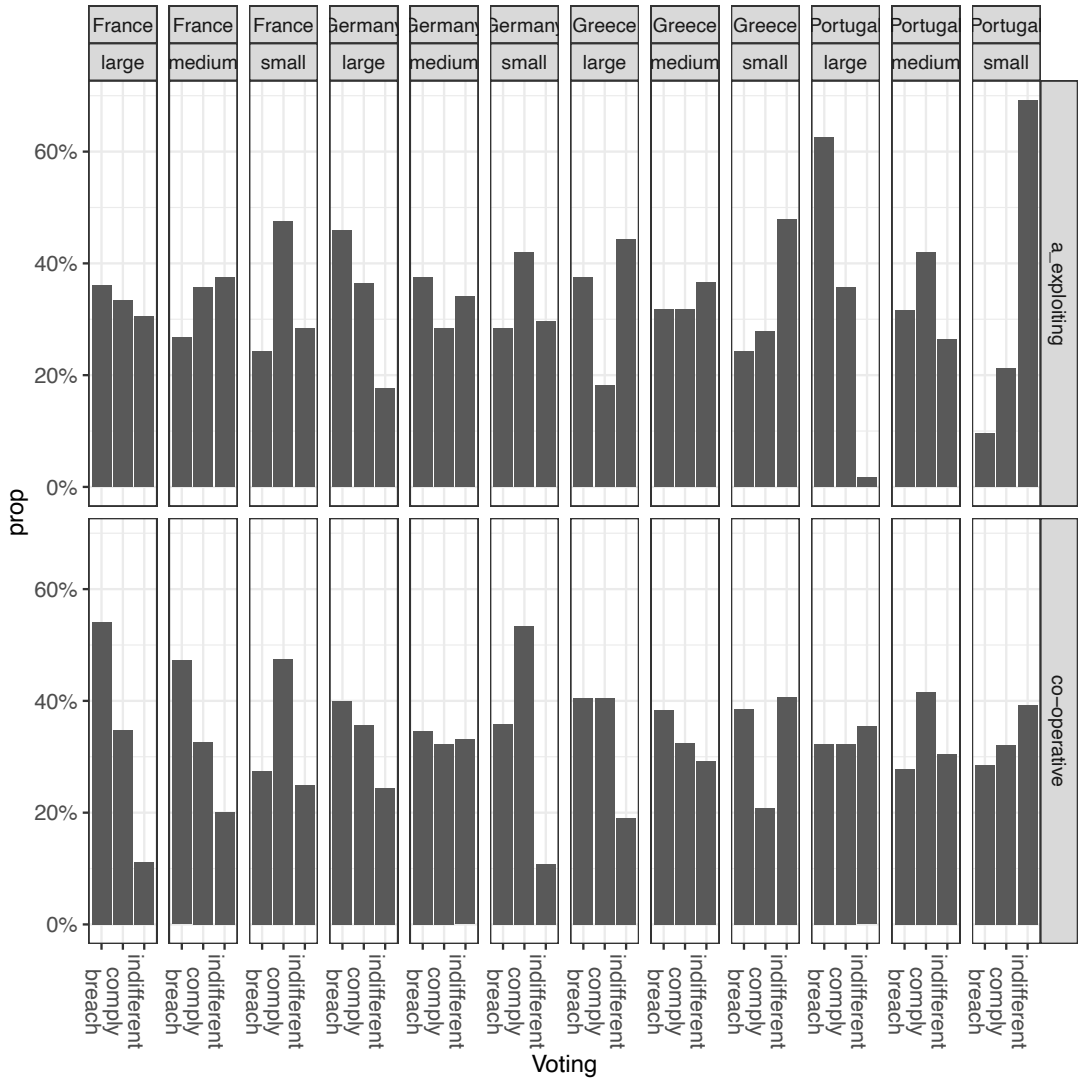
Figure A.6-1-75: Co-operation type and overharvesting – per nationality and size, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants per co-operation type that overharvested ('1') or not ('0') in each round ('TotelDef00_perR_c'). The co-operation type refers to the type taken over the course of the game and is on aggregate level.

For voting, one can see the largest dispersion across French, Portuguese and small German participants. While 'exploiting' type participants from Portugal behave almost opposite for large and small participants, 'co-operative' type participants behave most differently in the case of large French and small German participants, with the former breaching and the latter complying proportionally most often.

Figure A.6-1-76: Co-operation type and voting – per nationality and size, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants per co-operation type that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent') in each round ('Voting'). The co-operation type refers to the type taken over the course of the game and is on aggregate level.

In conclusion, I will use the co-operation typology as an independent variable. Moreover, the above analysis supports the idea of using a variable that combines nationality and size.

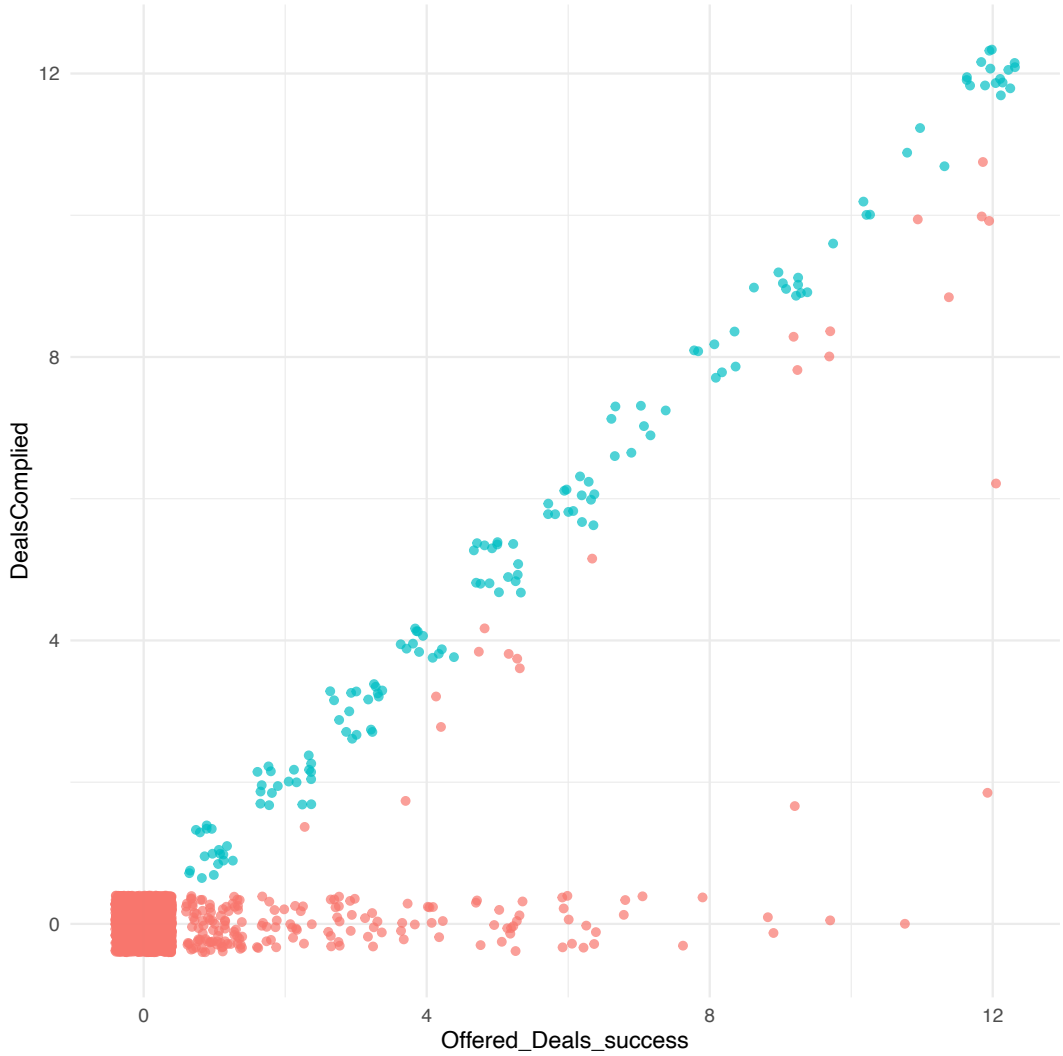
A.6-1.3.5 Reciprocal voting

The variable 'reciprocal voting' reflects the number of sealed[14] and complied deals[15]. The variable does not distinguish whether or not voting green corresponds to incorrectly voting green, i.e., a situation where the farmer overharvested and should have been sanctioned. In the figure below, I compare the number of successfully sealed deals ('Offered_Deals_success'), and the number of such deals with which a participant also complied ('DealsComplied'). The blue dots in the figure below show those cases where both equal 1, i.e., where the variable that combines both, 'DealsCompliedSh' is always 1. The red dots show all cases where a participant never complied with a deal, or where there were no deals at all ('0'). The figure shows that most participants who sealed deals also complied with them. Only some did not comply with all of their deals. Moreover, there are numerous participant-rounds in which a number of deals was sealed, but not complied with. The figure for the aggregate data shows a similar picture. There are, however, a couple of participants who sealed a number of deals but did not quite comply with them all. These people might bias the role of this variable for the analysis. However, conceptually, it is more important to have clear-cut criteria for the typology. One has to keep this in mind. Therefore, I conclude that I can use this construction of the typology.

14 We only count explicit votes against a sanction ('green'). We do not count abstain as 'green' since the participant cannot be sure that their non-vote would lead to no sanction against the farmer.

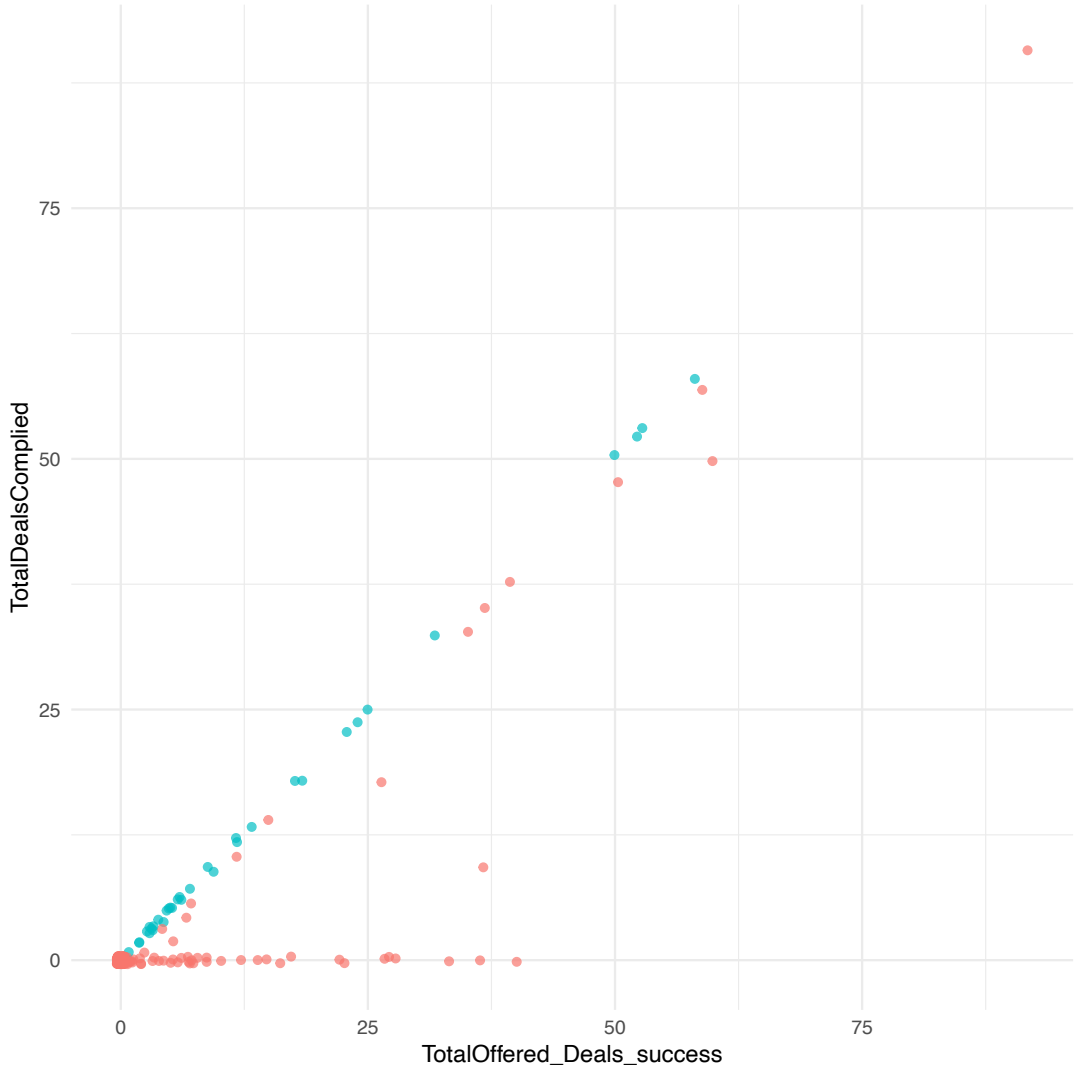
15 In the event of a participant not sealing any deal, the variable is coded 0. This coding ensures comparability and equalises the bare number of complied deals. One complied deal is equivalent to 5 complied deals. The distinction, instead, is between those who do not engage in false voting based on deals, and those who only partially act upon deals.

Figure A.6-1-77: Sealed deals and complied deals – per round.



Source: own calculation. Blue dots show participant-rounds in which a participant sealed and complied to all of their deals. Red dots show participant-rounds in which a participant did not comply with all of their deals, or where no deals were sealed ('0').

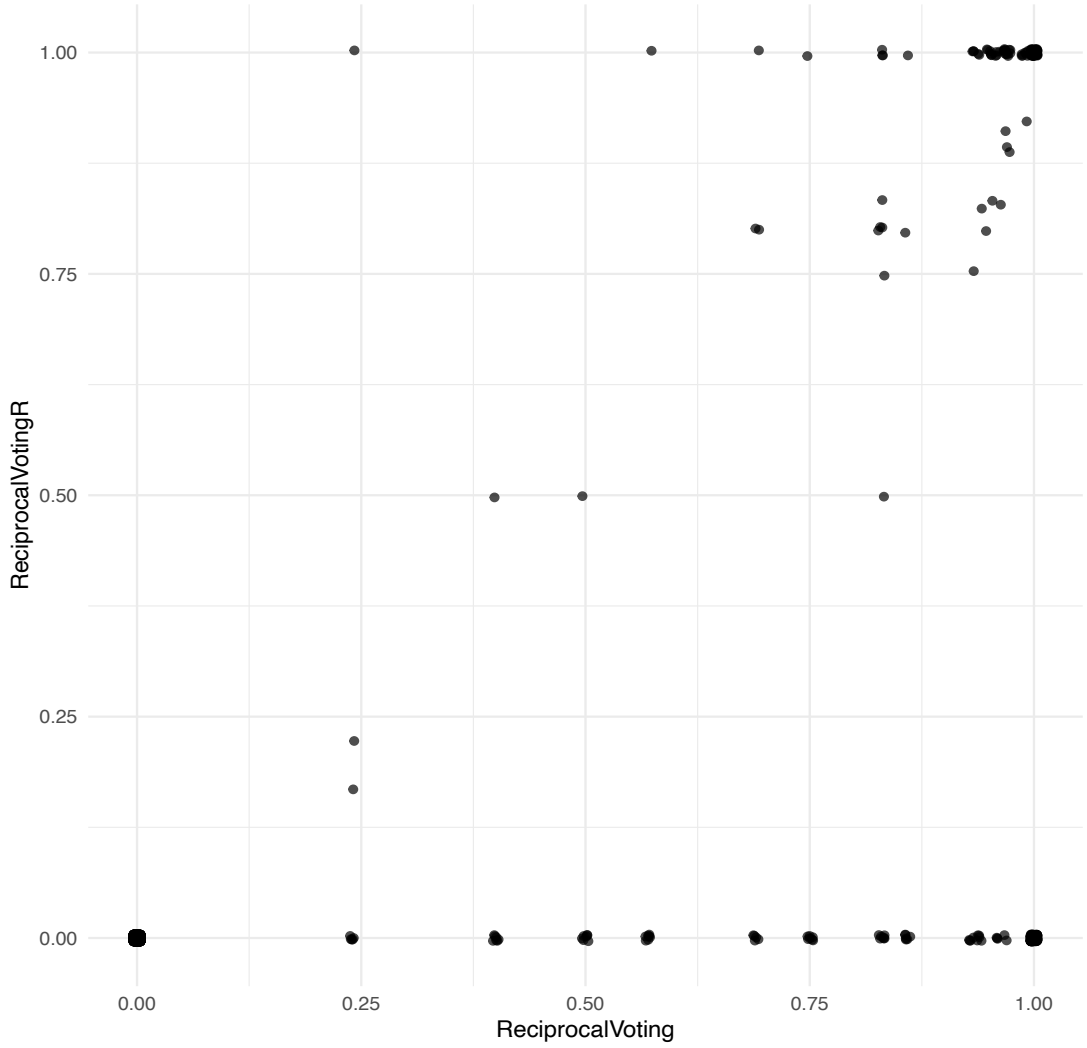
Figure A.6-1-78: Sealed deals and complied deals – total.



Source: own calculation. Blue dots show participants who sealed and complied to all of their deals over the course of the entire game. Red dots show participants who did not comply with all of their deals, or where no deals were sealed ('0').

The figure below shows that 'reciprocal voting' is consistent both across rounds (y-axis) and on aggregate level (x-axis). It shows that the aggregate variable corresponds to what type participants play per round. However, those participants who on aggregate level always comply with deals also have rounds in which they do not seal deals at all. In the following, depending on whether one is interested in per round or in aggregate behaviour, I use the per round or the aggregate variable for the reciprocal voting type.

Figure A.6-1-79: Reciprocal voting typology in total and per round.

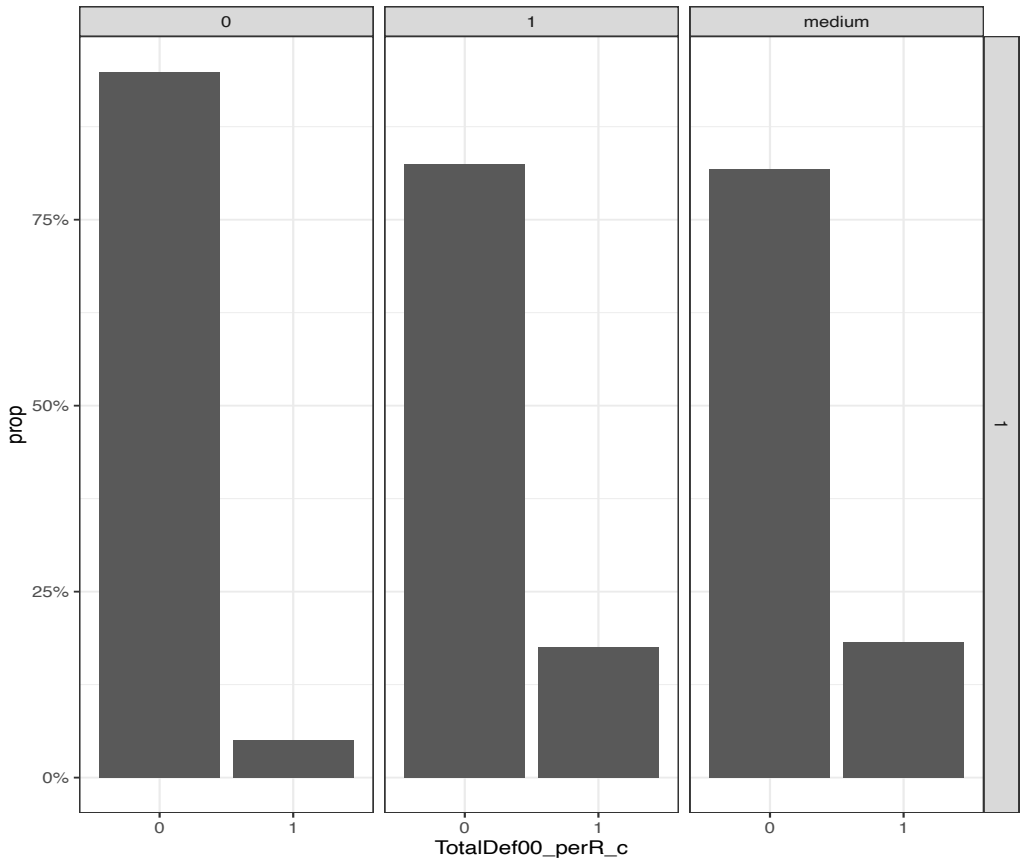


Source: own calculation. The y-axis shows the reciprocal voting type in each round and the x-axis shows the reciprocal voting type over the course of the entire game.

