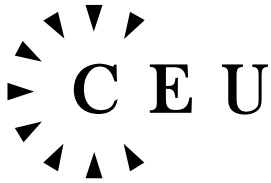
Networks and Cities



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RESEARCHER DECLARATION

I Luis Guillermo Natera Orozco certify that I am the author of the work Networks and Cities. I certify that this is solely my own original work, other than where I have clearly indicated, in this declaration and in the thesis, the contributions of others. The thesis contains no materials accepted for any other degrees in any other institutions. The copyright of this work rests with its author. Quotation from it is permitted, provided that full acknowledgement is made. This work may not be reproduced without my prior written consent.

Statement of inclusion of joint work

I confirm that Chapter 3 is based on a paper which was written in collaboration with Taha Yasseri, Balázs Lengyel, and János Kertész. I conceived of the idea to relate social capital with local corruption risk outcomes by comparing data from procurement contracts and the online social network. Dr. Kertész and I conceived the details of the implementation. Dr. Lengyel and I collected data on municipalities. Dr. Yasseri and I developed the methods used. I carried out the analyses of the data. All authors contributed to the writing of the paper on which the chapter is based and gave final approval for publication. Dr. Kertész endorses this statement with his signature below.

I confirm that Chapter 4 reuses a plot from a working paper written in collaboration with Mihály Fazekas on the impact of corruption on public procurement market structure. The plot, which I drafted, serves as a prototypical example of the representation of procurement markets as networks. The remaining contents of the paper are independent of the contents of Chapter 4. Dr. Fazekas endorses this statement with his signature below.

I confirm that Chapter 5 is based on a working paper which was written in collaboration with János Kertész. I conceived of the idea to use a co-bidding network framework to study collusion. Dr. Kertész and I collaborated on developing and improving the methods used in the paper. I collected the datasets used and implemented the methods. Dr. Kertész and I and both contributed to

the writing of the paper on which the chapter is based and gave final approval for submission. Dr. Kertész endorses this statement with his signature below.

Signature of PhD Candidate:

March, 2020

Signature of Dr. Federico Battiston, endorsing statement of joint work:

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ABSTRACT

Though corruption is a broad notion encompassing many kinds of behavior, it always has a relational aspect. Consider how a driver bribes a policeman, how a minister steers a contract to build a hospital to his son-in-law's construction company, how two managers from different firms agree to avoid competition in a region, or how a regulator goes easy on a potential future employer during an audit. The observation that interactions between people, firms, and institutions are where corruption happens is not a new one, but certainly merits further investigation. A better understanding of the relationship between the networks that these connections form and corruption can explain why corruption is so difficult to defeat.

This thesis applies the methods of network science to the study of corruption and its relationship with markets and society. I argue that corruption emerges from specific patterns of interactions that can productively be described using networks. The dyads of actors engaging in a corrupt behavior, the driver and policeman, minister and son-in-law, etc., are embedded in networks of social relations that facilitate corruption. Within this framework, the thesis addresses several questions about corruption. Why does corruption persist in certain communities? How does corruption relate to the organization of markets? How does corruption emerge when it depends on cooperation in highly adverse circumstances? I address these questions empirically using newly available micro-level data on corruption risks in public procurement.

Starting with a study of Hungarian towns, I relate corruption risk in local government contracts to the structure of their social networks. I find that fragmented towns have higher corruption risk, while towns with residents that have diverse connections have less. This suggests that corruption is embedded in the social networks of places. Next I zoom out to the national level, comparing the procurement markets, conceptualized as networks of issuers and winners, of different EU countries. I find a strong relationship between centralization and corruption risk. On the other hand, heterogeneity in market responses to changes in government across the EU suggests that corruption can be organized in many different ways. Finally, I investigate cartels, or groups of

firms that illegally agree to avoid competition. By drawing networks of firms that bid for the same contracts I highlight niches in markets where cartels are more likely to thrive.

Acknowledgements

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