15th Payment and Settlement System Seminar
Bank of Finland

Critical Participants in TARGET2

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Alexander would like to thank Lukas Walter for his research assistance.

Outline

Background

- TARGET2 is the RTGS system owned and operated by the Eurosystem.
- TARGET2 is exposed to a number of risks, including legal, **operational** and general business **risk**.
- Being a SIPS, TARGET2 is subject to the SIPS Regulation (ECB/2014/28) and the PFMIs.
- The TARGET2 operator has put in place a set of rules and procedures, including the development and implementation of **analytical tools**, aimed at ensuring compliance with the regulatory requirements.

Operational risk

The risk that deficiencies in information systems, internal processes and personnel or disruptions from external events will result in the reduction, deterioration or breakdown of services provided by an FMI. The FMI should identify the plausible sources of operational risk, deploy appropriate systems, establish appropriate policies, procedures and controls. (PFMIs, Principle 17)

In TARGET2 an operational disruption can occur at the level of:

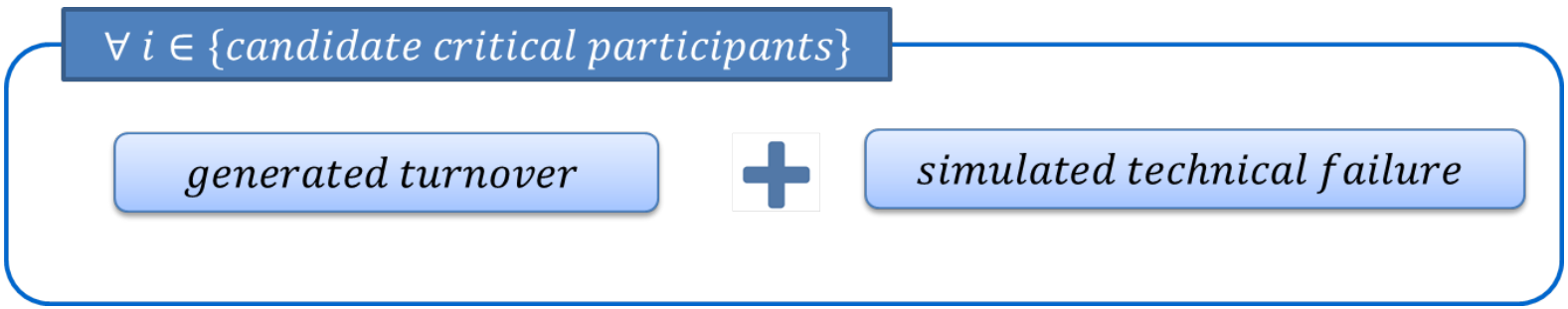
1. The network provider (SWIFT)
2. The SSP
3. The connected NCB
4. The ancillary system/**credit institution**

Critical participants in TARGET2

- Operational risk at credit institution level → potential source of systemic risk in the case of a technical outage in the connection to TARGET2.
- Critical participants are to be understood in this context as participants having a significant negative impact on the whole system in case of operational issues.
- Article 15(6) of SIPS Regulation requires the SIPS operator to **regularly** identify critical participants based on their **turnover** and their **potential impact** on other participants and the SIPS as a whole, **in the event of a significant operational problem** experienced by such participants.
- The TARGET2 operator imposes **higher** business continuity, contingency and test **requirements** to its critical participants.

Identification methodology

- The operator has elaborated a framework for identifying the critical participants in TARGET2.
- The framework is based on the combination of two criteria:



In general, a participant's turnover is a good proxy for its criticality in TARGET2. However, the largest repercussions in a network may not always be caused by the largest participants. Hence, the introduction of the second criterion was deemed necessary.

The generated turnover

$$criticality_i = \begin{cases} 1, & if\ traffic_i \geq 1\%\ of\ avg\ daily\ traffic\ in\ period\ p \\ 0, & if\ traffic_i < 1\%\ of\ avg\ daily\ traffic\ in\ period\ p \end{cases}$$

- The turnover is computed as the sum of the generated traffic by each participant at the technical platform level.
- *Generated* means that transactions where the participant is debited but that are not initiated by the participant have to be filtered out.
- The average daily traffic includes customer, interbank and CLS transactions, as well as liquidity transfers to T2S.

The simulated failure

$$criticality_i = \begin{cases} 1, & if\ avg\ unsettled\ payments_i \geq 1.5\%\ of\ traffic \\ 0, & if\ avg\ unsettled\ payments_i < 1.5\%\ of\ traffic \end{cases}$$

Simulation of the technical failure of a participant in TARGET2 over several independent days:

- A candidate critical participant is considered as no longer able to send payments to TARGET2 for an entire business day.
- However, it can still technically receive payments (credits on its account(s)).
- All the ancillary system payments debiting the account of that bank that are sent by the ancillary system itself could still take place, as well as payments related to changes in the intraday credit line of the participant - same principle as for *generated* turnover applies.

The tool used for the simulations is the **TARGET2 Simulator**.

The simulated failure

Unsettled payments can be decomposed as:

$$\begin{aligned} &Avg\ share\ of\ unsettled\ payments_i \\ &\quad = Avg\ share\ of\ unsettled\ payments\ in\ first\ round_i \\ &\quad + Avg\ share\ of\ unsettled\ payments\ in\ second\ round_i \end{aligned}$$

- **First round effects** indicate the share of **transactions** that were **not sent** due to technical failure of a participant - the generated turnover is a proxy for this effect.
- **Second round effects** indicate the share of **transactions sent by other participants but unsettled** in the scenario, due to missing incoming liquidity from the failed participant - those could lead to further unsettled payments.