Checking the role of the typology against the treatment variables, one can see that there is little difference across business cycle rounds (see Appendix A.6-3-7). There is a few more complied deals in bust times than in the other two. In contrast, there is some difference across size (see Appendix A.6-3-8), with most of the participants who always comply with deals being of small size. There is a linear relationship between size and 'reciprocal voting', increasing from large to small. There is little difference across nationalities (see Appendix A.6-3-9). French participants have the highest proportion of reciprocal voting, followed closely by German and Portuguese participants. Greek participants have proportionally the least participants with reciprocal voting.

The figure below show the relation between ‘reciprocal voting’ and overharvesting and voting. Here, I use the per round variable for ‘reciprocal voting’ and for the dependent variables. One can see that in participant-rounds, where deals are always complied with (‘1’), or at medium level, there is proportionally more overharvesting. This is similar to when I use the aggregate variable for ‘reciprocal voting’ (see Appendix A.6-3-10).

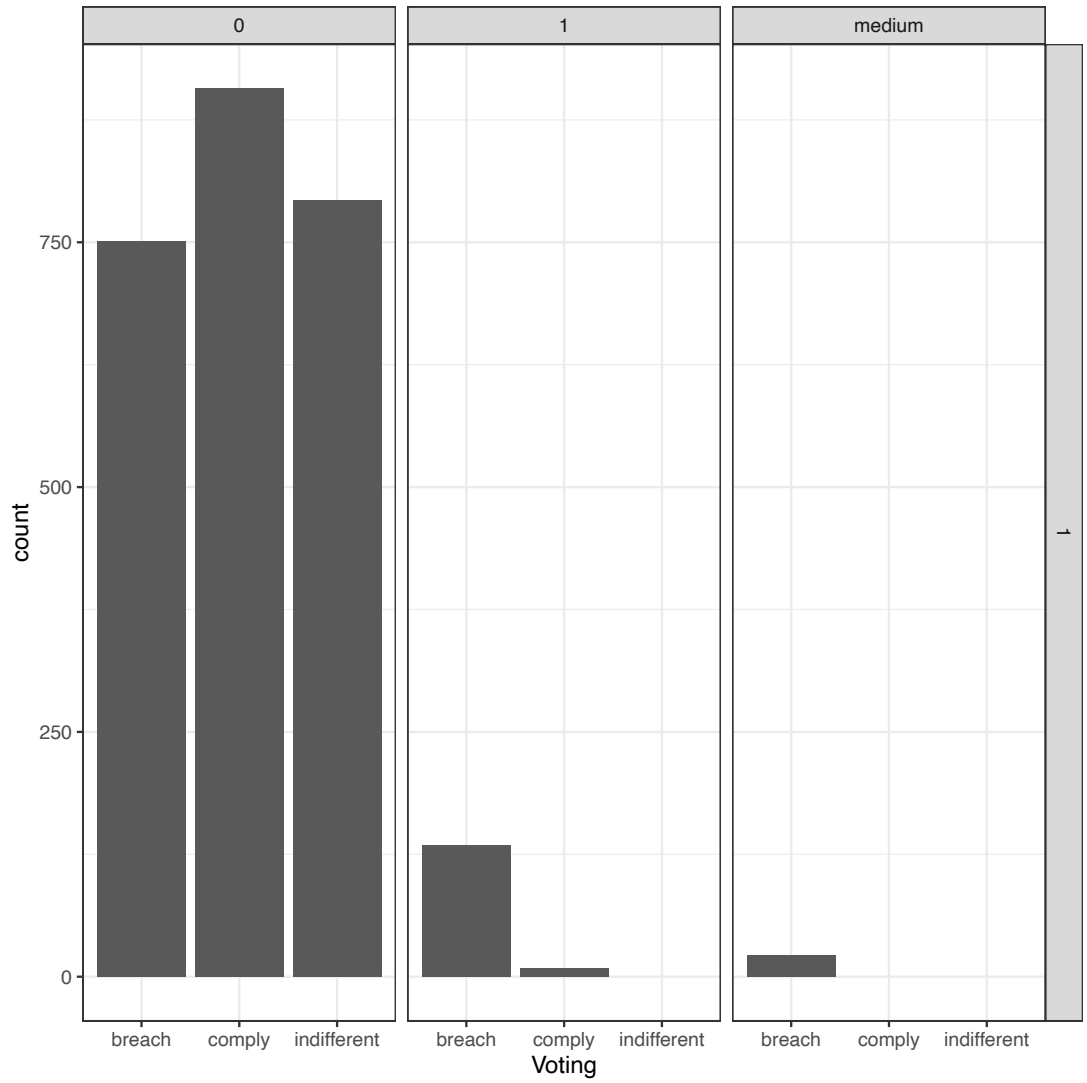
Figure A.6-1-80: Reciprocal voting and overharvesting – per round.



Source: own calculation. The y-axis shows the proportion of participant-rounds per reciprocal voting type in which overharvesting (‘1’) or no overharvesting (’0’) took place (‘TotelDef00_perR_c’).

Similarly, one can see that in those participant-rounds where deals were always complied with (‘1’), or at medium level, there is proportionally more voting incorrectly – despite the fact that the absolute numbers are rather low. In contrast, voting correctly happens proportionally more often in participant-rounds where there were no complied deals. The picture is similar for the aggregate ‘reciprocal voting’ type (see Appendix A.6-3-11). The differences are remarkable, but maybe I am missing an additional effect.

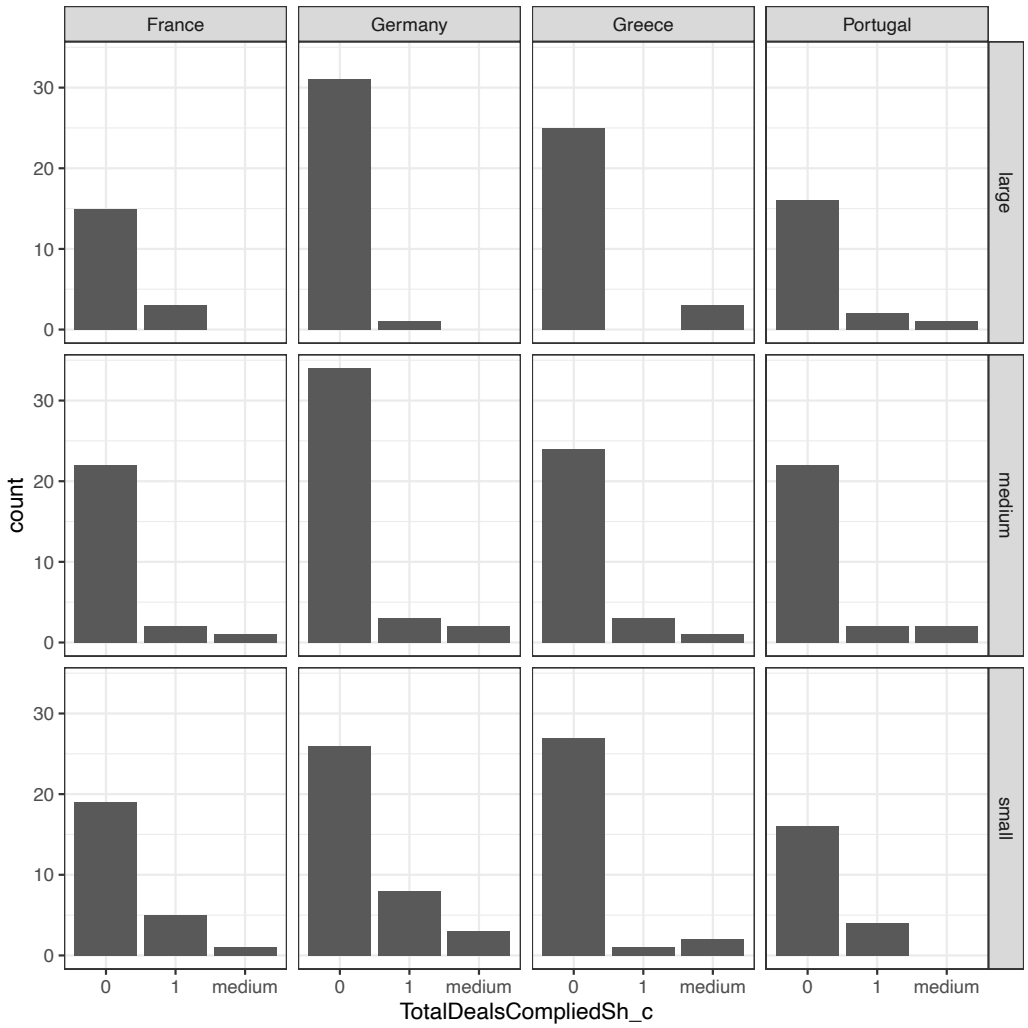
Figure A.6-1-81: Reciprocal voting and voting – per round.



Source: own calculation. The y-axis shows the proportion of participant-rounds per reciprocal voting type in which voting correctly ('comply'), incorrectly ('breach') or abstention ('indifferent') took place ('Voting').

The figure below shows participants per nationality, size and 'risk aversion' type as proportions per block. One can see that the absolute numbers are similar for all French participants, with proportionally slightly more small participants with fully complied deals. Secondly, it is remarkable that only a few large German participants belong to fully complied deals, and none to 'medium'. In contrast, proportionally more small German participants seal and comply with deals. For small and large Greek participants, there are proportionally fewer full and more medium complied deals. For medium Portuguese, there are more medium and for small Portuguese, more fully complied deals. The highest proportion of fully complied deals can be found among small German and Portuguese participants.

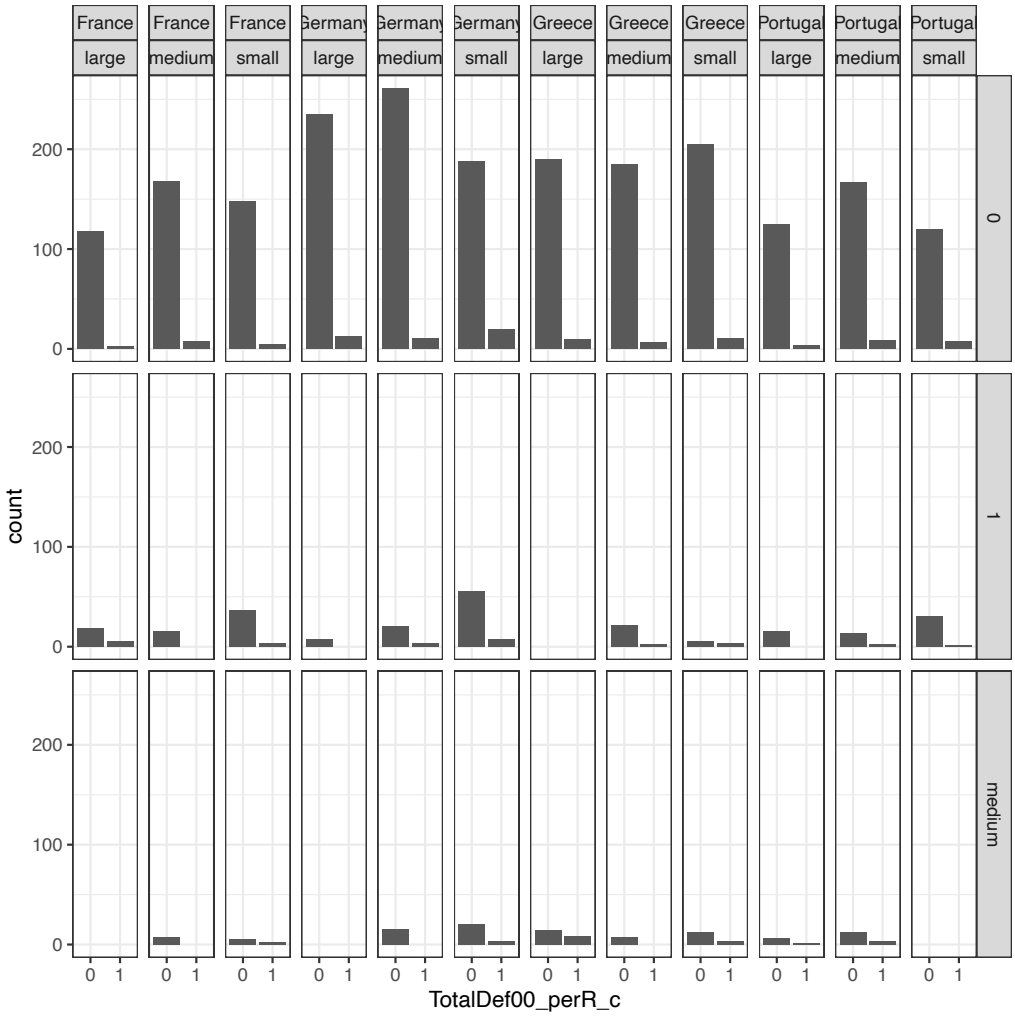
Figure A.6-1-82: Reciprocal voting, nationality and size – total.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants that always sealed and complied to deals ('1'), not at all ('0') or sometimes ('medium') over the course of the entire game ('TotelDealsCompliedSh_c').

The figures below show that the relation between 'reciprocal voting' and rule compliance is different per nationality and size. I use the aggregate variable for 'reciprocal voting' and display the absolute numbers (not the proportion) per block because there are only a few observations. Therefore, the first row can be ignored because the large differences stem mainly from the different number of participants per country. I only look at the second and third row and compare frequencies. One can see most participant-rounds for small French, German and Portuguese participants with fully complied deals. However, the highest proportion of overharvesting can be found with large German participants with medium complied deals, and large French participants with fully complied deals.

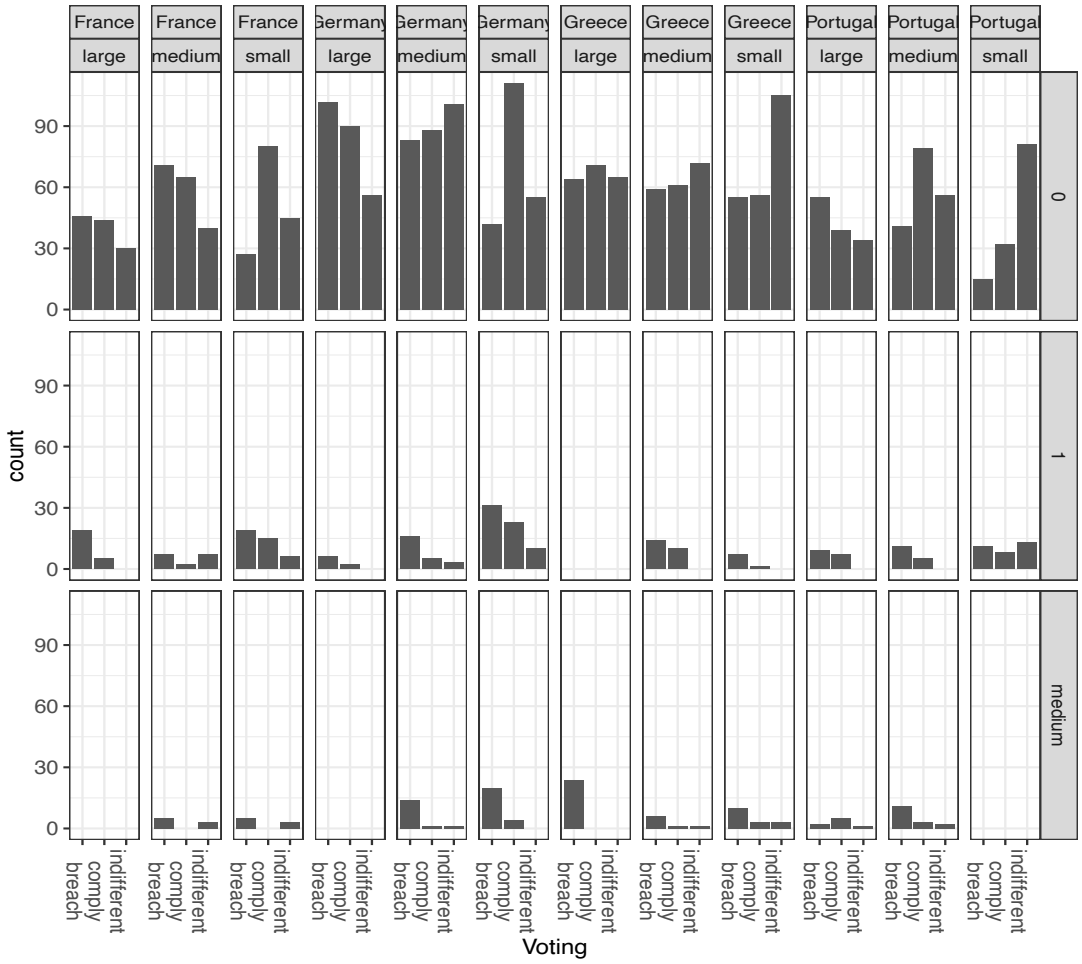
Figure A.6-1-83: Reciprocal voting and overharvesting – per nationality and size, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants that always sealed and complied to deals ('1'), not at all ('0') or sometimes ('medium') over the course of the entire game ('TotelDealsCompliedSh_c') that overharvested ('1') or not ('0') in each round ('TotelDef00_perR_c').

Similarly for voting, one has to ignore the first row. One can see most participant-rounds of breaches for small German participants with fully and medium complied deals, and large Greek participants with medium complied deals. However, one can also see that those who voted correctly most often are small German and French, medium Greek and large and small Portuguese participants with fully complied deals. One can see almost no compliance with medium complied deals, though, of which large Portuguese represent the majority.

Figure A.6-1-84: Reciprocal voting and voting – per nationality and size, per round.



Source: own calculation. The y-axis shows the proportion of e.g. 'large French' participants that always sealed and complied to deals ('1'), not at all ('0') or sometimes ('medium') over the course of the entire game that voted correctly ('comply'), incorrectly ('breach') or abstained ('indifferent') in each round ('Voting').

In conclusion, I will use 'reciprocal voting' as an independent variable. Moreover, the above analysis supports the idea of using a variable that combines nationality and size.

A.6-1.3.6 Summary

Summarising all the analyses above shows that the construction of the suggested typologies is meaningful and efficient, i.e., that there are sufficient observations per category to meaningfully interpret correlations. The only variable where there are few observations is 'reciprocal voting'. I will keep this in mind for the analyses. The tables below summarise the different correlations between a typology and breaching the rules (i.e., overharvesting and voting incorrectly) across sizes and nationalities. It reflects, per cell, whether one can see more or less breaching than the average level, i.e., as if I

did not take the treatments 'size' and 'nationality' into account. Red '+' means that one can see more breaching and a green '-' means that one can see less. Here, I do not consider compliance separately, but count it together with 'indifferent'. The summary shows that the distinction of the two treatments is meaningful and justified. Even though for some cases one can see coherent sets of '-' or '+', such as for medium French and Greek and large German participants for overharvesting (all green), none of them behaves coherently, also with regard to 'voting incorrectly'. There is always a mixture between red and green, and grey, too (i.e., no significant divergence).

