SUMMARY OF REPORT 2020:1

Fraud Detection and Compliance – Analysing Stability of Social Security Systems with ABM

Swedish Social Insurance Inspectorate

www.inspsf.se

Göteborg 2020

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Summary

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The Swedish Social Insurance Inspectorate *(Inspektionen för social-försäkringen, ISF*) is an independent supervisory agency for the Swedish social insurance system. The objectives of the agency are to strengthen compliance with legislation and other statutes, and to improve the efficiency of the social insurance system through system supervision and efficiency analysis and evaluation.

The ISF's work is mainly conducted on a project basis and is commissioned by the Government or initiated autonomously by the agency.

This report has been initiated by the agency. It focuses on compliance and detection of unjustified claims within the Swedish social insurance system, and to what extent certain levels of screening can be expected to influence compliance and unjustified claims. The analysis is based on a social learning model and the interaction between individuals is simulated with an agent-based model. The structure or amount of interactions in reality is not known and the analysis gives qualitative insight into a question previously not thoroughly addressed by research. Conclusions from the results relate to the way to optimally design screening and control, and what information is needed to make such decisions. The qualitative insights suggest that the optimal amount of screening differs considerably depending on which type of communication is assumed and thus it is crucial to find out how information is actually diffused.

Background

Efficient fraud detection and a high level of compliance are generally viewed as crucial to the stability of social insurance and the population's acceptance of extensive use of tax-based transfers.

This report deals with issues not addressed within research concerning how screening qualitatively is affected by different interactions between individuals. As such it will give directions for further research or actions to find adequate data for optimizing screening interventions.

Objectives

The report focuses on propagation of information about screening within the social insurance system through communication between individuals. And, to what extent certain levels of screening can hypothetically be expected to influence compliance. One hypothesis is that if individuals are

assumed to communicate with others and are influenced by their experiences, not everyone needs to be screened, but dissemination effects can be achieved by strategically directing screening. Using an agent-based model with some plausible assumptions on individual behaviour and a varying degree of communication will enable policy makers to gain qualitative insight into a complex and under-researched question.

The intention is to examine whether there are levels of screening that are excessively high or low under different conditions to keep compliance at a stable high level (unjustified claims at a stable low level). By varying the perceived cost of detection, it is also possible to highlight the implications of introducing sanctions of various kinds as a complement or substitute for screening.

It should be emphasized that the objective is concerned with qualitative insight, not empirical understanding or normative design.

Methods

The behavioural model is based on a social learning model and the interaction between individuals is simulated with an agent-based model. The idea is adapted from the paper by Nowak et.al (2017).[1] What is modelled is the individual propensity of claiming social benefits without justified cause. The individual continuously updates his or her propensity, either by adding new information (as own experiences or as information from the social network) or as a gradual return to an original inclination adjusted by a memory parameter. The original inclination could be used as a general level of compliance in society, but is assumed constant in the model.

The individual meets two exogenous impulses, claiming benefits of a justified or an unjustified cause. Action on the unjustified cause is based on his or her individual propensity of the socially acceptable behaviour. The first impulse entitles to income support, but the second does not if detected as unjustified.

The impulses are not modelled. They are random impulses and parameters set at model initialization. They could be viewed as environmental parameters and thus possible to act upon through policy, making different actions more or less accessible in different circumstances.

When choosing sick-leave, there are two possible experiences; screened or not. Thus, there are four outcomes (five if the event "not report sick-leave" is included). The valuation of each is a policy parameter in the simulations and different values can be tested and evaluated. In cases where the individual has not claimed benefits, no screening will be made, but communication with others can still affect the propensity in the next period.

Models with different communication levels are set against each other. The first is a pure individualistic model where individuals do not communicate with others. The others are models with increasing levels of

[1] Nowak, S. A., Matthews, L. J. and Parker, A. M.: A General Agent-Based Model of Social Learning. Santa Monica, CA: RAND Corporation, 2017. https://www.rand.org/pubs/research_reports/RR1768.html, last accessed 2019/04/29.

communication. No dynamic adaptation of communication is used but could be an interesting extension. The amount of screening is varied but random between persons on sick-leave. Two different screening approaches are used, a random approach and a profiling approach. In the profiling approach screening is based on an assumed knowledge of individual propensities.

The outcome from different model settings are described using diffusion curves, where the number of individuals who would make an unjustified benefit claim if an opportunity arises is reported.

Findings

The analysis gained important qualitative insight regarding optimal design of control taking into account the possibility of communication within social networks. Screening is costly, and should be kept to a minimum, but still be high enough to prevent unjustified claims. Under some circumstances, e.g. when individuals do not communicate, the amount of screening needed is considerable. If however individuals tend to communicate with others to a great extent the same amount of screening would be rather wasteful. Because outcome differs considerably depending on which kind of communication is assumed, it is crucial to find out how information is actually diffused.

When introducing profiling the model gave, at first sight, puzzling results. In a non-communicating network profiling - compared to using the same level of screening with a random sampling method - increase the positive predictive value (PPV, share of unjustified claims in a sample) with increased screening, and reduced the total number of unjustified claims. In a communicating network profiling also increased PPV but at the same time a relative increase in the total number of unjustified claims. Further analyses reveal both the mean of propensities and its variance as important for the outcome. In both a communicating and a non-communicating network the variance was lower using profiling. Individuals were more alike and behaviours thus more consistent within the group. However, the mean was not lowered to the same extent when using profiling, explaining the relatively higher probability of unjustified claims. Further analysis is needed to verify if this is a general result or specific to the model used.

Finally, using an agent-based approach it was possible to demonstrate the hidden benefits of screening due to prevention. Higher levels of screening make it more difficult to find additional unjustified claims. This is expected due to a lower propensity in making unjustified claims in the aggregate. The visible revenue from finding unjustly paid benefits is thus lowered, making it difficult to balance costs to visible revenues. However costs relative to hidden revenues suggest a substantial social benefit from increasing screening even though few unjustified claims could be detected.

Recommendations

We believe that using agent-based simulation is a valuable tool for understanding the underlying mechanisms that can be linked to control. The method gives reasonable results and deepens the understanding of this complex area.

Properly used agent-based simulation could also be of benefit in understanding outcomes from interventions where evaluations are difficult to conduct, in planning of new interventions and to test various alternative policies in different policy areas.