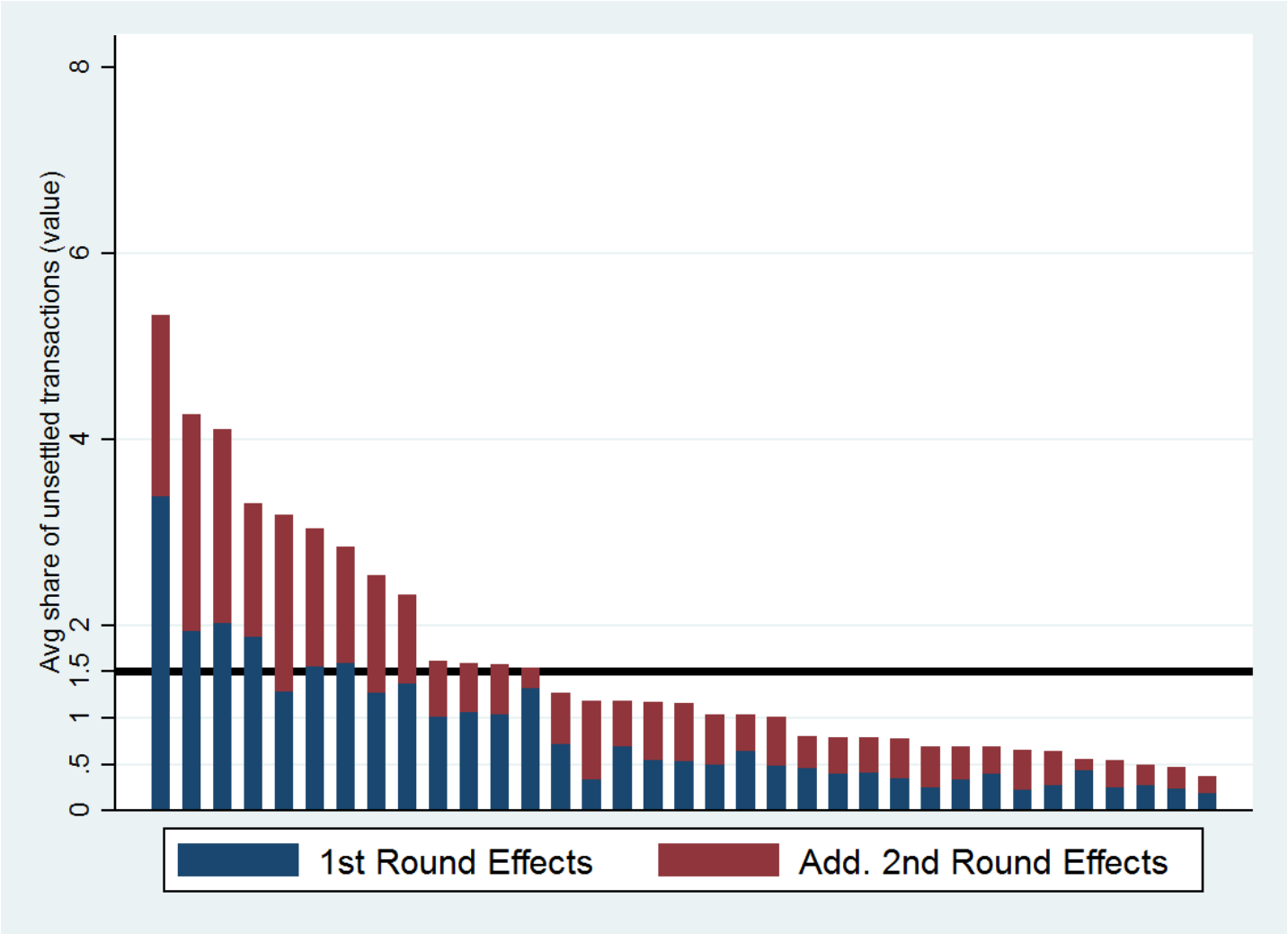
Policy implications

The identification exercise has concrete consequences for the designated critical participants in terms of:

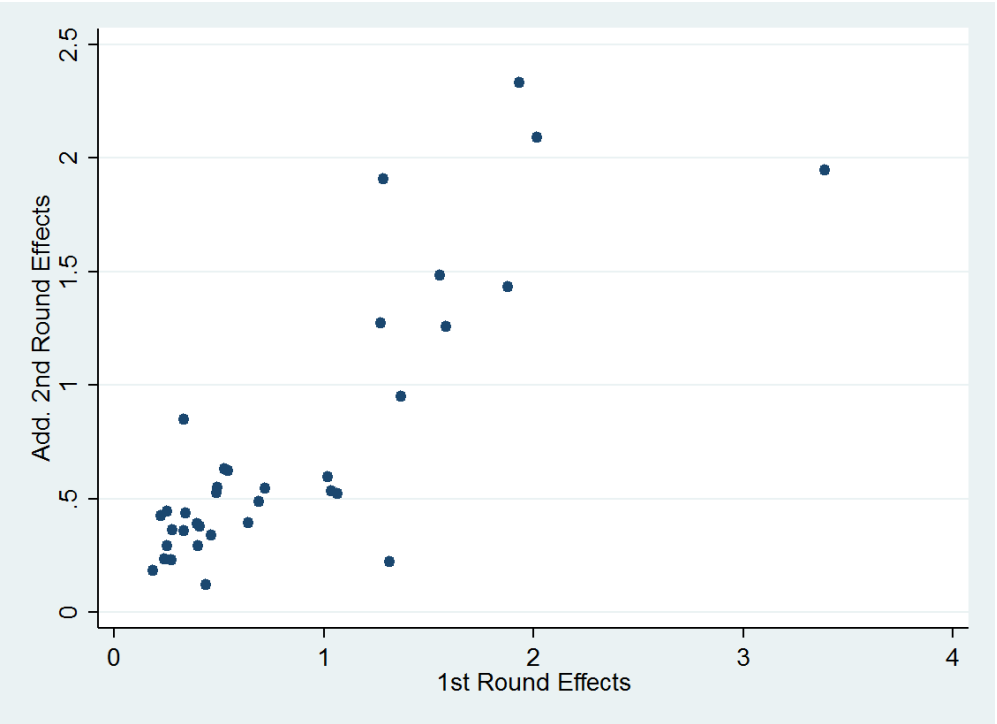
1. **Monitoring** by the relevant NCB
2. **Incident** reporting
3. System **security**
4. **Business continuity** measures:
    1. Existence of plans and procedures
    2. Set up of an alternative site with different risk profile
    3. Staff training
5. **Testing** at regular intervals