Table A.6-1-85: Divergence from the general level of breaching (overharvesting) – by typologies, size and nationality.

	France			Germany			Greece			Portugal		
Typologies	**L**	**M**	**S**	**L**	**M**	**S**	**L**	**M**	**S**	**L**	**M**	**S**
Investment type		–	+	–	+	–			+		+	–
Risk aversion type	+	–				+		–		–	–	
Sustainable type	–		+	–	+	–		–	–		+	–
Co-operation type	+	–	+	–	+		–	–	+	+	–	
Reciprocal voting		–	+	–		–	+	–	+		+	–

Source: own calculation. L: large, M: medium, S: small; +/- means more/less breaching (i.e., overharvesting and voting incorrectly), when comparing the proportion of breach' of each cell with the average proportion across all sizes and nationalities, as if I make no distinction by size and nationality.

Table A.6-1-86: Divergence from the general level of breaching (voting incorrectly) – by typologies, size and nationality.

	France			Germany			Greece			Portugal		
Typologies	**L**	**M**	**S**	**L**	**M**	**S**	**L**	**M**	**S**	**L**	**M**	**S**
Investment type	–	+		–	–		+		–	–		+
Risk aversion type	+	+		–	+	–					–	–
Sustainable type	–		+	+		–	–	+		+		–
Co-operation type	+	+		–	–				+	–	–	+
Reciprocal voting			+	–	+	+	+				+	+

Source: own calculation. L: large, M: medium, S: small; +/- means more/less breaching (i.e., overharvesting and voting incorrectly), when comparing the proportion of 'breach' of each cell with the average proportion across all sizes and nationalities, as if I make no distinction by size and nationality.

As shown above, I cannot generalise across sizes or nationalities. I cannot conclude that it is small participants or Portuguese participants, in general, that drive breaches. Instead, I need to account for the combination of both variables.

Finally, there are a number of additional variables that are used in the analyses. The variable 'happiness points' shows the total number of energy points invested in 'happiness points'. This variable serves as an alternative option to avoid overharvesting, and does not have a conceptual meaning. These energy points have not been allocated to harvesting apples. Similarly, the variable 'energy points' is only used for descriptive statistics to show a participant's wealth. It is not used for regressions, as it is endogenous and already reflected in all other independent variables, since energy points are needed for all cultivation options. Participants can use spare energy points for 'happiness points' so that they do not get lost, or are otherwise tempted to use them for harvesting which they would not have done otherwise. By game design, the purchase of buckets is not related to an economic ideology, but rather symbolises good public administration as a bucket facilitates harvesting. For similar reasons as for 'happiness points', investing in a bucket might also serve as an exit option to undesired harvesting. Therefore, I will check whether it makes sense to include it as a control variable in the analyses.

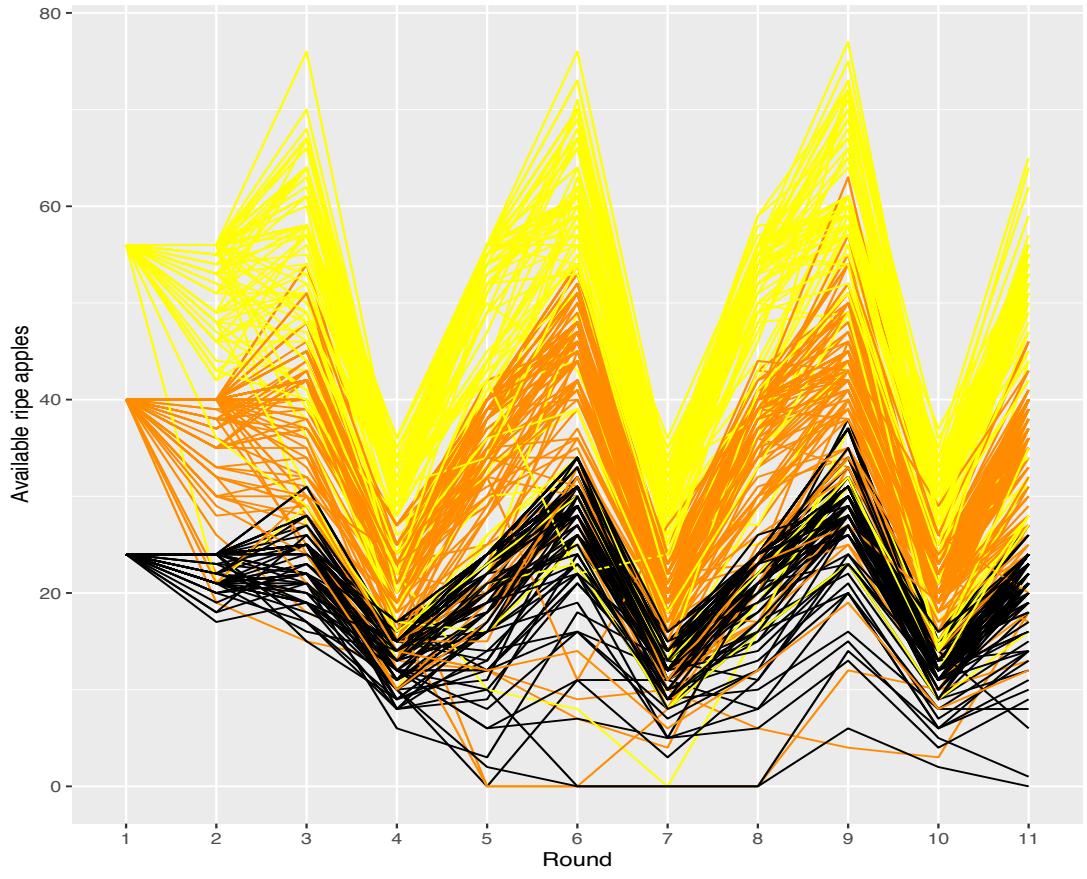
The correlation table (Table 6.1-5 in Section 6.1.3 in the body of the thesis) shows that there is some indication that the cultivation strategy could indeed play a role for rule compliance. One can see that risk-averse investing, sustainable harvesting, as well as co-operative behaviour and reciprocal voting correlate with overharvesting. On the other hand, there is indication that the investment type correlates with voting correctly. Once can also find some indication that the treatments 'nationality' and 'business cycle' play a role. Moreover, the two control variables, 'international' and 'trees', correlate. The latter is in fact good news as it shows that participants managed to formulate a goal and to implement it in their voting behaviour – if they were unable to implement it in their cultivation behaviour. We assume that it is those participants that drive the correlation. This is because I can also find indication that 'trees' correlate with the investment type and sustainable harvesting. The variable 'international' is a little trickier. It also correlates with the treatment 'nationality', which could take up some explanatory power. 'Age' appears to be an important control variable to account for non-measured and potentially hidden effects of age-related inexperience with

economic decisions and co-operation. This might also explain some correlations stemming from ‘capital’ and ‘international’. Because of the correlations, I might need to consider dropping the variables for ‘happiness points’ and ‘bucket’ in the analyses, so as not to distort the effect of the investment type.

A.6-1.4 Does the game work as intended?

The number of available ripe apples at the beginning of a round also reflects well the business cycles and the fact that the game works. At the top of the set of curves, one can see a slight increase across cycles, reflecting the natural growth rate. In turn, at the lower ends of the sets, one can see that harvesting small apples results in having few ripe apples and this is equally possible for all sizes of farmers.

Figure A.6-1-87: Number of available ripe apples at the beginning of a round.

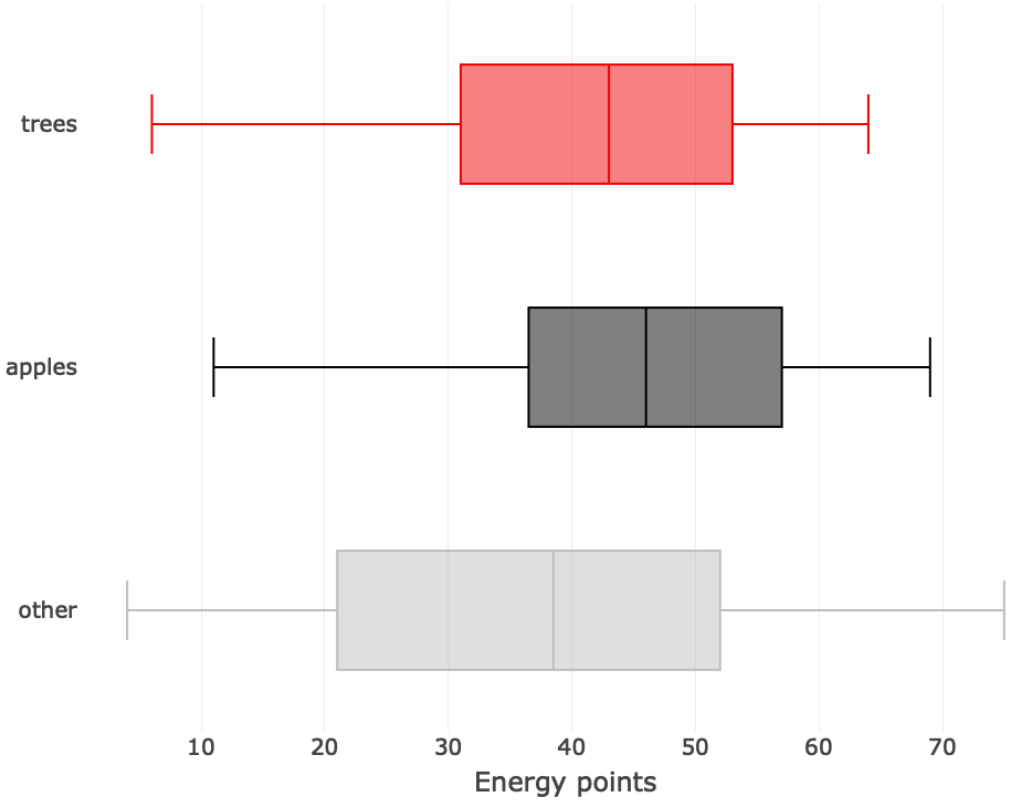


Source: own calculation.

Moreover, the game also works as intended because participants manage to follow their goal or, more specifically, their different playing reflects differently in economic

success. One can measure economic success by looking at a participant's wealth, i.e., the total number of energy points collected during the game, and the 'economy's' wealth, i.e., the total number of ripe apples that are available on the participant's trees (own and shared) throughout the game. Given the self-stated goal (see figure below), one can see that the game's design allows participants to play differently according to their taste. While collected energy points differ as expected across the main goals 'trees' and 'apples', the number of available apples (see Appendix A.6-1.4) is similar and shows that the game's design manages to keep both goals at comparable levels. It is not a one-or-the-other cultivation strategy that is more successful in principle, but it is up to the participant to use harvesting and investing options.

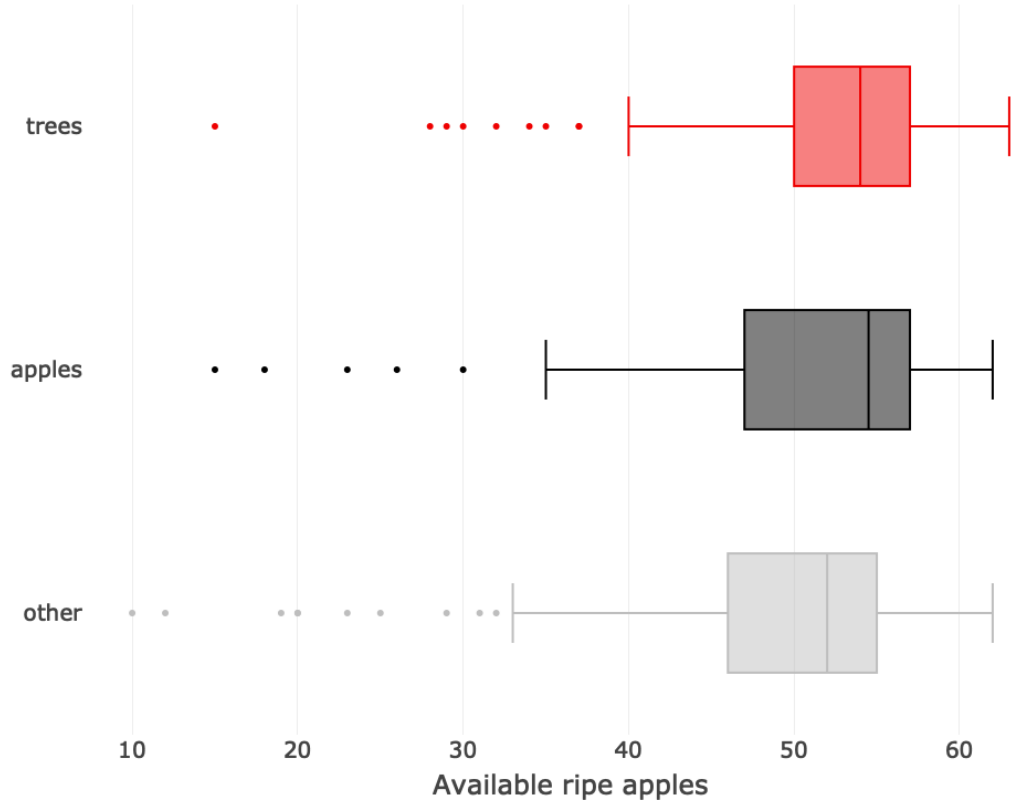
Figure 6.1-88a: Total number of energy points – per goal.



Source: own calculation. Energy points are size-adjusted. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

The number of available apples is similar and shows that the game's design manages to keep both at comparable levels of economic success.

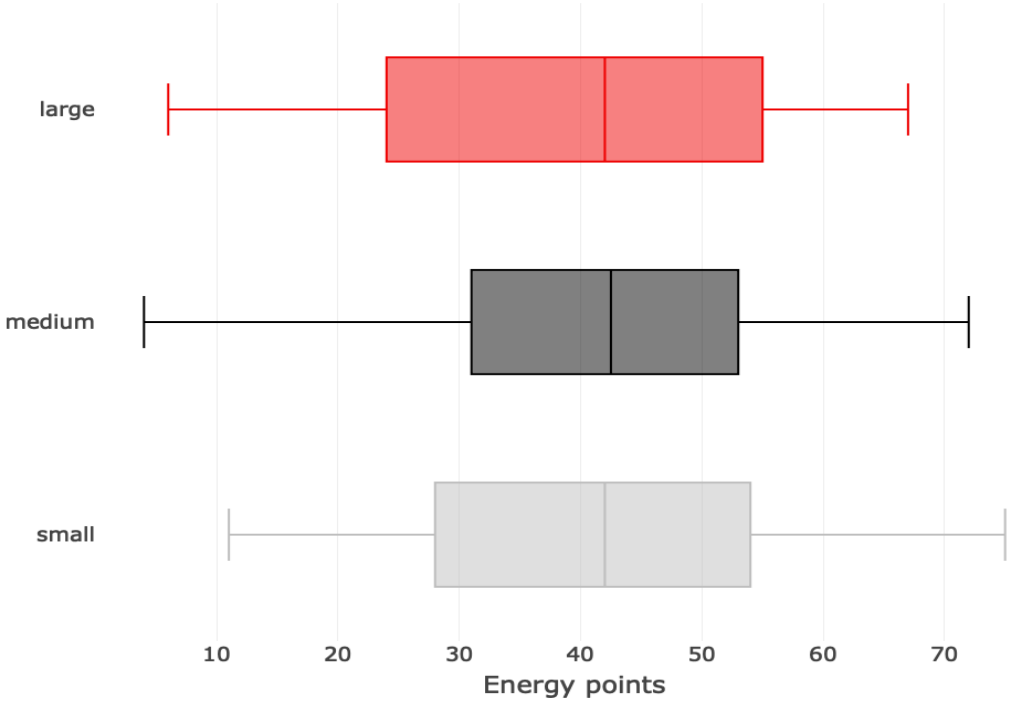
Figure A.6-1-88b: Total number of available ripe apples – per goal.



Source: own calculation. The number of available ripe apples is size-adjusted. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

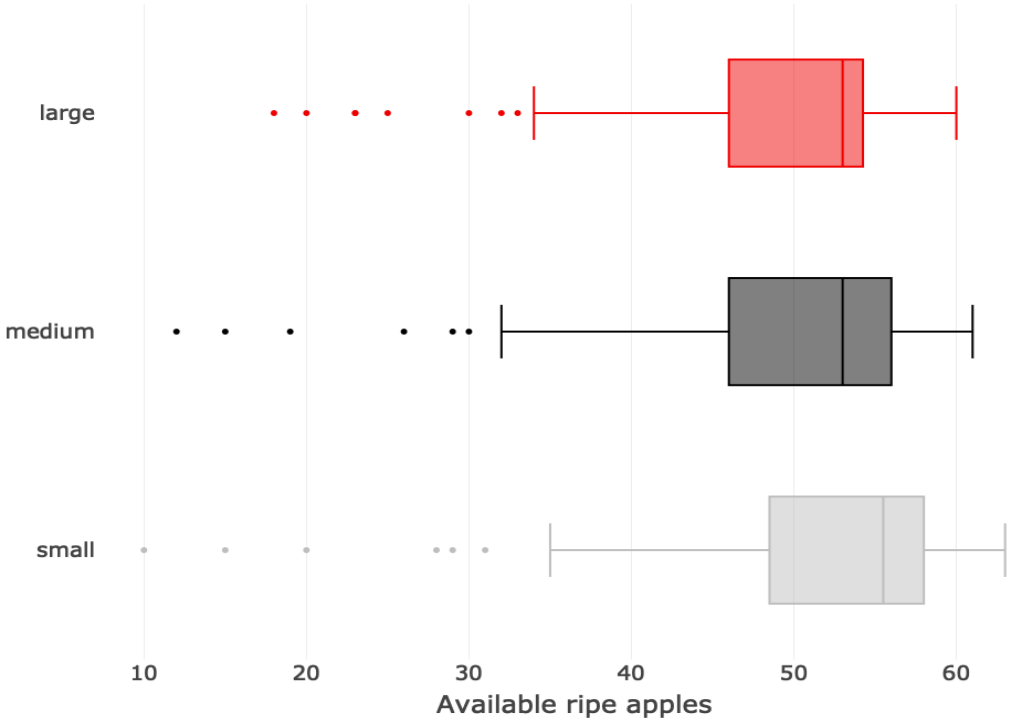
Moreover, I can check the role of treatment variables and typologies for economic success. As regards treatments, ideally, I would not see significant differences. In turn, I expect to see differences depending on the typologies, which reflect personal preferences. Firstly, as regards treatments, the business cycle is endogenous and affects all participants in the same way. As the figure above shows, in general, the number of available ripe apples goes down in bust rounds and increases during recovery to reach a peak in boom rounds. As regards the treatment variable 'size', all output variables are size-adjusted to enable comparisons across all farmers. Nonetheless, I can check whether there is an impact on both wealth indicators. As the two figures below show, I cannot see a systematic effect of size on economic success. Both observations support the plausibility of the game's design.

Figure A.6-1-89: Total number of energy points – per size of a farmer.



Source: own calculation. Energy points are size-adjusted. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

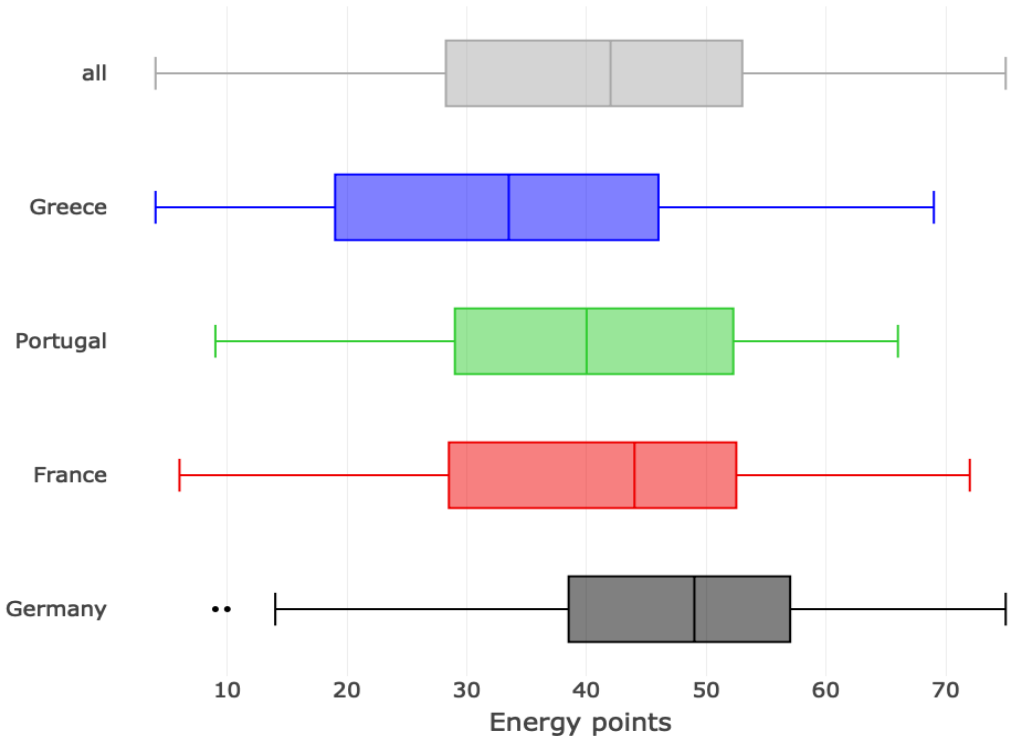
Figure A.6-1-90: Total number of available ripe apples – per size of a farmer.



Source: own calculation. The number of available ripe apples is size-adjusted. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

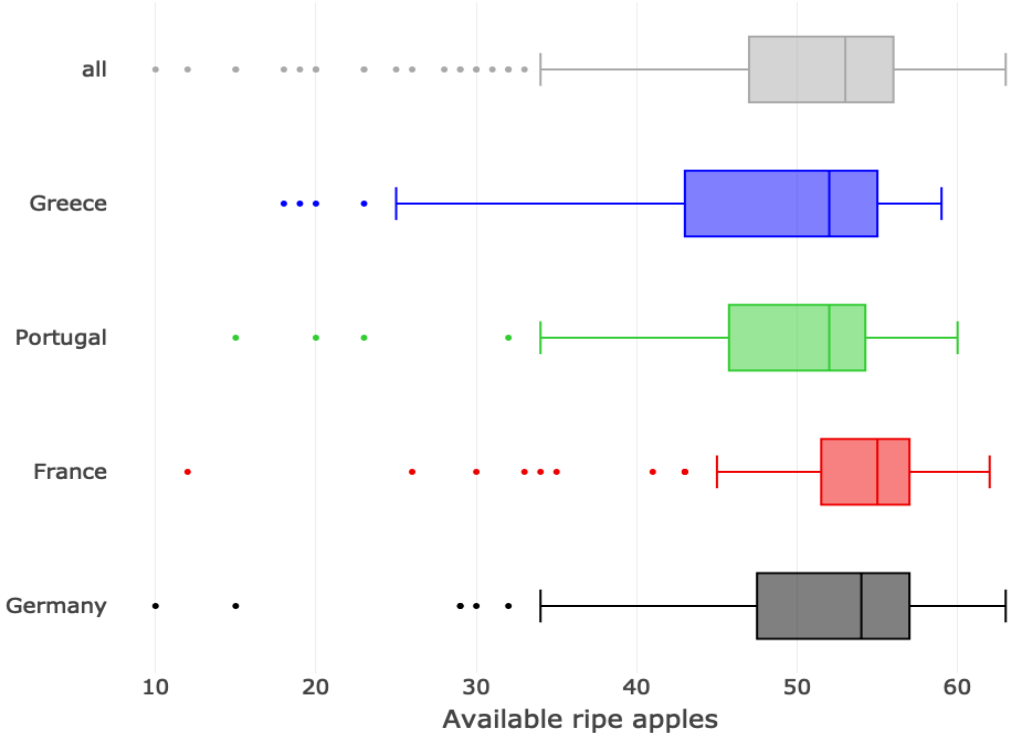
Turning to the treatment variable ‘nationality’, one can see quite different patterns. The median German collects 49 size-adjusted energy points over the course of the game; the median French, 44; the median Portuguese, 40; and the median Greek, 33.5. The difference is quite large, with 16 units on a scale ranging from 3 to 75 units. In contrast, the number of available ripe apples (see Appendix A.6-1.4) is rather similar with the median standing at 55 units for French, 54 for Germans and 52 for Greeks and Portuguese participants. This shows that a participant’s wealth differs across nationalities while the field’s wealth remains at relatively comparable levels. This is interesting as one could have expected that both wealth developments are linked. In that regard, one could conclude that Greeks are in fact the smartest turning relatively few harvested energy points into many available ripe apples. However, this simple conclusion is not likely the case and we will investigate further during the analyses. From the game design, we know that what reduces the number of available ripe apples is weather events and harvesting small apples. Investing in manure and beekeepers increases the number in the short-run, and investing in water-irrigation systems reduces weather effects. Therefore, one could expect investments to play a role.

Figure 6.1-91a: Total number of energy points – per nationality.



Source: own calculation. Energy points are size-adjusted. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line’s ends shows the minimum and the maximum.

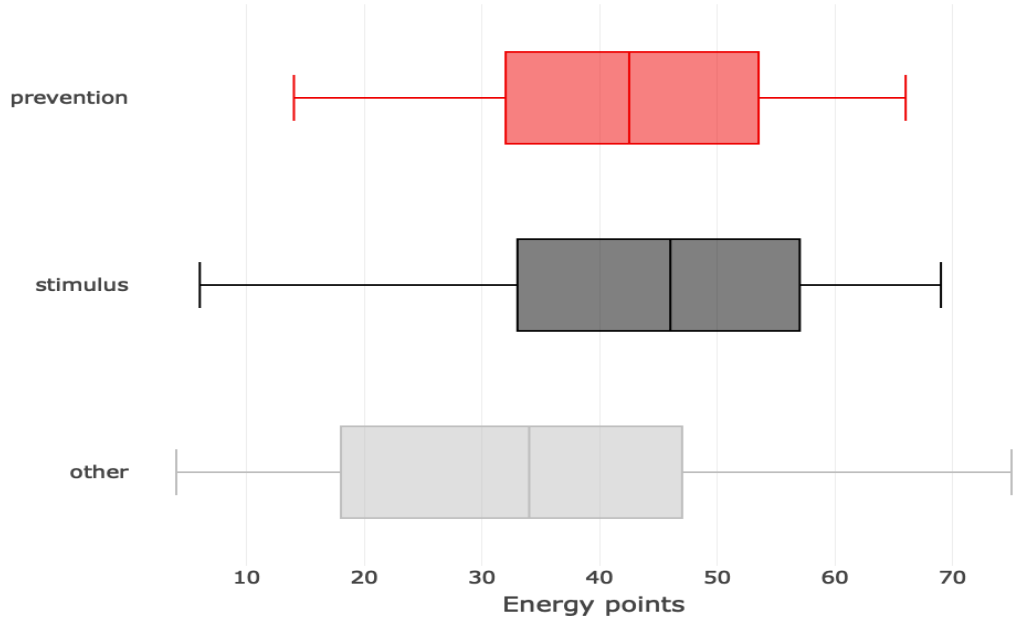
Figure A.6-1-91b: Total number of available ripe apples – per nationality.



Source: own calculation. The number of available ripe apples is size-adjusted. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

Turning to the typologies, the graph below shows that the investment type reflects different economic output. In particular, it shows that following any investment strategy at all leads to higher output. Those who have not invested at all or similarly in both 'stimulus' and 'prevention' items, managed to collect, at median levels, 9 fewer units. The difference is not as large for the number of available ripe apples (see Appendix A.6-1.4), however, it goes in the same direction: on average, 'stimulus'-oriented participants collect most energy points, while 'prevention'-oriented participants have fields with the most ripe apples.

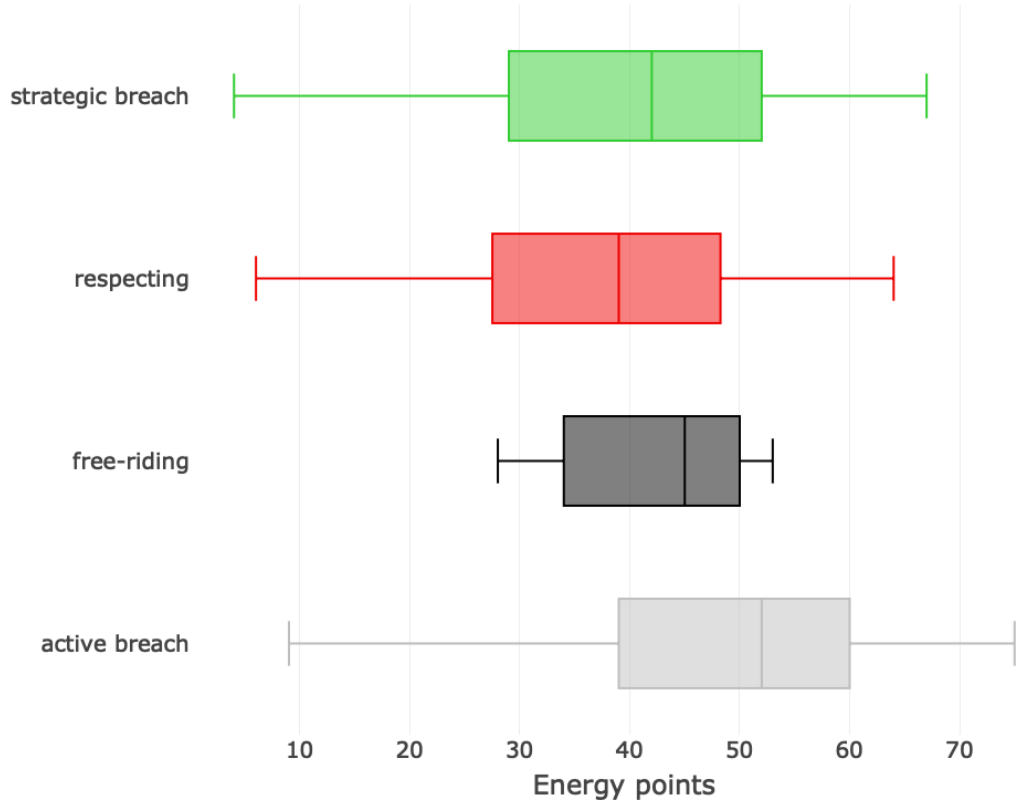
Figure 6.1-92: Total number of energy points – per investment type.



Source: own calculation. Energy points are size-adjusted. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

Rule behaviour also makes a difference for economic output. Those who breach the voting rules, and overharvest on shared trees, are economically the most successful. This is remarkable as I would only expect harvesting to play a role given the higher numbers of apples collected therewith, but I would not expect a direct link to voting rules. Those who never overharvest throughout the game (i.e., 'strategic breach' and 'respecting') manage to collect, at median levels, at least 10 units fewer than those who breach both rules ('active breach'). The figure for available ripe apples (see Appendix A.6-1.2.2) is even more nuanced.

Figure 6.1-93a: Total number of energy points – per rule behaviour type.

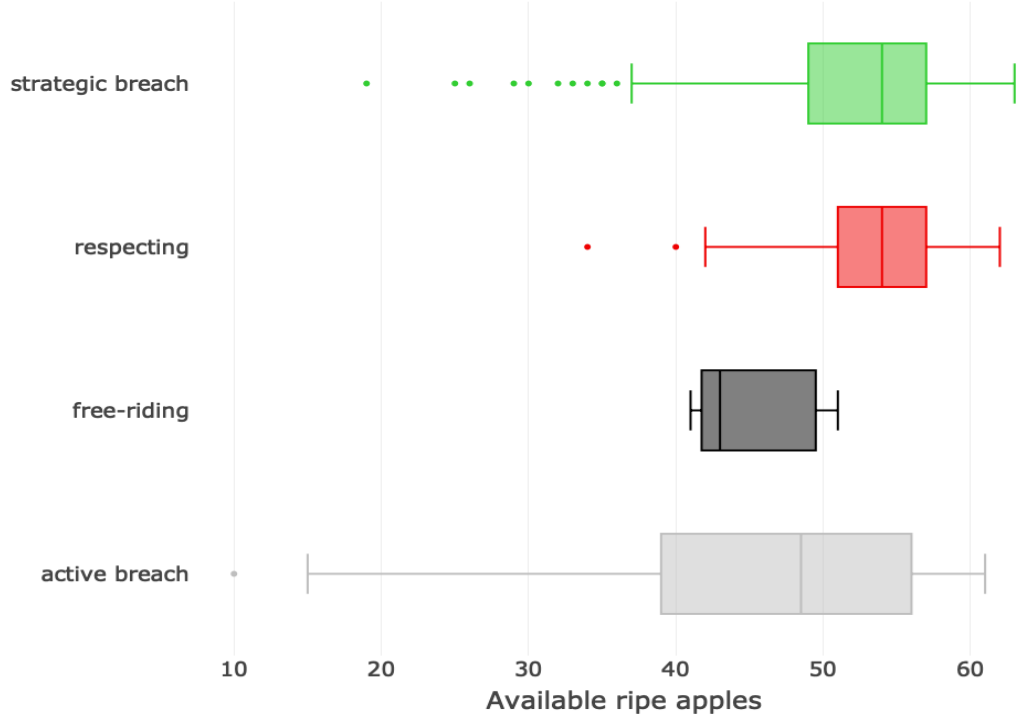


Source: own calculation. Energy points are size-adjusted. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

The figure for available ripe apples is even more nuanced. Those who never overharvest throughout the game have at median 6 units more on their trees. The graph for 'free-riding' shows that those who overharvest also tend to take from small apples, which in turn cannot ripen. Here, people following 'active breach' are somewhat in the middle, and the category is wide-spread in contrast to the more concise 'other' categories on the upper end of economic success. This suggests that breaching the rules could be considered a response to a poorly-performing economy.

All of this supports the game's design, showing that it works in the intended way. Moreover, the graphs provide indications that the chosen variables matter for the individual's game playing.

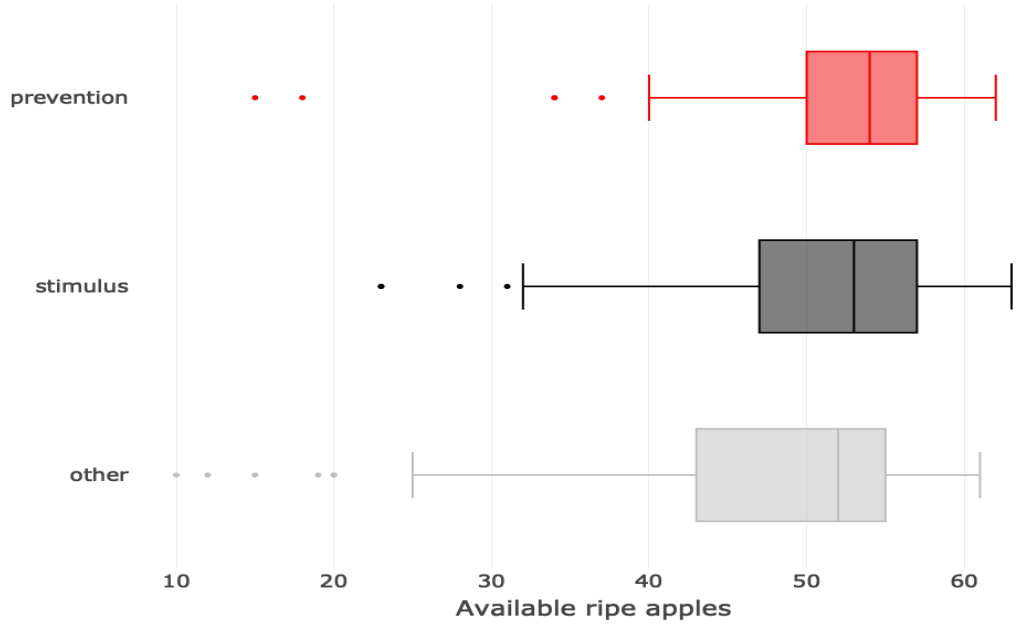
Figure A.6-1-93b: Total number of available ripe apples – per rule behaviour type.



Source: own calculation. The number of available ripe apples is size-adjusted. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

The investment type per number of available ripe apples is displayed below.

Figure A.6-1-94: Total number of available ripe apples – per investment type.



Source: own calculation. The number of available ripe apples is size-adjusted. The boxplot shows the median as a vertical line in the box; the box represents 50% of the sample (within the first and the third quantile) and the line's ends shows the minimum and the maximum.

A.6-2 Empirical analyses

I sequentially built the regression models to see how the variables behave by first adding the control variables for the null model, then treatments, cultivation behaviour, co-operation strategy and Stage 1 or Stage 2 compliance. I proceeded stepwise as suggested by Hox (2010, cited from Krause and Urban 2013). Accordingly, I started with the null model and sequentially added parameters. In order to compare the models, Krause and Urban suggest using a likelihood-ratio test, which compares the deviance of the models. I analysed the used variables by checking for their statistical significance (p-values or 'stars') and comparing the goodness-of-fit of the models.

A.6-2.1 Overharvesting

A.6-2.1.1 Regression tables

The tables below provide the sequential building of the model. The first model is the null model, where I have a dummy variable for each round with round 4 as basis and all control variables[16]. One can already see the effect of 'bust' rounds as all dummies, except the one for Round 10, are negative and significant. This means that overharvesting happens less often in these rounds than in Round 4. Round 10 is also a bust round and is, therefore, similar to Round 4. Round 7 has a significant negative effect, but a smaller one than the other 'recovery' and 'boom' rounds. One can also see that of all control variables, only 'age' and 'capital' are statistically significant, and this is the case in all six models. They also have very similar magnitude across the six models, which shows that there is no interference with the other variables.

Model 1 adds all treatment variables and substitutes the round-dummies with the variable 'BusinessCycle'. Now one can see that the rounds 'bust' and 'recovery' have a positive effect on overharvesting. One can also see that neither 'size' nor 'nationality' are statistically significant, which remains across all models.

Model 2 adds the bare investment rate, 'happiness points' and the purchase of 'buckets'. The statistically significant effect for the investment rate shows that

16 Following Urban and Krause (2013:31), I do not use an intercept only model, but one with rounds that refer to the point in time for the observations per Id.

investing, in general, decreases the probability of overharvesting. This means that any engagement in cultivation has a positive effect on respecting the rules to safeguard the common-pool resource. In contrast, the purchase of 'buckets' has a positive effect on overharvesting. The explanation could be that a bucket facilitates harvesting and reduces its costs, i.e., makes it more efficient and, hence, easier to use. 'Happiness points' have no significant effect.

Now I start including typologies. Model 21 adds cultivation typologies and I remove 'happiness points' and 'bucket' because of correlations with the investment type. At first sight, I can see that the 'stimulus'-oriented investment type has a positive effect on overharvesting as expected by the hypothesis. However, this effect temporarily loses significance in some of the following models. I do not see any statistically significant effect of the 'prevention' type. Moreover, I do not see an effect of the 'risk aversion' typology. Instead, I see a strong negative effect of 'sustainable', which also remains in the other models. This is consistent with the hypothesis.