Result: annual self-certification of compliance with the Eurosystem requirements.

The simulated failure



First and second round effects

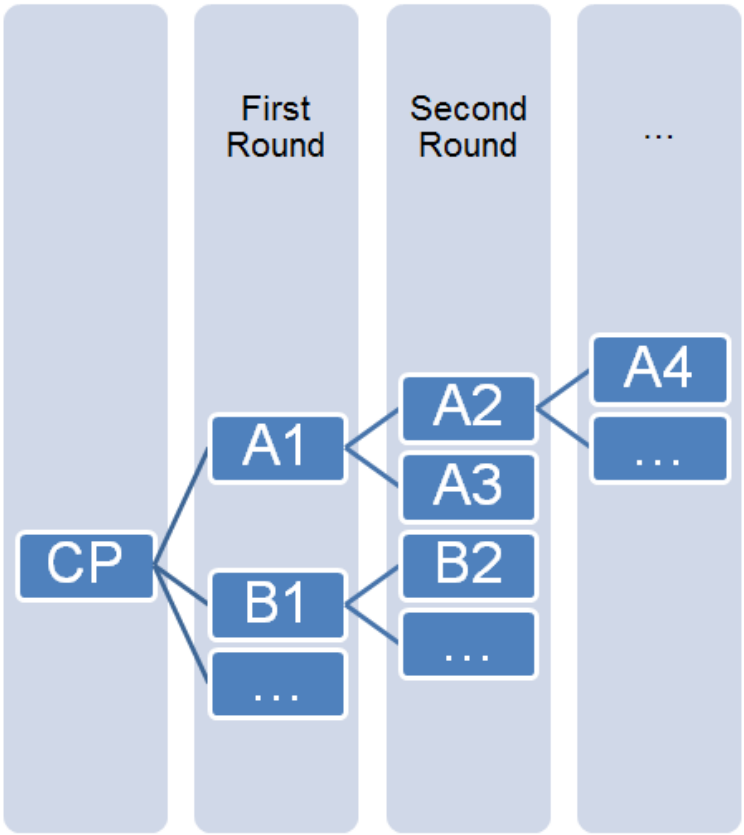


- Simulation results are broadly in line with the turnover criterion.
- However, each year a few candidates are reclassified based on the simulation results.
- The interplay between the first and the second round effects can be further analysed.

Analytical questions

- The starting point is the need to identify critical participants:
  - Simulations allow to directly assess the impact of a technical failure.
  - Are there other indicators predicting the simulation results?
    - Is a "simple" proxy as the generated turnover already enough?
    - More "sophisticated" indicators like network indicators or combinations of a participant's (uncorrelated) characteristics?
- Simulation results provide a very rich dataset that allows studying how the technical failure impact spreads through the system.
- The effects of technical outages are a general topic of interest in the literature, independent of the need to identify critical participants.

Analytical questions



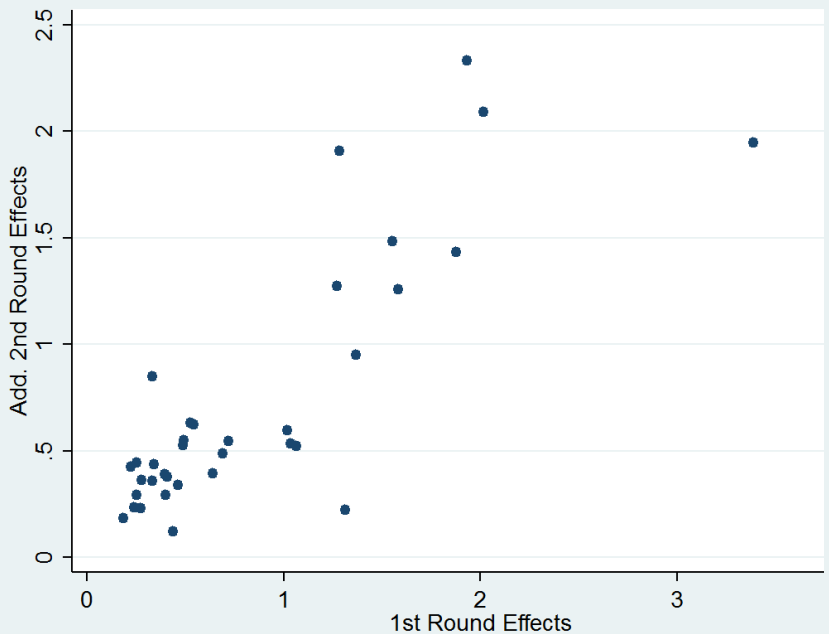
What are the reasons for the non-linear relations between the impact of the first and second round?