Model 3 adds the 'co-operative' type on shared trees, which – in comparison to the 'exploiting' type – has a positive effect on overharvesting. This could be explained by the fact that such participants might consider themselves to have the 'right' to overharvest, as they also invest in shared trees and, hence, contribute to the maintenance and improvement of the common-pool resource. Models 3 and 31 add to the aggregate level of 'reciprocal voting' and the per round level, respectively. Both show statistically significant, with a positive effect on overharvesting as expected by the hypothesis. I continue with the aggregate level of reciprocal voting because conceptually, it is rather obvious that overharvesting in a specific round implies sealing deals in that very round. Therefore, the aggregate variable is more meaningful. Moreover, comparing the models' fit, the one with the aggregate variable has slightly less deviance (AIC).

Models 4 and 41 add rule compliance as aggregate and as per round variable, respectively. The per round variable does not show a significant effect. In contrast, the aggregate variable shows a significant negative effect on overharvesting for participants who complied all across the game, compared to the baseline 'indifferent'. Therefore, I continue to use the aggregate variable.

Model 5 is the same as Model 41, but without the control variables that are neither statistically significant nor have a significant magnitude. I do this in order to reduce the number of independent variables before I compute interactions, which create more dummy variables. The idea is to increase the number of degrees of freedom and not to over-specify the model. Ideally, of course, I would also keep such controls because conceptually they are important, and statistically, they play a role as I have seen for the variables for the investment type, the co-operation type and voting correctly, which temporarily change their significance[17]. However, one can see that the error terms and coefficients of the other variables do not change much, which is reassuring that the control variables were not taking over variation from other variables and, hence, can safely be dropped.

17 I checked and there is no remarkable difference between the coefficients of the final Model 61 and a version of Model 61 with all control variables. The latter model has more deviance.

Table A.6-2-1: Overharvesting per round – models null to 41.

	Dependent variable:						
	Overharvesting perR						
	(0)	(1)	(2)	(21)	(3)	(31)	(4)	(41)
factor(Round)5	-0.7079**							
	(0.3361)							
factor(Round)6	-1.5598***							
	(0.4036)							
factor(Round)7	-0.8462**							
	(0.3448)							
factor(Round)8	-1.3484***							
	(0.3835)							
factor(Round)9	-1.8073***							
	(0.4306)							
factor(Round)10	-0.1418							
	(0.3077)							
factor(Round)11	-1.0777***							
	(0.3612)							
Sizemedium		0.2004	0.1527	0.2022	0.0988	0.1946	0.1226	0.1443
		(0.4082)	(0.3978)	(0.4116)	(0.4030)	(0.3977)	(0.4011)	(0.4048)
Sizesmall		0.4986	0.3712	0.4306	0.1788	0.3824	0.1859	0.2450
		(0.3986)	(0.3880)	(0.4097)	(0.4120)	(0.3992)	(0.4115)	(0.4171)
NationalityGermany		0.6857	0.5217	0.6581	0.7321	0.6895	0.7652*	0.7504
		(0.4677)	(0.4562)	(0.4668)	(0.4642)	(0.4560)	(0.4630)	(0.4644)
NationalityGreece		0.4806	0.3381	0.2462	0.1339	0.1880	0.1621	0.1422
		(0.4980)	(0.4889)	(0.4997)	(0.4975)	(0.4872)	(0.4942)	(0.4975)
NationalityPortugal		-0.1338	-0.1481	-0.1505	0.0173	0.0192	0.0305	0.0367
		(0.5320)	(0.5139)	(0.5316)	(0.5272)	(0.5183)	(0.5234)	(0.5272)

BusinessCyclebust	1.3717***	1.3715***	1.3670***	1.3659***	1.3298***	1.3712***	1.3417***
	(0.2850)	(0.2849)	(0.2846)	(0.2845)	(0.2847)	(0.2850)	(0.2908)
BusinessCyclerecovery	0.6496**	0.6528**	0.6439**	0.6393**	0.6075**	0.6400**	0.6101**
	(0.2970)	(0.2969)	(0.2966)	(0.2966)	(0.2974)	(0.2970)	(0.3039)
InvestmentRate		-5.0426***					
		(1.4400)					
HappinessPoints		-0.0714					
		(0.0446)					
Bucket		1.0487***					
		(0.3759)					
InvestmentTypeprevention			0.1595	-0.3557	-0.1914	-0.2648	-0.3360
			(0.4425)	(0.4584)	(0.4453)	(0.4570)	(0.4586)
InvestmentTypestimulus			0.7173*	0.3965	0.4180	0.4651	0.4276
			(0.4163)	(0.4279)	(0.4216)	(0.4275)	(0.4290)
RiskAversionrisk-averse			-0.3878	-0.3624	-0.3503	-0.3649	-0.3309
			(0.3694)	(0.3628)	(0.3565)	(0.3608)	(0.3627)
RiskAversionrisk-taking			0.1068	-0.0459	0.0283	-0.0858	-0.0325
			(0.4880)	(0.4875)	(0.4756)	(0.4841)	(0.4868)
Sustainable1			-0.9581**	-1.1626**	-1.0711**	-1.2185***	-1.1691**
			(0.4495)	(0.4553)	(0.4425)	(0.4549)	(0.4557)
Cooperationco-operative				0.5999*	0.5921*	0.6250*	0.6002*
				(0.3450)	(0.3389)	(0.3429)	(0.3446)
ReciprocalVoting				1.4237***		1.3979***	1.3668***
				(0.4301)		(0.4478)	(0.4429)
ReciprocalVotingR					1.1223***		
					(0.3864)		
VotingT_rcomply						-1.1631*	
						(0.6375)	
VotingT_rbreach						-0.3871	
						(0.4437)	

Votingrcomply								-0.0204
								(0.3380)
Votingrbreach								0.1634
								(0.3287)
International1	0.1220	0.0848	0.0618	0.2004	-0.0513	0.0953	-0.0105	-0.0452
	(0.3364)	(0.3476)	(0.3399)	(0.3461)	(0.3455)	(0.3360)	(0.3459)	(0.3470)
EconomicsEconomics	0.3428	0.5398	0.5962	0.3706	0.4020	0.3669	0.5395	0.4316
	(0.4309)	(0.4350)	(0.4266)	(0.4410)	(0.4398)	(0.4299)	(0.4451)	(0.4415)
EconomicsSocSci	-0.5286	-0.5268	-0.4140	-0.5716	-0.4036	-0.4873	-0.3528	-0.3655
	(0.4793)	(0.4697)	(0.4597)	(0.4720)	(0.4699)	(0.4585)	(0.4688)	(0.4698)
PolSpec	0.0003	0.0338	0.0087	-0.0189	-0.0049	-0.0097	0.0057	0.0045
	(0.1396)	(0.1391)	(0.1360)	(0.1405)	(0.1399)	(0.1372)	(0.1385)	(0.1397)
TreesApples	0.7092	0.6107	0.6956	0.5873	0.5150	0.5441	0.5310	0.5207
	(0.4403)	(0.4408)	(0.4360)	(0.4553)	(0.4498)	(0.4419)	(0.4502)	(0.4493)
TreesTrees	-0.0672	-0.1024	0.2024	-0.0441	-0.1189	-0.0904	-0.0570	-0.1126
	(0.3645)	(0.3682)	(0.3792)	(0.3819)	(0.3785)	(0.3723)	(0.3861)	(0.3807)
Male	0.2671	0.2501	0.1265	0.2506	0.3437	0.3597	0.3800	0.3664
	(0.3390)	(0.3304)	(0.3220)	(0.3304)	(0.3275)	(0.3218)	(0.3256)	(0.3275)
Age	-0.0626**	-0.0761**	-0.0714**	-0.0760**	-0.0592*	-0.0653**	-0.0568*	-0.0556*
	(0.0314)	(0.0321)	(0.0309)	(0.0320)	(0.0307)	(0.0307)	(0.0304)	(0.0304)
Capital1	-1.2629***	-1.1497**	-1.0964**	-1.1983***	-1.3254***	-1.2673***	-1.3171***	-1.2867***
	(0.4695)	(0.4599)	(0.4440)	(0.4546)	(0.4516)	(0.4428)	(0.4499)	(0.4507)
Constant	-0.9200	-2.9562***	-1.3305	-2.6524**	-2.9806***	-2.9197**	-2.8805**	-3.2749***
	(1.0642)	(1.1241)	(1.1876)	(1.1695)	(1.1483)	(1.1345)	(1.1634)	(1.1640)
Observations	2,616	2,616	2,616	2,616	2,616	2,616	2,616	2,616
Log Likelihood	-490.1192	-492.4225	-484.4258	-486.7689	-479.3408	-480.9908	-477.5864	-479.0503
Akaike Inf. Crit.	1,016.2380	1,020.8450	1,010.8520	1,019.5380	1,008.6820	1,011.9820	1,009.1730	1,012.1010
Bayesian Inf. Crit.	1,121.8880	1,126.4940	1,134.1090	1,154.5340	1,155.4170	1,158.7170	1,167.6470	1,170.5740

Note: *p<0.1; **p<0.05; ***p<0.01

A.6-2.1.2 Goodness-of-fit of the final models

For Model 61, the AIC, a goodness-of-fit measure, is lowest compared to the similar Model 62 and just slightly higher than the so far best AIC for model 5. Comparing models using the likelihood ratio test (Winter 2014), one can see that Model 61 is a better fit than the null model. Therefore, I continue using this model.

Figure A.6-2-2a: Likelihood ratio test for model 61.

	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
Null model	18	1016.2	1121.9	-490.12	980.24			
Model 61	30	1011.4	1187.5	-475.70	951.39	28.847	12	0.004152**

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

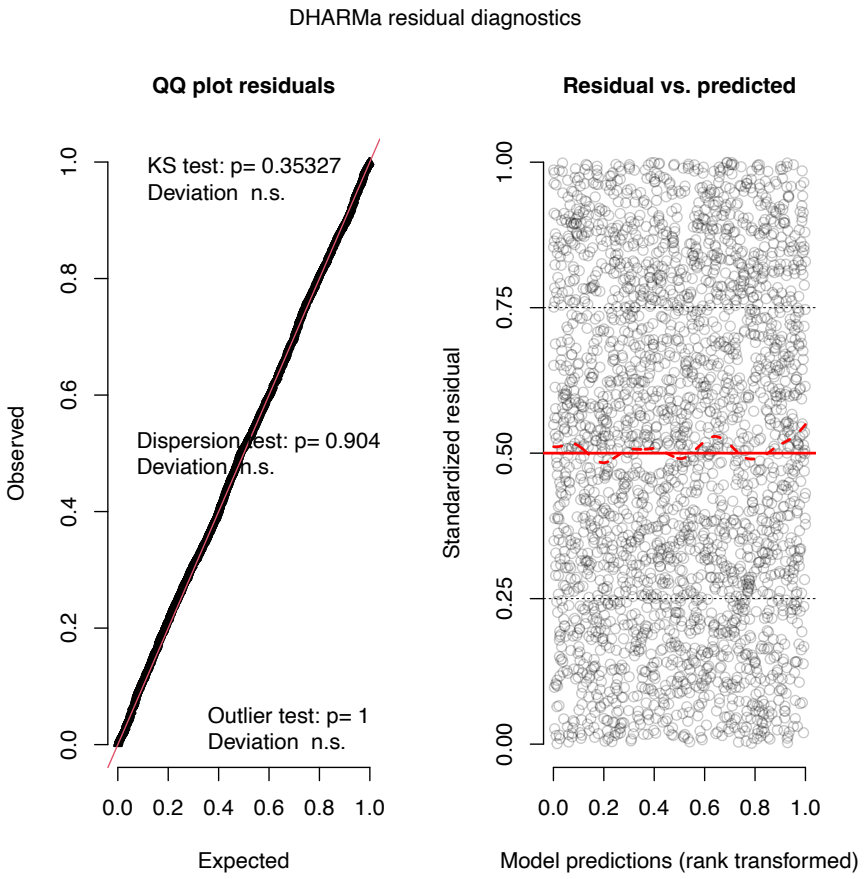
Source: own calculation using the anova() function in R.

Analysing the residual plots[18] shows that for Model 61, the residuals are normally distributed (see Q-Q plot in the figure below). However, the right-hand side plot shows that not all residuals are scattered: the solid line indicates the mean of unsystematically spread residuals, i.e., zero, deviates from the dashed line which represents the fitted values by the model[19]. I could argue that the deviation does not have a large magnitude, and that in general, the scatter plot looks rather evenly distributed. Therefore, I should not worry about heteroscedasticity, i.e., a systematic bias in residuals that would indicate a structural misfit of the model by maybe ignoring a variable or interaction. I know from the correlation table above that I do not need to worry about collinearity of independent variables. Moreover, I do not see a systematic shape of the dashed line except for the right-hand end. It looks a little like a sinus curve around the solid line with larger deviations for values closer to 1. This means that the model is similarly good (or bad) in predicting compliance, but is marginally worse in predicting breaches.

18 We follow StackExchange (2012) and use the R package DHARMa (Hartig 2021) to adjust logistic residuals to standard residuals.

19 We also see a similar picture for the null model and Model 6.

Figure A.6-2-2b: Residual diagnostics for model 61.



Source: own calculation.

One can see this when calculating correctly classified cases (see table below). While all models are very good at correctly predicting breaches (nearly 100%), they also overestimate breaches and classify as '1' where in fact there is a '0'. They correctly classify compliance only around 60% of correctly predicted cases as a share of all cases. Overall, the null model and Models 6 and 61 perform rather similarly.

Table A.6-2-3: Correctly classified cases.

		Null model			Model 6			Model 61		
		0	1	correctly classified cases	0	1	correctly classified cases	0	1	correctly classified cases
Data	0	1560	902	63%	1468	994	60%	1484	978	60%
	1	1	153	99%	0	154	100%	1	153	99%
Total correctly classified cases		65%			62%			63%		

Source: own calculation.

Remarkably, the models do not differ much. The null model already predicts nearly 100% of breaches correctly. Models 6 and 61 are not particularly better overall than the null model. However, Models 6 and 61 provide conceptually more meaningful variables. What the table shows is that all models overestimate breaches. While they correctly predict nearly all actual cases of breaches, they also predict some of the compliance cases as a breach. This indicates that one might see rather large confidence bounds for predicted probabilities for 'overharvesting' to take 0. In turn, one can be rather certain about the coefficients that show a positive effect on 'overharvesting'. This also indicates that future research could engage in understanding what variables are missing to explain compliance for the cases for which the model predicts a breach. An explanation could be that this reflects principled behaviour. Summing up, statistically Model 61 is not the ideal model, while conceptually it is.

A.6-2.1.3 Predicted probabilities

I plot predicted probabilities that overharvesting equals '1' for different levels of the respective independent variable, while keeping constant all other variables at their mean (numerical variables) or reference value (categorical variables). The table below shows these values.

Table A.6-2-4: Mean and reference values for calculating predicted probabilities.

```
            Size =         large
     Nationality =        France
    BusinessCycle =          boom
   InvestmentType =        a_none
     RiskAversion =        a_none
      Sustainable =             0
     Cooperation =  a_exploiting
ReciprocalVoting =          0.14
       VotingT_r = a_indifferent
             Age =         24.79
         Capital =             0
              Id = 0 (population-level)
```

Source: own calculation based on model 61.

A.6-2.1.4 Aggregate models

Model 7 is the full model with all control variables and no interactions. This is comparable to Model 4 from above. In Model 71, I drop all those control variables which are not significant. One can see that a few coefficients of the other variables change and temporarily lose or gain statistical significance. This changes back in the following models. However, the magnitude of the intercept (comparing coefficient

with standard error) become much better, which supports this way forward. Model 72 includes the interaction between ‘size’ and ‘nationality’, and Model 73 includes the three-way interaction with the investment type. Finally, Model 73_lin is a linear model and equivalent to Model 73. It has as dependent variable the number of rounds in which a participant overharvests during the game. One can see that similar variables are significant and this way, the model provides us with meaningful coefficients that are easily interpretable. The intercept has a significant magnitude in all but the first model. However, it is not statistically significant except in the linear Model 73_lin.

Model 73_lin shows largely similar results, with a couple of noticeable differences. The independent and control variables are similar to the ones described above except that ‘risk aversion’ is not significant anymore. ‘Voting correctly’ has a slightly significant magnitude, but is not statistically significant anymore.

Table A.6-2-5: Overharvesting at aggregate level – models 7 to 73_lin.

	Dependent variable:				
	Overharvesting perR logistic				OverharvestingTA OLS
	(7)	(71)	(72)	(73)	(73_lin)
Sizemedium	0.4669	0.3982	0.1631	0.3054	0.8707
	(0.3614)	(0.3512)	(0.8907)	(1.4934)	(0.6723)
Sizesmall	0.1260	0.0739	0.5303	-1.4924	-0.1469
	(0.3883)	(0.3803)	(0.8745)	(1.5152)	(0.5917)
NationalityGermany	0.6079	0.4761	0.4045	-1.4841	-0.1897
	(0.4430)	(0.4114)	(0.8605)	(1.4931)	(0.6298)
NationalityGreece	0.0970	0.0511	0.7065	-2.2987	-0.0079
	(0.4569)	(0.4302)	(0.8414)	(1.4350)	(0.5416)
NationalityPortugal	0.1470	0.3981	-0.1199	-18.6480	-0.3173
	(0.4733)	(0.4441)	(0.9640)	(4,023.5850)	(0.8348)
InvestmentTypeprevention	0.1482	0.2451	0.2925	-19.7096	-0.5870
	(0.4226)	(0.4040)	(0.4093)	(1,941.4890)	(0.5696)
InvestmentTypestimulus	0.8198**	1.0257***	1.0829***	-1.6937	0.3947
	(0.3968)	(0.3830)	(0.3900)	(1.6907)	(0.6393)
RiskAversionrisk-averse	-0.5827*	-0.6416**	-0.5889*	-0.8435**	-0.0974
	(0.3294)	(0.3195)	(0.3278)	(0.3712)	(0.1366)
RiskAversionrisk-taking	-0.6495	-0.6321	-0.5476	-0.8779*	0.1053
	(0.4585)	(0.4387)	(0.4573)	(0.5263)	(0.1917)
Sustainable1	-1.1153***	-1.0609***	-1.0827***	-1.2135***	-0.3448**
	(0.4216)	(0.4040)	(0.4126)	(0.4584)	(0.1454)
Cooperationco-operative	0.6056*	0.5147*	0.5805*	0.8015**	0.2318*
	(0.3136)	(0.3027)	(0.3099)	(0.3503)	(0.1248)
ReciprocalVoting	1.3932***	1.4542***	1.4205***	2.0740***	0.6443***
	(0.4118)	(0.3934)	(0.4026)	(0.5024)	(0.1855)

VotingT_rcomply	-1.1019*	-0.9856	-1.1773*	-1.1280*	-0.3440
	(0.6294)	(0.6048)	(0.6195)	(0.6728)	(0.2217)
VotingT_rbreach	-0.2219	-0.1766	-0.3119	-0.3937	-0.1426
	(0.4138)	(0.3883)	(0.3947)	(0.4471)	(0.1616)
International1	-0.1152				
	(0.3210)				
EconomicsEconomics	0.3401				
	(0.4191)				
EconomicsSocSci	-0.1769				
	(0.4296)				
PolSpec	0.0100				
	(0.1271)				
TreesApples	0.6121				
	(0.4206)				
TreesTrees	0.0916				
	(0.3542)				
Male	0.2439				
	(0.3010)				
Age	-0.0339				
	(0.0269)				
Capital1	-0.7943*	-0.5918	-0.6919*	-0.6404	-0.4256**
	(0.4322)	(0.4058)	(0.4154)	(0.4626)	(0.1749)
Sizemedium:NationalityGermany			0.2579	-17.4621	-1.1330
			(1.0881)	(1,668.2640)	(0.8498)
Sizesmall:NationalityGermany			0.0013	2.1873	0.8912
			(1.0758)	(2.0254)	(0.7818)
Sizemedium:NationalityGreece			-0.3978	-0.7298	-1.3396*
			(1.0948)	(2.1410)	(0.8002)
Sizesmall:NationalityGreece			-1.5435	1.1160	-0.2622
			(1.1078)	(2.1323)	(0.7202)

Sizemedium:NationalityPortugal	1.3632	16.1207	-0.9477
	(1.2023)	(4,023.5850)	(1.0451)
Sizesmall:NationalityPortugal	-0.0735	17.7757	0.6151
	(1.2422)	(4,023.5850)	(1.0157)
Sizemedium:InvestmentTypeprevention		17.5598	-0.6067
		(1,941.4900)	(0.8099)
Sizesmall:InvestmentTypeprevention		20.9168	0.5444
		(1,941.4900)	(0.8002)
Sizemedium:InvestmentTypestimulus		-1.3990	-1.9049**
		(2.2962)	(0.8806)
Sizesmall:InvestmentTypestimulus		1.3385	-0.4874
		(2.1466)	(0.7917)
NationalityGermany:InvestmentTypeprevention		19.8109	0.8338
		(1,941.4890)	(0.7613)
NationalityGreece:InvestmentTypeprevention		20.7795	0.1800
		(1,941.4900)	(0.8692)
NationalityPortugal:InvestmentTypeprevention		19.6191	0.3301
		(4,981.0920)	(0.9757)
NationalityGermany:InvestmentTypestimulus		1.7766	-0.4666
		(2.2019)	(0.8303)
NationalityGreece:InvestmentTypestimulus		3.6139*	-0.1196
		(2.0875)	(0.7568)
NationalityPortugal:InvestmentTypestimulus		19.5470	-0.2703
		(4,023.5850)	(1.0024)
Sizemedium:NationalityGermany:InvestmentTypeprevention		-0.7217	0.5665
		(2,559.7820)	(1.0303)
Sizesmall:NationalityGermany:InvestmentTypeprevention		-22.1262	-1.5670
		(1,941.4900)	(1.0192)
Sizemedium:NationalityGreece:InvestmentTypeprevention		-18.4482	0.9454
		(1,941.4910)	(1.1928)

Sizesmall:NationalityGreece:InvestmentTypeprevention				-37.9142	-0.1921
				(3,425.4600)	(1.1635)
Sizemedium:NationalityPortugal:InvestmentTypeprevention				-15.3829	1.4607
				(4,981.0920)	(1.2247)
Sizesmall:NationalityPortugal:InvestmentTypeprevention				-19.7928	-0.7469
				(4,981.0920)	(1.2508)
Sizemedium:NationalityGermany:InvestmentTypestimulus				20.8149	2.6000**
				(1,668.2660)	(1.1118)
Sizesmall:NationalityGermany:InvestmentTypestimulus				-1.4090	0.2870
				(2.8194)	(1.0469)
Sizemedium:NationalityGreece:InvestmentTypestimulus				1.6774	1.9842*
				(2.8924)	(1.0553)
Sizesmall:NationalityGreece:InvestmentTypestimulus				-2.1655	1.1117
				(2.7834)	(0.9759)
Sizemedium:NationalityPortugal:InvestmentTypestimulus				-14.1705	2.3719*
				(4,023.5860)	(1.2942)
Sizesmall:NationalityPortugal:InvestmentTypestimulus				-18.4410	0.0476
				(4,023.5860)	(1.2544)
Constant	-0.4565	-1.1884	-1.1979	1.2250	0.9907*
	(1.0830)	(0.7388)	(0.9373)	(1.1804)	(0.5153)
Observations	327	327	327	327	327
R2					0.2039
Adjusted R2					0.0830
Log Likelihood	-157.2035	-161.4002	-158.1156	-137.8173	
Akaike Inf. Crit.	362.4069	354.8003	360.2313	363.6346	
Residual Std. Error					0.9886 (df = 283)
F Statistic					1.6862*** (df = 43; 283)
Note:					*p<0.1; **p<0.05; ***p<0.01

Source: own calculation.

Moreover, I run a linear model (Model 73_lin), which has as dependent variable the number of rounds in which a participant overharvested during the game. This is conceptually slightly different than the analyses above: above, I seek to understand under which conditions overharvesting takes place at all – or vice versa, when compliance takes place despite all challenges. The linear model rather focuses on the conditions under which some participants overharvest more often than others. Hence, statistically significant effects can rather be interpreted as showing to linearly impact several instances of overharvesting compared to none.

Model 73_lin shows quite a number of significant combinations of the three-way interaction, which are summarised in the table below[20]. One can clearly see that the 'stimulus' type for medium participants is predominant for overharvesting. Only the reference value for French medium participants shows a negative effect. Also, small Greek 'stimulus' type participants have a positive effect on overharvesting. In contrast, the picture for 'no type' and 'prevention' type participants is mixed. German medium participants have a negative effect, while German small participants carry a positive one. In contrast to the hypothesis, one can also see positive effects for 'prevention' type participants. German small participants have a negative effect, while German large participants carry a positive one. Medium Portuguese participants have a positive effect. One can see, in general, that German participants are rather pronounced, which might refer to the fact that there are more participants from Germany and, therefore, the effect is more pronounced.

20 The other independent variables remain largely the same; for some exceptions, see Appendix A.6-2.1.4.

Table A.6-2-6: Significant combinations of the three-way interaction – model 73_lin.

Size	Nationality	Investment type	positive effect	negative effect	statistical significance
M	FR	stimulus	-	-1.90	**
M	DE	stimulus	2.60	-	**
M	GR	stimulus	1.98	-	*
M	PT	stimulus	2.37	-	*
S	GR	stimulus	1.11	-	
M	DE	none	-	-1.13	
M	GR	none	-	-1.33	*
S	DE	none	0.89	-	
L	DE	prevention	0.83	-	
M	PT	prevention	1.46	-	
S	DE	prevention	-	-1.56	

Source: own calculation.

The model supports the prevalence of the 'stimulus'-oriented type for overharvesting – in particular compared to the baseline category of French medium participants for which the effect is even negative and, therefore, the opposite for other nationalities. The model also supports the role of Greek 'stimulus' type and medium Portuguese participants. However, the model does not support the other results for French and German participants. One does not see any other significant effect for French participants. For German participants, one can see opposing effects depending on 'size' and 'investment' type.

A.6-2.2 Voting incorrectly

A.6-2.2.1 Regression tables

The tables below show the sequential building of the model. The first model is the null model, where I have a dummy variable for each round, with Round 4 as basis and all control variables. One can already see the effect of the business cycle: 'voting incorrectly' is less likely in rounds of 'boom' (Rounds 6 and 9) compared to the other rounds. One can also see that of all control variables, only 'international' is statistically significant.

Model 1 adds all treatment variables and substitutes the round-dummies with the variable 'BusinessCycle'. One can see that 'bust' and, even more so 'recovery',

have a strong positive effect. This coincides with the experiment's design where punishment starts with a warning before they can vote for a fine and, is thereby lagged by one round. One can also see that 'small' participants are significantly less likely to vote incorrectly than the baseline 'large'. Medium participants can be considered slightly less likely to vote incorrectly as the coefficient has a small magnitude (compared to the standard error), but it is not statistically significant (p-value). This remains across all models until Model 6, where I add the interaction between 'size' and 'nationality'. None of the country variables is statistically significant. Only Portugal has a small magnitude, but only until Model 6 when the interaction comes in.

Model 2 adds the investment rate, 'happiness points' and the purchase of 'buckets'. In contrast to 'overharvesting', the investment rate seems to have no effect on 'voting incorrectly'. Similarly, 'happiness points' does not have a significant effect. In contrast, the purchase of buckets has a positive effect on 'voting incorrectly'. This is similar to 'overharvesting'. The explanation could be that a bucket facilitates harvesting and reduces its costs, i.e., makes it more efficient. However, the relation to 'voting incorrectly' remains unclear for the moment.

As for the analysis of Stage 1 compliance, I include all typology variables as aggregate variables as I am interested in the general type of the participant. Model 21 adds cultivation typologies and I remove 'happiness points' and 'bucket' because of correlations with the investment type. Contrary to the hypothesis, one cannot see any effect from the investment type. One can see a small coefficient for the 'prevention type', but it is not statistically significant and also, not visible in the other models. It only becomes statistically significant in Model 61 when I add the interaction with the business cycle. Moreover, one does not see an effect of the 'risk aversion' typology, nor 'sustainable'. This is contrary to the hypotheses.

Model 3 adds the 'co-operative' type on shared trees, which shows no effect on 'voting incorrectly'. This is contrary to the hypothesis. Models 3 and 31 add the aggregate level of reciprocal voting and the per round level, respectively. Both show statistically significant with a positive effect on 'voting incorrectly' as expected by the hypothesis. I continue with the aggregate level of reciprocal voting because conceptually, it is rather obvious that sealing deals in a specific round implies voting incorrectly in that very round. Therefore, the aggregate variable is more meaningful.

Models 4, 41 and 42 add rule compliance as aggregate binary, as aggregate in absolute numbers and as per round variable, respectively. The per round variable does not show a significant effect in Model 42. In contrast, the aggregate variables show a positive effect on ‘voting incorrectly’. The one with absolute numbers, i.e., in how many rounds a participant breached, is statistically significant, and I continue using this variable. It also adds more variance to the model than another dummy variable would.

Model 5 is the same as Model 41, but without the control variables that are not statistically significant and also do not have a magnitude of the coefficient. I do this in order to reduce the number of independent variables before I compute interactions, which create many more dummy variables. Ideally, of course, I would also keep such controls because conceptually, they are important. However, the other variables’ coefficients and standard errors do not change remarkably, and Model 5’s AIC is better than that of Model 41. Therefore, I drop the controls.

Table A.6-2-7a: Voting incorrectly per round – models null to 42.

	Dependent variable:								
	Voting incorrectly perR								
	(0)	(1)	(2)	(21)	(3)	(31)	(4)	(41)	(42)
factor(Round)5	-0.0265								
	(0.2300)								
factor(Round)6	-1.2767***								
	(0.2584)								
factor(Round)7	0.9978***								
	(0.2243)								
factor(Round)8	1.6142***								
	(0.2271)								
factor(Round)9	-1.3947***								
	(0.2626)								
factor(Round)10	1.6827***								
	(0.2277)								
factor(Round)11	1.8201***								
	(0.2291)								
Sizemedium		-0.3581	-0.3423	-0.3935	-0.5059	-0.4341	-0.5235*	-0.4979	-0.5057
		(0.3340)	(0.3317)	(0.3356)	(0.3113)	(0.3129)	(0.3085)	(0.3099)	(0.3112)
Sizesmall		-1.1162***	-1.1476***	-1.1193***	-1.5319***	-1.4487***	-1.5016***	-1.5643***	-1.5325***
		(0.3426)	(0.3416)	(0.3504)	(0.3376)	(0.3341)	(0.3335)	(0.3370)	(0.3375)
NationalityGermany		-0.0306	-0.0919	-0.0192	0.0165	-0.2630	0.0096	-0.0459	0.0151
		(0.3946)	(0.3934)	(0.3932)	(0.3644)	(0.3695)	(0.3610)	(0.3641)	(0.3644)
NationalityGreece		0.1912	0.2921	0.2565	0.1768	0.1195	0.1827	0.1506	0.1766
		(0.4233)	(0.4252)	(0.4306)	(0.3996)	(0.4039)	(0.3954)	(0.3983)	(0.3995)
NationalityPortugal		-0.5432	-0.4768	-0.5596	-0.5732	-0.5280	-0.5638	-0.5748	-0.5729
		(0.4472)	(0.4441)	(0.4483)	(0.4175)	(0.4209)	(0.4128)	(0.4155)	(0.4173)

BusinessCyclebust	2.1214***	2.1219***	2.1212***	2.1296***	2.1906***	2.1104***	2.1323***	2.1268***
	(0.1729)	(0.1729)	(0.1729)	(0.1734)	(0.1843)	(0.1726)	(0.1736)	(0.1742)
BusinessCyclerecovery	2.3520***	2.3526***	2.3516***	2.3601***	2.4962***	2.3396***	2.3626***	2.3589***
	(0.1748)	(0.1749)	(0.1749)	(0.1753)	(0.1866)	(0.1744)	(0.1755)	(0.1754)
InvestmentRate		-0.9331						
		(1.2701)						
HappinessPoints		0.0090						
		(0.0390)						
Bucket		0.6906**						
		(0.3234)						
InvestmentTypeprevention			0.4624	0.0355	0.1522	0.0621	0.0581	0.0359
			(0.3567)	(0.3442)	(0.3449)	(0.3403)	(0.3426)	(0.3441)
InvestmentTypestimulus			-0.0002	-0.1565	-0.1764	-0.1997	-0.1800	-0.1570
			(0.3503)	(0.3422)	(0.3444)	(0.3409)	(0.3407)	(0.3421)
RiskAversionrisk-averse			-0.1978	-0.1868	-0.2090	-0.1443	-0.1621	-0.1864
			(0.3227)	(0.2996)	(0.3026)	(0.2979)	(0.2983)	(0.2995)
RiskAversionrisk-taking			0.0557	-0.0097	0.0199	0.0633	-0.0392	-0.0103
			(0.4407)	(0.4090)	(0.4124)	(0.4056)	(0.4071)	(0.4088)
Sustainable1			-0.1326	-0.2208	-0.2161	-0.1697	-0.1469	-0.2190
			(0.3401)	(0.3154)	(0.3198)	(0.3148)	(0.3165)	(0.3155)
Cooperationco-operative				0.2068	0.1745	0.1537	0.1585	0.2058
				(0.2728)	(0.2755)	(0.2709)	(0.2729)	(0.2728)
ReciprocalVoting				2.6139***		2.4183***	2.5011***	2.6111***
				(0.3865)		(0.3879)	(0.3887)	(0.3867)
ReciprocalVotingR					5.3688***			
					(0.5689)			
OverharvestingT						0.4520		
						(0.3015)		
OverharvestingTA							0.2361*	
							(0.1329)	

Overharvesting									0.0404
									(0.2689)
International1	0.8691***	0.7234**	0.6763**	0.6995**	0.3477	0.4988*	0.3514	0.3434	0.3477
	(0.3159)	(0.2987)	(0.2965)	(0.2987)	(0.2798)	(0.2798)	(0.2768)	(0.2786)	(0.2797)
EconomicsEconomics	0.3616	0.4545	0.3650	0.3961	0.3507	0.2727	0.3128	0.3466	0.3506
	(0.4027)	(0.3733)	(0.3722)	(0.3805)	(0.3535)	(0.3560)	(0.3497)	(0.3520)	(0.3534)
EconomicsSocSci	-0.4107	-0.2373	-0.2646	-0.3107	-0.1426	-0.2756	-0.1530	-0.0849	-0.1413
	(0.4301)	(0.3852)	(0.3821)	(0.3888)	(0.3614)	(0.3645)	(0.3578)	(0.3611)	(0.3614)
PolSpec	-0.1513	-0.1194	-0.1208	-0.1279	-0.1070	-0.1261	-0.1089	-0.1062	-0.1070
	(0.1292)	(0.1185)	(0.1180)	(0.1189)	(0.1101)	(0.1109)	(0.1089)	(0.1096)	(0.1101)
TreesApples	0.2568	0.3372	0.3364	0.3489	0.2419	0.1392	0.1985	0.1896	0.2411
	(0.4391)	(0.4086)	(0.4119)	(0.4155)	(0.3875)	(0.3940)	(0.3846)	(0.3864)	(0.3874)
TreesTrees	0.4160	0.4222	0.4763	0.3454	0.2840	0.4361	0.2674	0.2945	0.2841
	(0.3333)	(0.3139)	(0.3225)	(0.3208)	(0.2984)	(0.3012)	(0.2950)	(0.2969)	(0.2983)
Male	-0.0418	-0.0820	-0.1245	-0.1222	-0.0939	-0.0157	-0.1260	-0.1212	-0.0950
	(0.3222)	(0.2896)	(0.2877)	(0.2898)	(0.2692)	(0.2715)	(0.2663)	(0.2683)	(0.2691)
Age	-0.0200	-0.0240	-0.0249	-0.0232	-0.0022	-0.0037	-0.0038	0.0024	-0.0022
	(0.0273)	(0.0250)	(0.0248)	(0.0250)	(0.0232)	(0.0233)	(0.0230)	(0.0233)	(0.0232)
Capital1	-0.5178	-0.5062	-0.4623	-0.5219	-0.4859	-0.5098	-0.4437	-0.3852	-0.4839
	(0.4732)	(0.4257)	(0.4224)	(0.4234)	(0.3946)	(0.3984)	(0.3912)	(0.3964)	(0.3948)
Constant	-1.2456	-1.7961*	-1.7149	-1.7074*	-2.1514**	-2.0699**	-2.1789**	-2.4116**	-2.1546**
	(0.9976)	(0.9389)	(1.0620)	(0.9985)	(0.9313)	(0.9358)	(0.9271)	(0.9398)	(0.9315)
Observations	2,616	2,616	2,616	2,616	2,616	2,616	2,616	2,616	2,616
Log Likelihood	-1,220.9750	-1,284.1680	-1,281.6120	-1,282.7030	-1,258.9030	-1,194.3840	-1,257.8450	-1,257.3250	-1,258.8920
Akaike Inf. Crit.	2,477.9490	2,604.3360	2,605.2240	2,611.4070	2,567.8060	2,438.7690	2,567.6900	2,566.6500	2,569.7830
Bayesian Inf. Crit.	2,583.5980	2,709.9860	2,728.4820	2,746.4030	2,714.5410	2,585.5040	2,720.2940	2,719.2540	2,722.3880
Note:									*p<0.1; **p<0.05; ***p<0.01

Source: own calculation.

Table A.6-2-7b: Voting correctly per round – models 5 to 62.

	Dependent variable:		
	Voting correctly perR		
	(5)	(61)	(62)
Sizemedium	0.3093	0.3056	0.3162
	(0.2889)	(0.2887)	(0.2910)
Sizesmall	0.6071**	0.5942*	0.6165**
	(0.3088)	(0.3085)	(0.3110)
NationalityGermany	-0.1327	-0.1341	-0.1666
	(0.3340)	(0.3339)	(0.3362)
NationalityGreece	-0.3621	-0.3550	-0.3870
	(0.3647)	(0.3642)	(0.3631)
NationalityPortugal	-0.3766	-0.3608	-0.3620
	(0.3787)	(0.3785)	(0.3808)
BusinessCyclebust	-1.7374***	-1.2635***	-1.5077***
	(0.1422)	(0.2613)	(0.1826)
BusinessCyclerecovery	-1.9015***	-1.4965***	-1.8434***
	(0.1444)	(0.2664)	(0.1747)
InvestmentTypeprevention	0.5595*	1.2256***	
	(0.3183)	(0.3859)	
InvestmentTypestimulus	0.7061**	0.8586**	
	(0.3186)	(0.3834)	
InvestmentTypeRprevention			0.3730
			(0.2859)
InvestmentTypeRstimulus			0.5528
			(0.3438)
RiskAversionrisk-averse	0.3242	0.3332	0.3579
	(0.2788)	(0.2785)	(0.2790)
RiskAversionrisk-taking	0.1068	0.1059	0.1955
	(0.3793)	(0.3789)	(0.3798)
Sustainable1	0.0553	0.0542	0.0781
	(0.2928)	(0.2927)	(0.2943)
Cooperationco-operative	0.0028	0.0003	0.1667
	(0.2508)	(0.2507)	(0.2412)
ReciprocalVoting	-1.1323***	-1.1253***	-1.0998***
	(0.3673)	(0.3674)	(0.3639)
OverharvestingTA	-0.2720**	-0.2688**	-0.2655**
	(0.1290)	(0.1290)	(0.1289)
International1	0.7177***	0.7121***	0.7025***
	(0.2569)	(0.2566)	(0.2580)
EconomicsEconomics	0.8302**	0.8220**	0.8886***
	(0.3254)	(0.3252)	(0.3266)
EconomicsSocSci	0.2217	0.2064	0.2394
	(0.3337)	(0.3334)	(0.3356)
TreesApples	0.4111	0.4168	0.5209
	(0.3539)	(0.3534)	(0.3523)
TreesTrees	0.9002***	0.8889***	0.9290***
	(0.2768)	(0.2765)	(0.2763)
Male	0.4268*	0.4240*	0.4441*
	(0.2492)	(0.2490)	(0.2502)

BusinessCyclebust:InvestmentTypeprevention		-1.0121***	
		(0.3500)	
BusinessCyclerecovery:InvestmentTypeprevention		-0.9205***	
		(0.3550)	
BusinessCyclebust:InvestmentTypestimulus		-0.2928	
		(0.3441)	
BusinessCyclerecovery:InvestmentTypestimulus		-0.1993	
		(0.3488)	
BusinessCyclebust:InvestmentTypeRprevention			-0.6128*
			(0.3415)
BusinessCyclerecovery:InvestmentTypeRprevention			-0.0514
			(0.3448)
BusinessCyclebust:InvestmentTypeRstimulus			-0.6100
			(0.4156)
BusinessCyclerecovery:InvestmentTypeRstimulus			-0.2193
			(0.4797)
Constant	-1.6343***	-1.9129***	-1.5116***
	(0.5589)	(0.5745)	(0.5532)
Observations	2,616	2,616	2,616
Log Likelihood	-1,345.6060	-1,340.1430	-1,344.4160
Akaike Inf. Crit.	2,737.2120	2,734.2860	2,742.8310
Bayesian Inf. Crit.	2,872.2080	2,892.7600	2,901.3050
Note:			*p<0.1; **p<0.05; ***p<0.01

Source: own calculation.