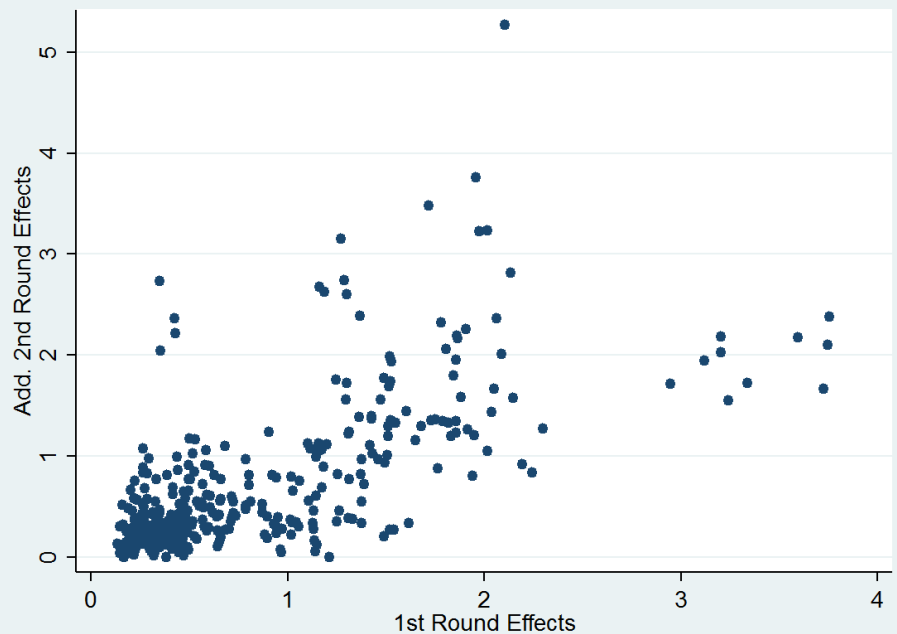
Potential influencing factors:

- Concentration of the first impact with respect to the participant affected.
- Characteristics making participants vulnerable to lack of incoming liquidity ("catalysts").
- Specific types of payments.

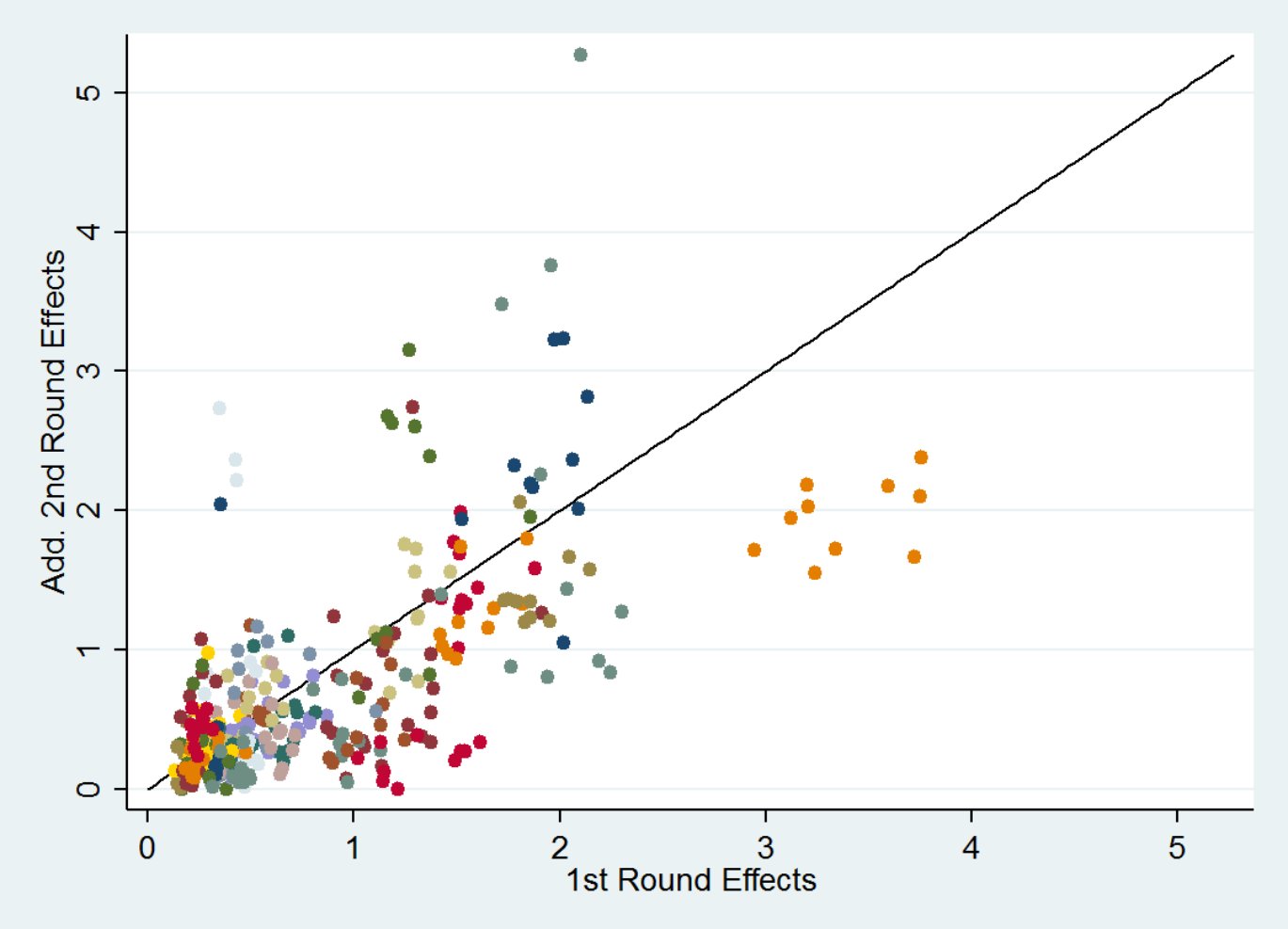
First and second round effects

In terms of individual days simulated instead of averages:



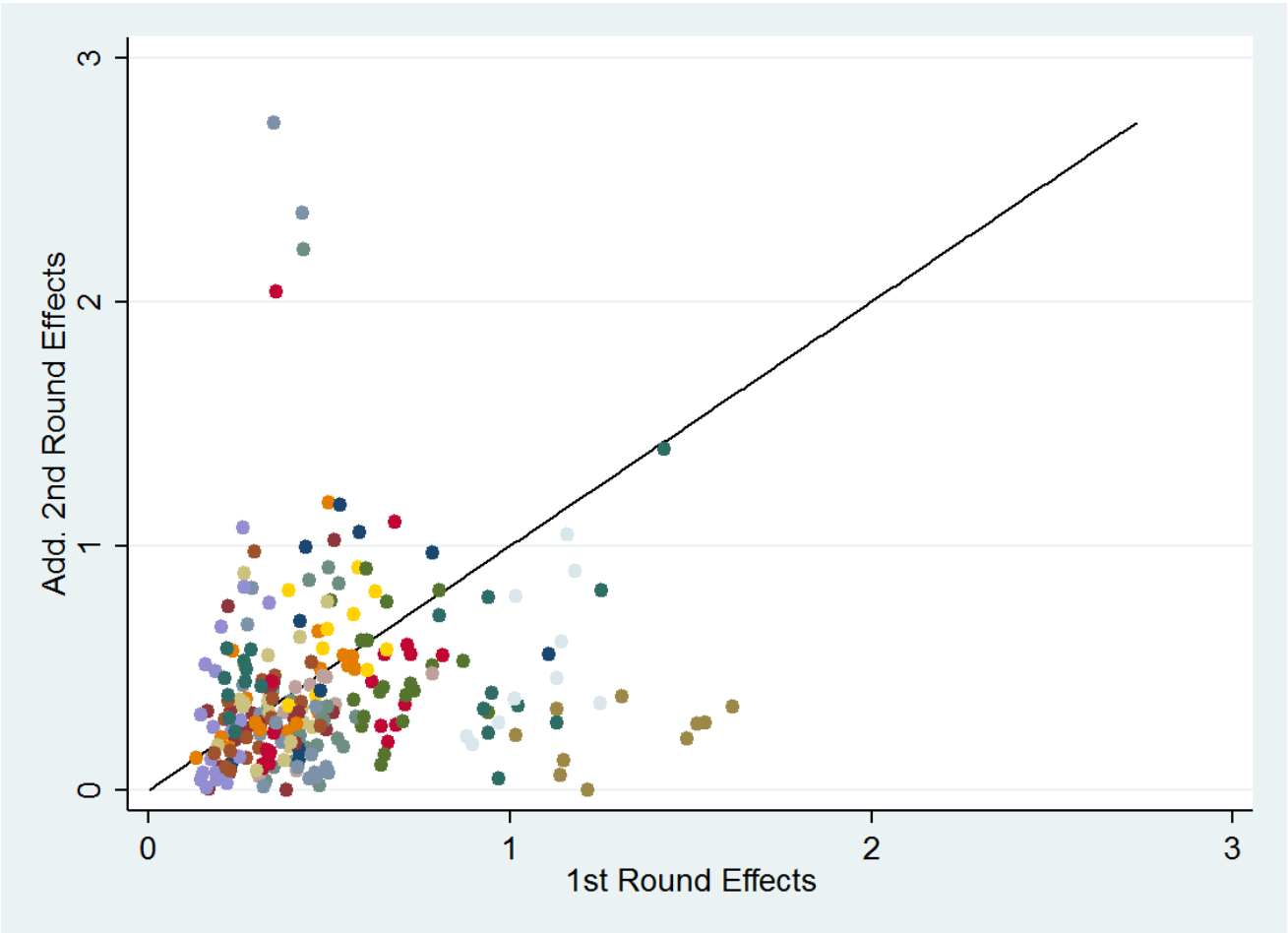


Clusters of critical participants



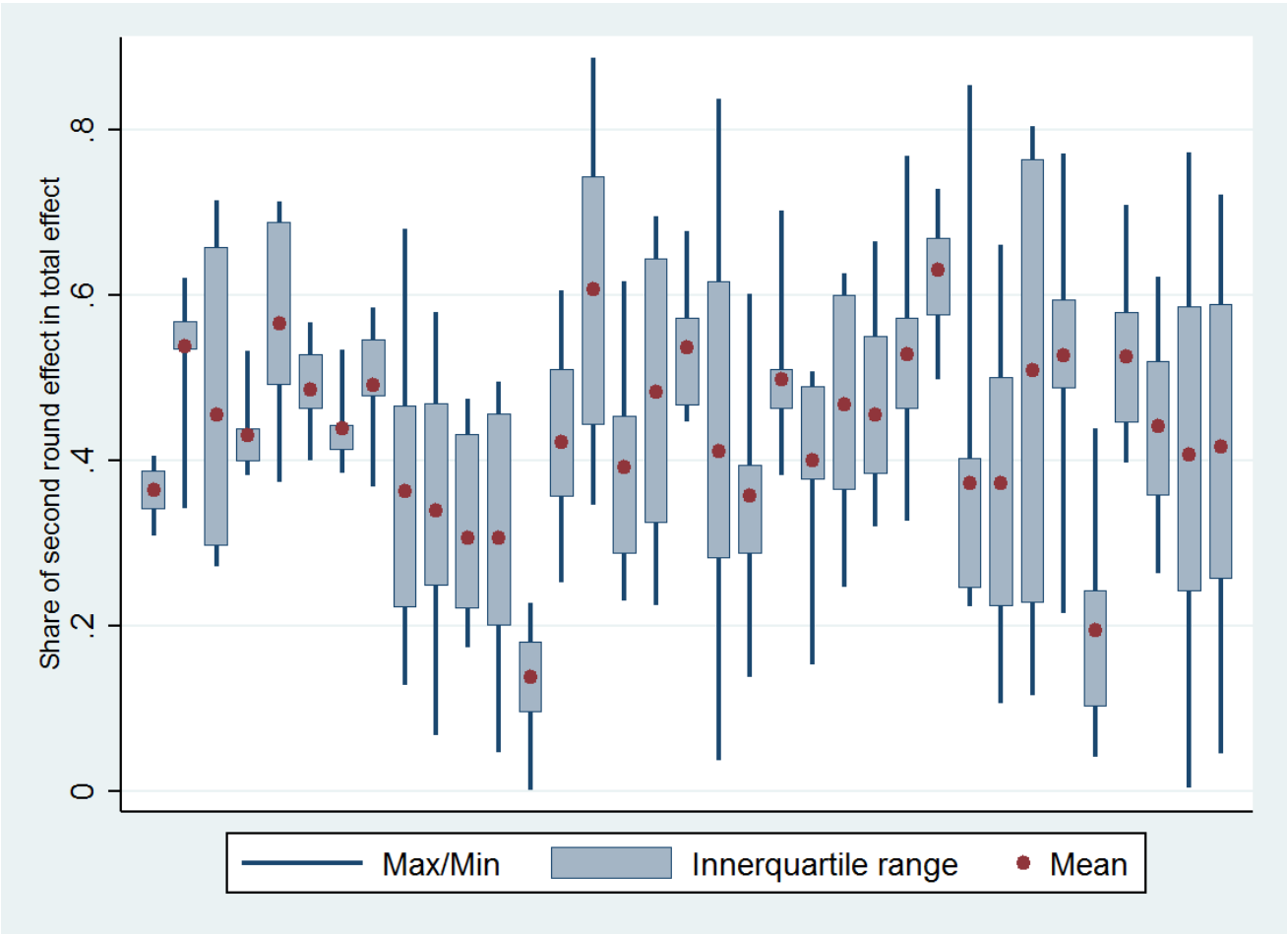
Clusters of critical participants