A.6-2.2.2 Goodness-of-fit of the final models

For Model 61, the AIC, a goodness-of-fit measure, is lowest compared to the other Models 5 to 63. Comparing models using the likelihood ratio test (Winter 2014), one can see that Model 61 is not a better fit than the null model. This is unfortunate, but still the model shows meaningful effects of the variables, and the intercept is statistically significant. Therefore, I continue using this model.

Figure A.6-2-8a: Likelihood ratio test for model 61.

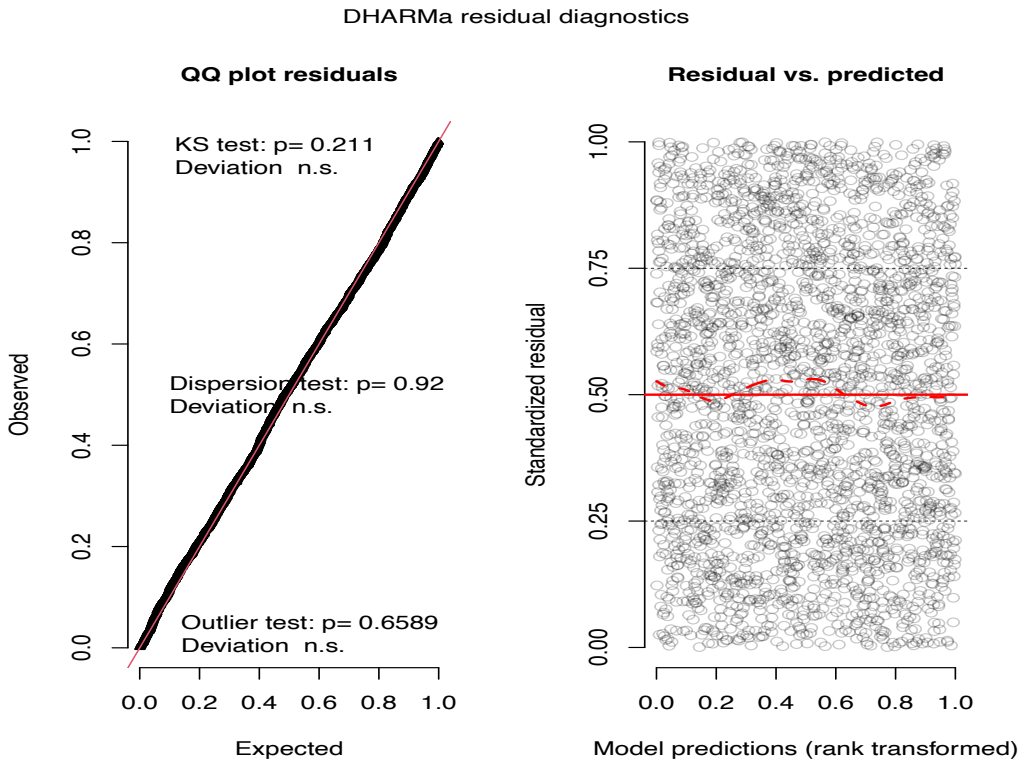
	npar	AIC	BIC	logLik	deviance	Chisq	Df	Pr(>Chisq)
Null model	18	2477.9	2583.6	-1221.0	2441.9			
Model 61	21	2547.1	2670.4	-1252.6	2505.1	0	3	1

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Source: own calculation using the anova() function in R.

Analysing the residual plots[21] shows that for Model 61, the residuals are normally distributed (see Q-Q plot in the figure below). However, the right-hand sight plot shows that not all residuals are scattered: the solid line indicating the mean of unsystematically spread residuals, i.e., zero, deviates from the dashed line which represents the fitted values by the model[22]. I could argue that the deviation does not have a large magnitude, and that in general, the scatter plot looks rather evenly distributed. Therefore, I should not worry about heteroscedasticity, i.e., a systematic bias in residuals that would indicate a structural misfit of the model by maybe ignoring a variable or interaction. I know from the correlation table above that I do not need to worry about collinearity of the independent variables used. Moreover, one cannot see a systematic shape of the dashed line except for the right-hand end. It looks a little like a sinus curve around the line, with larger deviation for values closer to 1. This is similar to the analysis of overharvesting.

Figure A.6-2-8b: Residual diagnostics for model 61.



Source: own calculation.

21 We follow StackExchange (2012) and use the R package DHARMa (Hartig 2021) to adjust logistic residuals to standard residuals.

22 We also see a similar picture for the null model and Model 6.

Finally, I calculate correctly classified cases (see table below). The null model and Models 6 and 61 are similarly successful, with 80% correctly predicted cases as a share of all cases. Models 6 and 61 are better than the null model at correctly predicting breaches with 94%. In contrast, they overestimate breaches and correctly classify compliance only in 72%-73%, one percentage point less than the null model.

Table A.6-2-9: Correctly classified cases.

		Null model			Model 61		
		0	1	correctly classified cases	0	1	correctly classified cases
Data	0	1263	446	**74%**	1248	461	**73%**
	1	69	838	**92%**	56	851	**94%**
Total correctly classified cases				**80%**			**80%**

Source: own calculation.

Remarkably, the models do not differ much. Model 61 is not particularly better overall than the null model. However, Models 6 and 61 provide more meaningful variables. The picture looks very similar to the analysis of 'overharvesting'. Summing up, statistically it is not the ideal model, while conceptually, it is.

A.6-2.2.3 Predicted probabilities

I plot predicted probabilities that 'voting incorrectly' equals '1' for different levels of the respective independent variable, while keeping constant all other variables at their mean (numerical variables) or reference value (categorical variables). The table below shows these values.

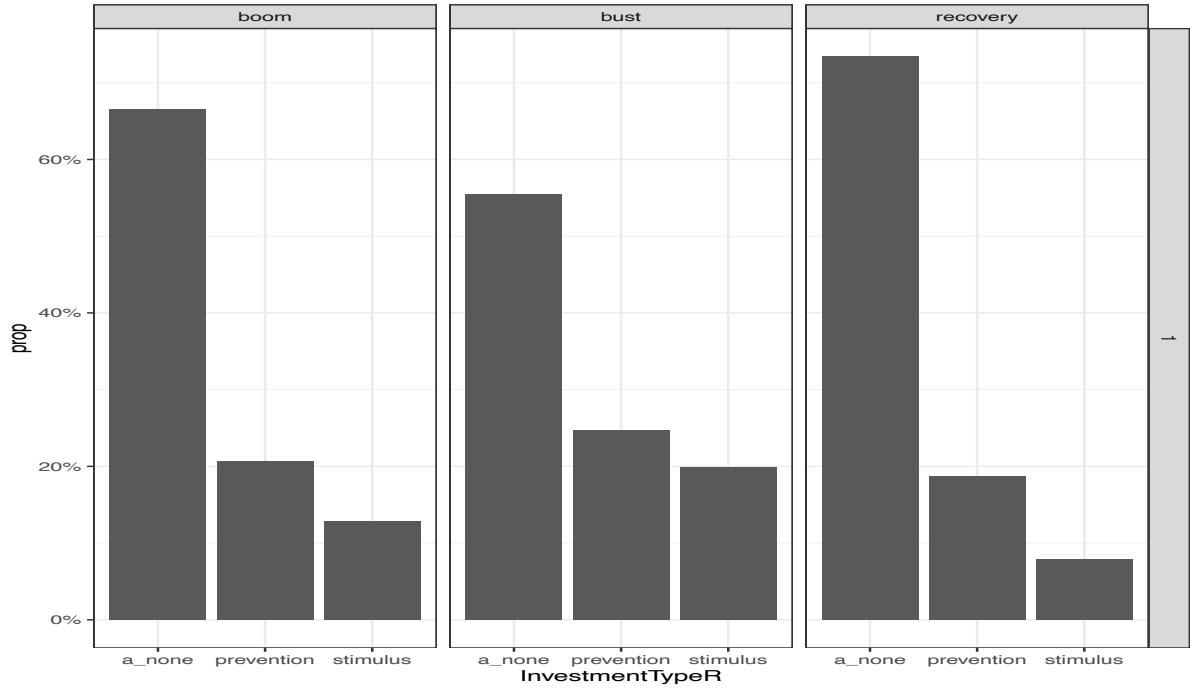
Table A.6-2-10: Mean and reference values for calculating predicted probabilities.

Size	large
Nationality	France
BusinessCycle	boom
InvestmentType	a_none
RiskAversion	a_none
Sustainable	0
Cooperation	a_exploiting
ReciprocalVoting	0.14
OverharvestingTA	0.47
Id	0 (population-level)

Source: own calculation.

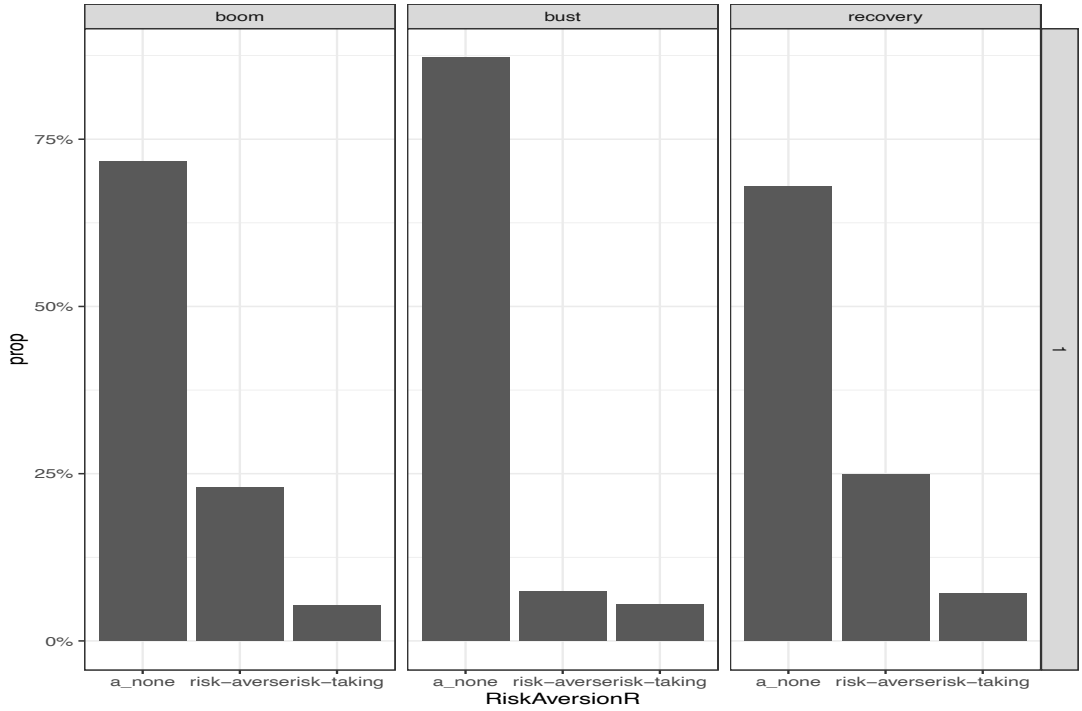
A.6-3 Additional figures

Figure A.6-3-1: Investment type and business cycle, per round.



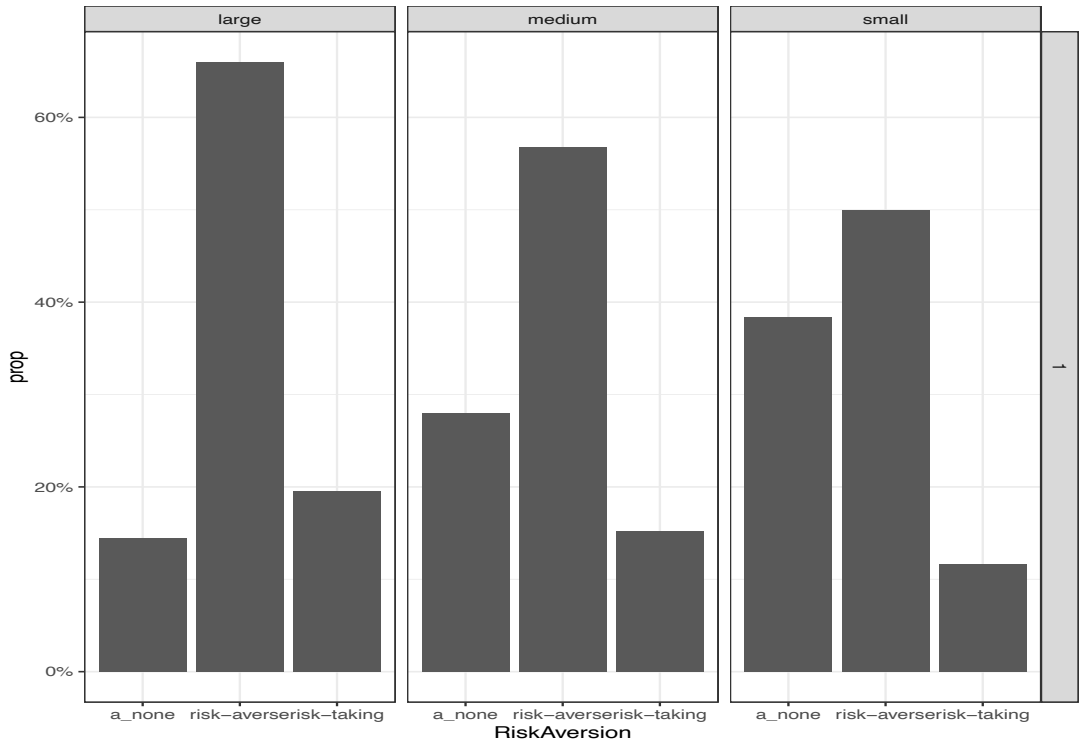
Source: own calculation. The y-axis shows the proportion of participant-rounds in e.g. 'boom' rounds per investment type; 'a_none' shows those that have not invested at all or similarly in both categories.

Figure A.6-3-2: Risk aversion type and business cycle, per round.



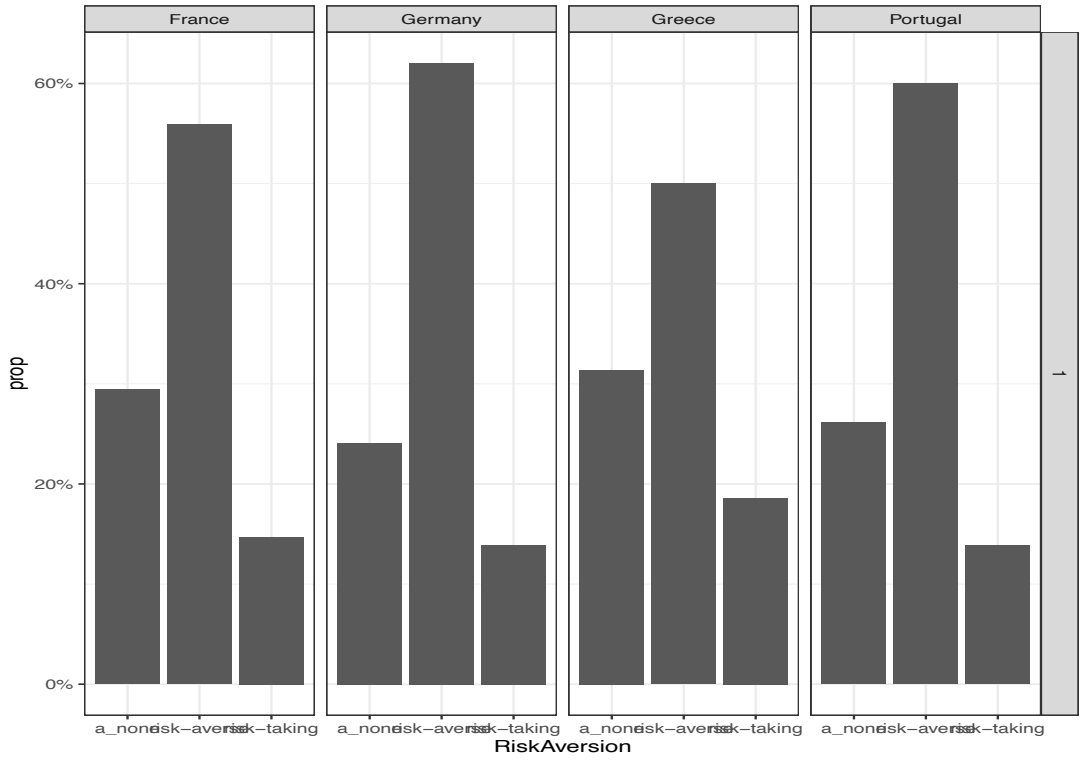
Source: own calculation. The y-axis shows the proportion of participant-rounds in e.g. 'boom' rounds per risk aversion type; 'a_none' shows those that have not invested at all or similarly in both categories.

Figure A.6-3-3: Risk aversion type and size, total.



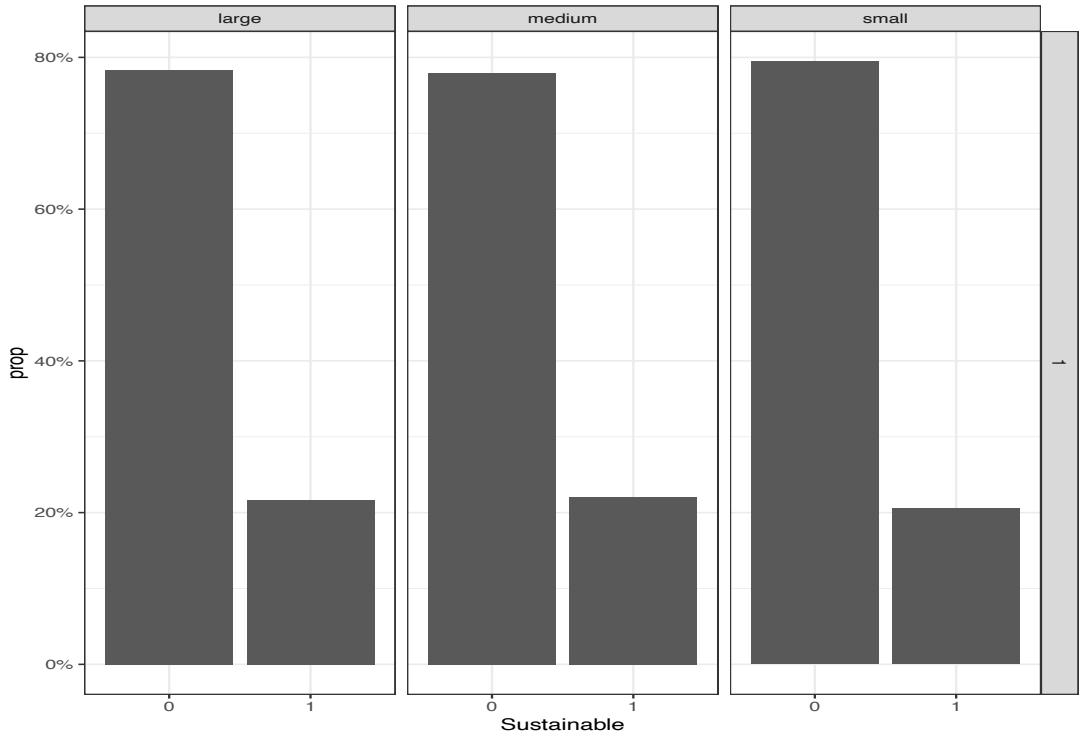
Source: own calculation. The y-axis shows the proportion of e.g. 'large' participants that are risk-averse; 'a_none' shows those that have not invested at all or similarly in both categories.