Eliminating the 10 largest:



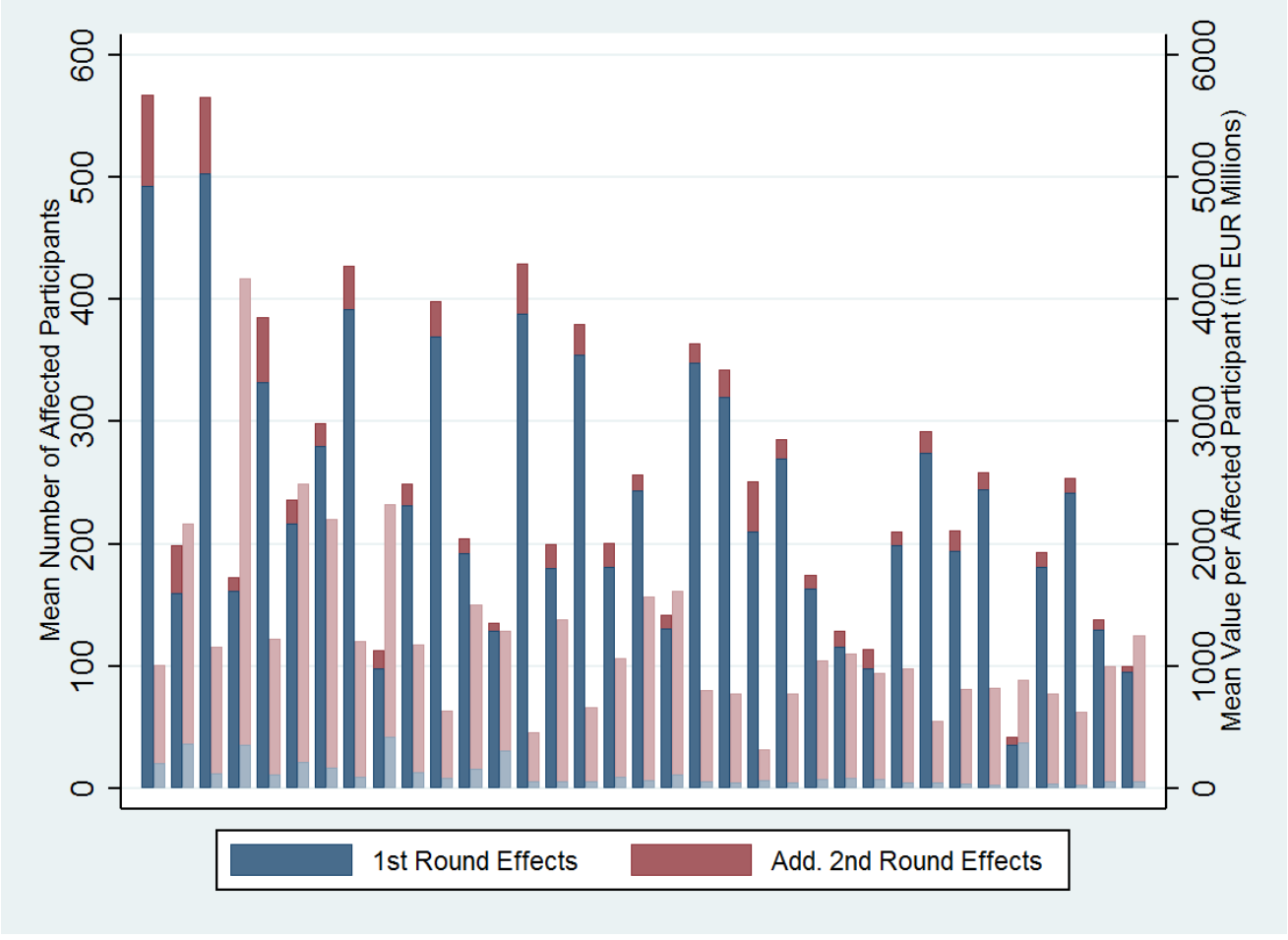
Share of second round effects by CP

Very heterogeneous results:



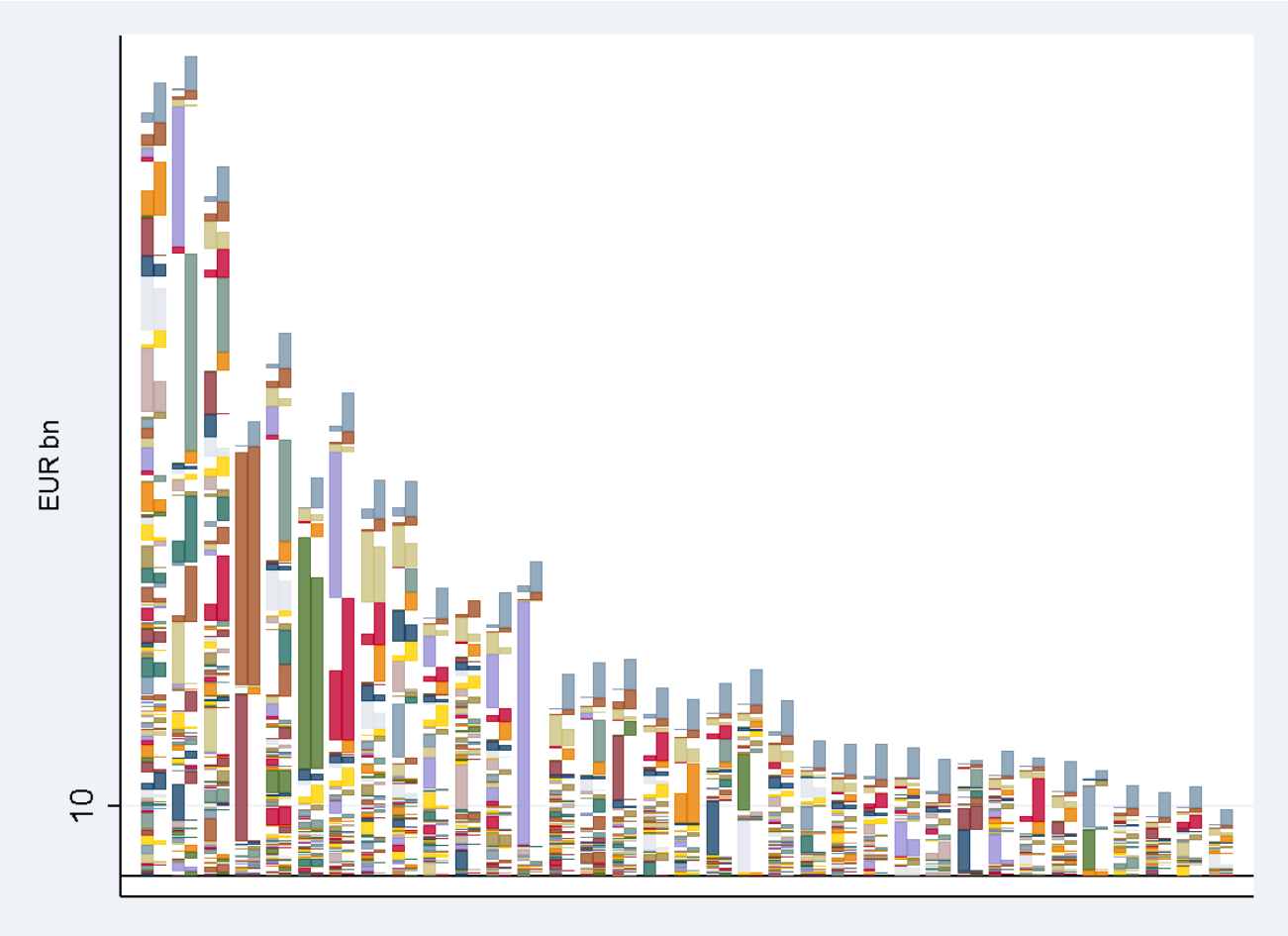
Affected institutions

Shift of focus on *catalysts* - daily averages:



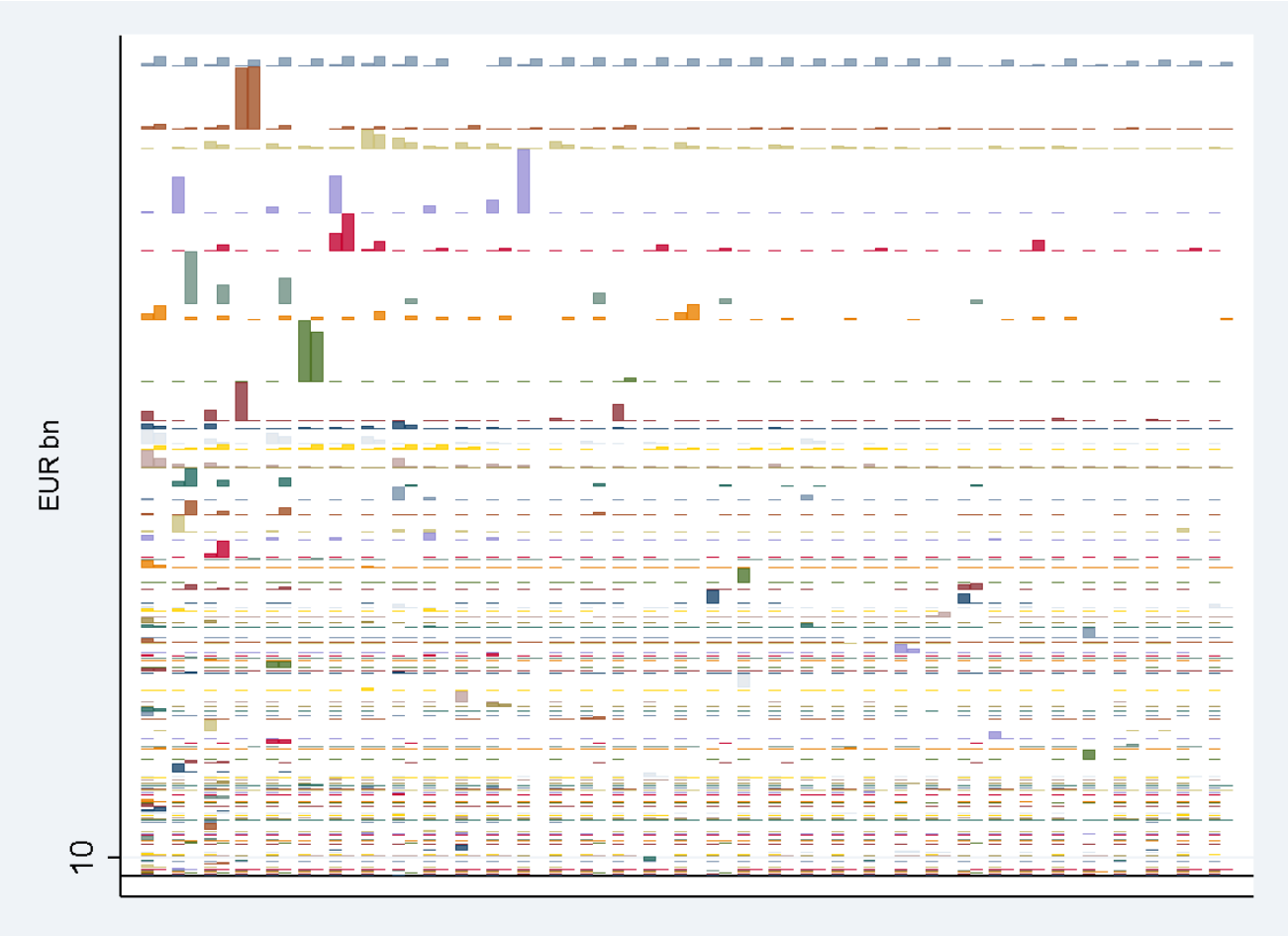
Affected institutions

First and second round effects at the level of affected participants:

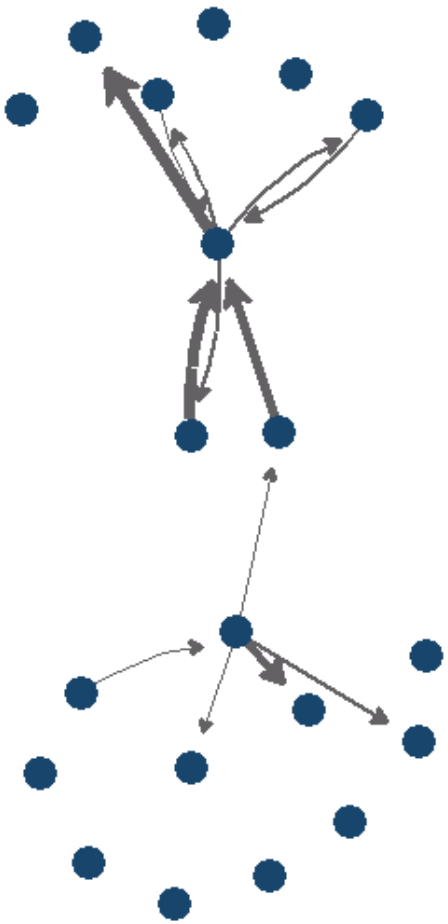


Affected institutions

Are the affected participants also critical?



Network analysis



- Ad-hoc visualisation of the networks of unsettled payments in the scenario allows analysing the contagion effects in detail.
- Case-by-case analysis to assess the potential impacts of a technical outage of one participant.
- Network analysis methodology could be applied in order to make systematic analysis.

Simultaneous failure of two

Additional simulation of a simultaneous outage of the two critical participants with the two respective largest impacts in the individual simulation.

$1 + 1 = 2$?

- **Overlap**:
  Payment that is unsettled already in both individual simulations
  Effect of combinated simulation <Sum of individual simulations
- **Additional contagion**:
  Payments that are only unsettled if the effects are combined
  Effect of combinated simulation >Sum of individual simulations

Preliminary results indicate that the impact of the combined simulation is very close to the sum of the individual impacts.

Concluding remarks

- The identification methodology is continuously scrutinised and reviewed.
- The analysis is repeated every year and allows checking the robustness of the findings.
- "Simple" indicators seem to be a good proxy, but detailed analysis increases the understanding.
- Case-by-case analysis seems adequate due to the diversity of contagion channels and the importance of non-linear effects.
- In addition to the critical participants with respect to their impact in case of a technical failure, there is an additional group of participants potentially amplifying such effects - from a risk perspective, this allows mitigating the impact by focusing actions on these participants.

Thank you!

Critical participants of the seminar should now ask questions...

References

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