Figure A.6-3-4: Risk aversion type and nationality, total.



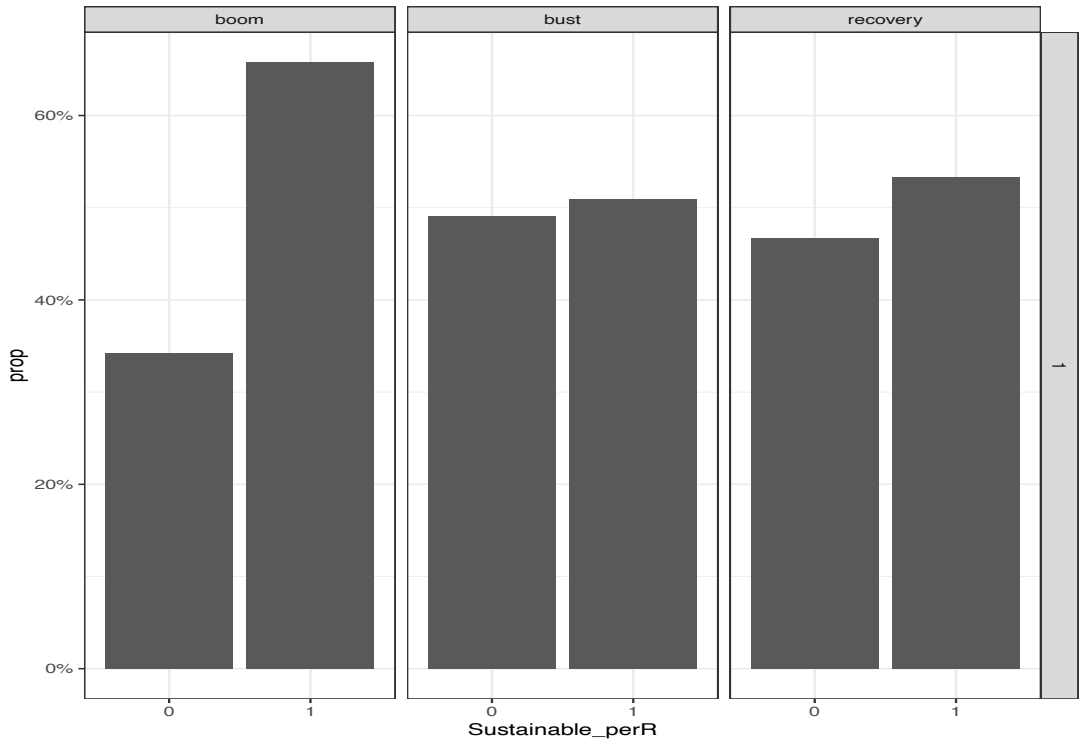
Source: own calculation. The y-axis shows the proportion of e.g. 'French' participants that are risk-averse; 'a_none' shows those that have not invested at all or similarly in both categories.

Figure A.6-3-5: Sustainable type and size, total.



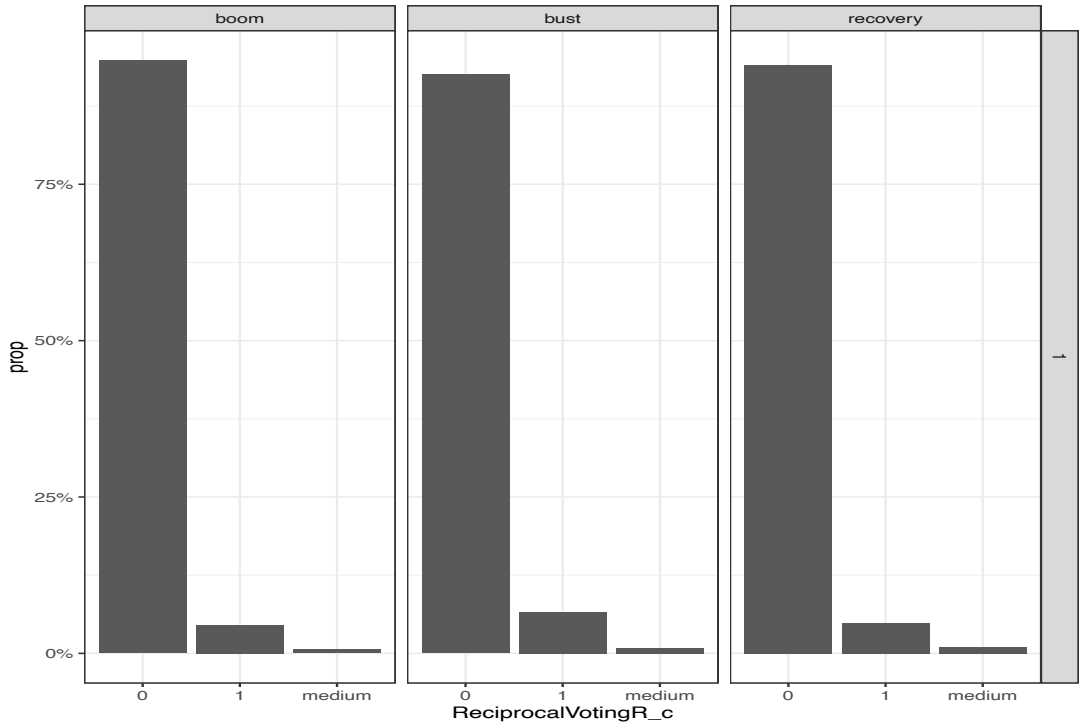
Source: own calculation. The y-axis shows the proportion of e.g. ‘large’ participants that harvested sustainably (‘1’); ‘a_none’ shows those that have not invested at all or similarly in both categories.

Figure A.6-3-6: Sustainable type and business cycle, per round.



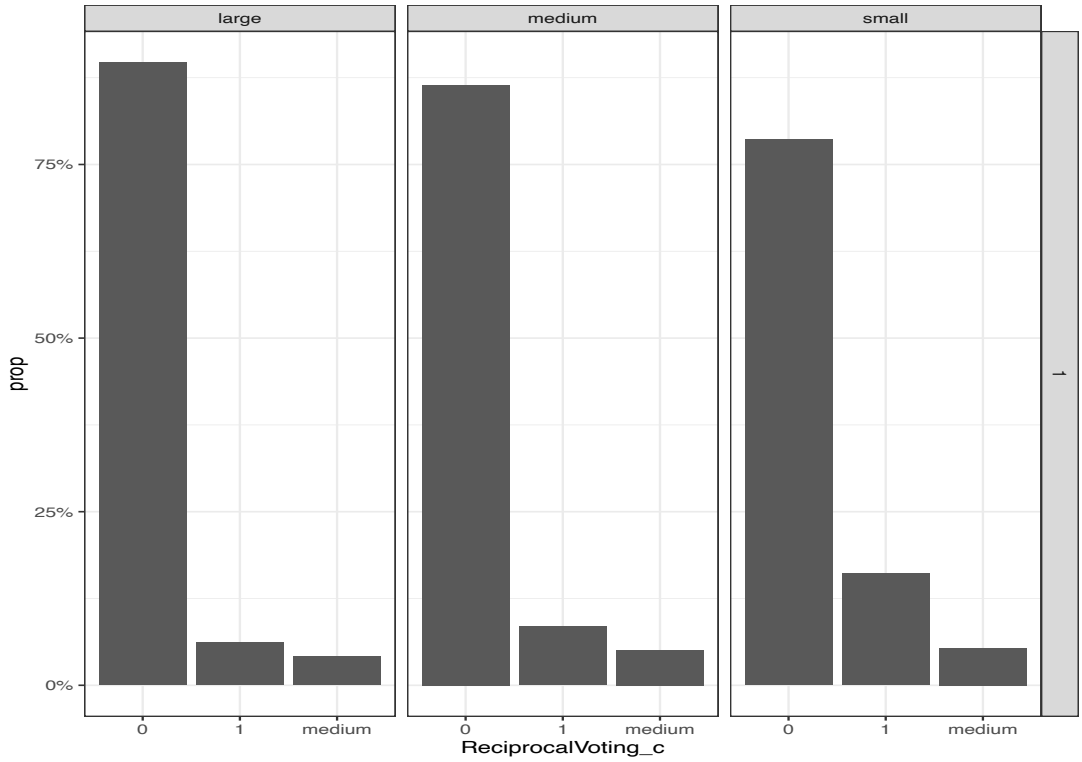
Source: own calculation. The y-axis shows the proportion of participant-rounds in e.g. ‘boom’ rounds that harvested sustainably over the course of the game (‘1’); ‘a_none’ shows those that have not invested at all or similarly in both categories.

Figure A.6-3-7: Reciprocal voting and business cycle, per round.



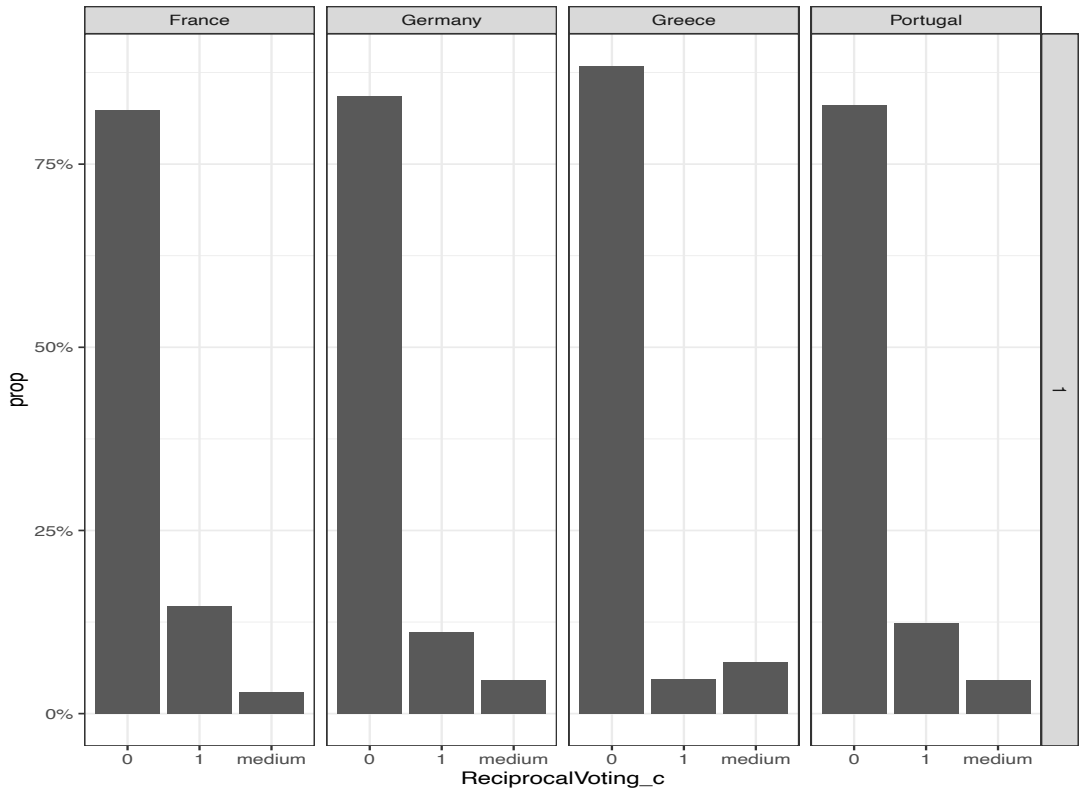
Source: own calculation. The y-axis shows the proportion of participant-rounds in e.g. 'boom' rounds that engaged in reciprocal voting over the course of the game ('1').

Figure A.6-3-8: Reciprocal voting and size, total.



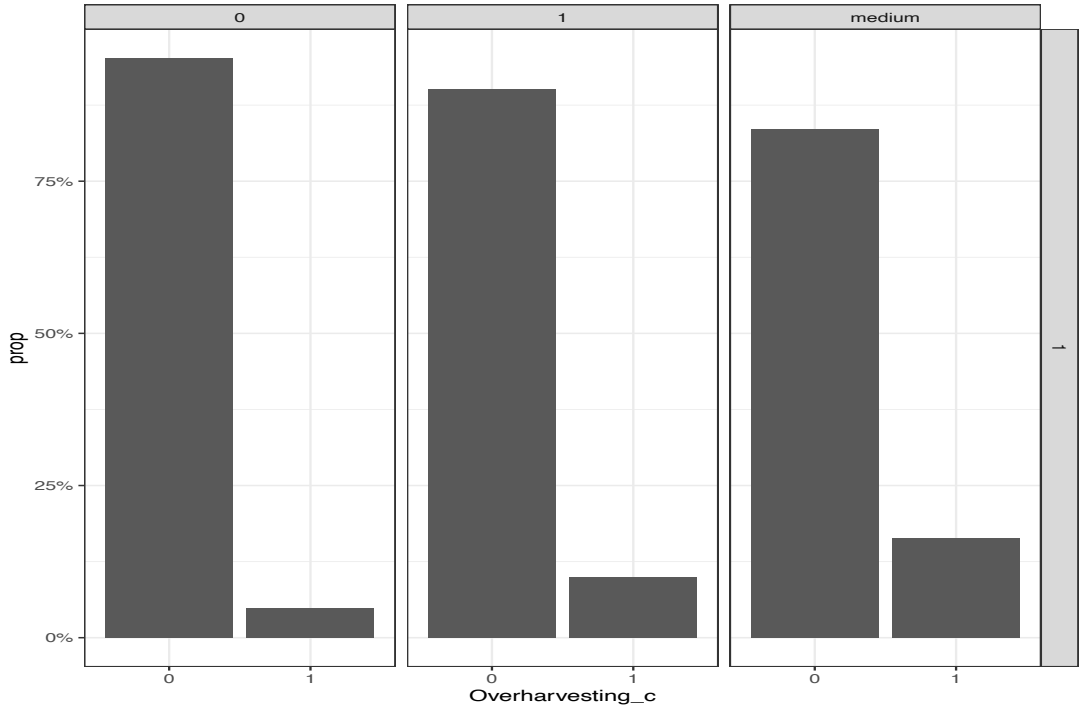
Source: own calculation. The y-axis shows the proportion of e.g. 'large' participants that engaged in reciprocal voting over the course of the game ('1').

Figure A.6-3-9: Reciprocal voting and nationality, total.



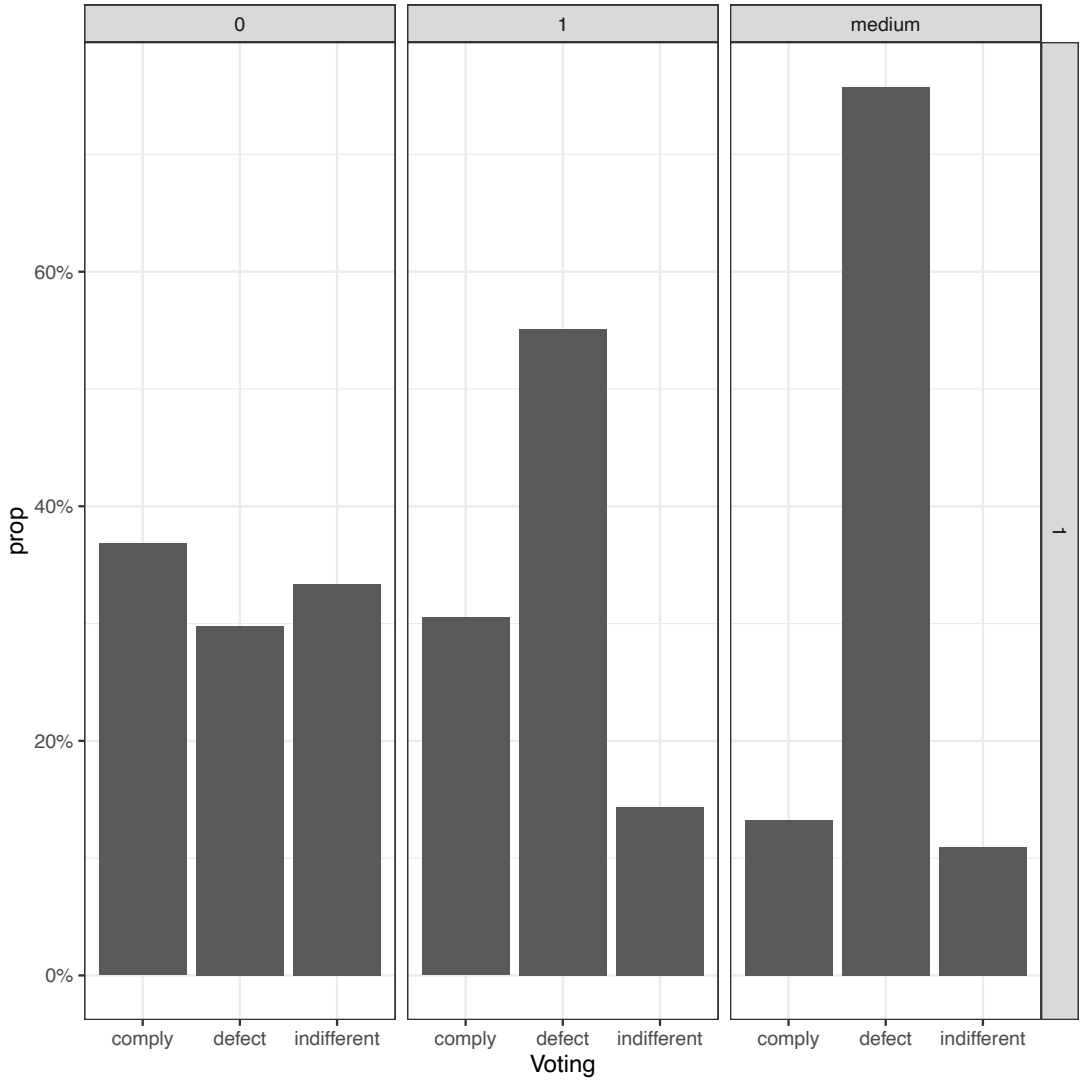
Source: own calculation. The y-axis shows the proportion of e.g. 'French' participants that engaged in reciprocal voting over the course of the game ('1').

Figure A.6-3-10: Reciprocal voting and overharvesting, total.



Source: own calculation. The y-axis shows the proportion of participants per reciprocal voting category that overharvested at least once ('1') or not at all ('0') during the entire game ('Overharvesting_c').

Figure A.6-3-11: Reciprocal voting and voting type, total.



Source: own calculation. The y-axis shows the proportion of participants per reciprocal voting category that voted always correctly, at least once incorrectly or always abstained ('indifferent') during the entire game ('Voting').