Peer effects and interorganizational performance similarity: A longitudinal study

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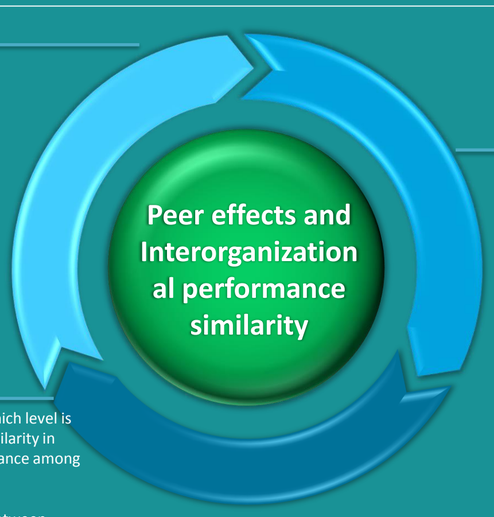
Introduction

Why?

There is growing evidence that peer effects modify individual behaviours and affect performance. Less is know about the range of such effects beyond an individual level , e.g dyadic relations through the network in which such ties are embedded



Gaps

Economics literature fails to explain peer effects in organizational behaviour

Few studies in interorganizational literature have used the joint effect of network levels to explain peer effects between organizations (Mizruchi and Marquis,2006; Pallotti et al., 2015).

Aims

This study aims to clarify and analyse which level is more appropriate for understanding similarity in behaviour between actors, e.g. performance among organizations overtime

it aims to empirically test peer effects between organizations at different network levels simultaneously

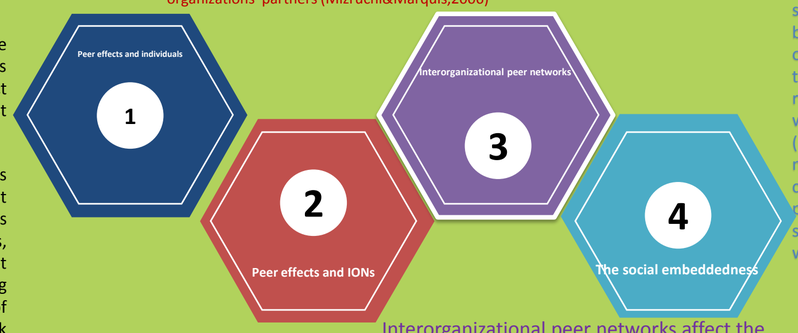
Literature Review

Social actors are affected in their behaviors, attitude and orientation by their peers, i.e., other actors that are connected to them through network ties

Peer effects refers to the correlation between outcomes of individuals who interact together (Braoumolle' et al.2009

More recently, researchers (Calvo et al.2009; Patacchini et al.,2017) show that peer effects vary across network members, hence they are not homogenous, depending instead on the position of individuals within the network structures

if the focus is the relation between social relations and similarity of behavior (e.g. peer effects), interorganizational dyads represent the smallest unit in which peer effects can be meaningfully detected, thus each dyad should be investigated individually. As a result, peer effects come from the accumulation of decentralized dyadic relations with organizations' partners (Mizruchi&Marquis,2006)



Interorganizational peer networks affect the behavior and performance of organizations by facilitating access to extramural resources as potential stimulus to "initiate changes aimed at achieving higher performance" (Zuckerman and Sgourev, 2006:1330).

The social embeddedness perspective that inspires this work also offers a coherent theoretical account for the role of peers in promoting similarity in performance behavior, whereby the range of their effects starts from: (i) the dyadic level, e.g. dyadic relations and its strength with direct network partners, (ii) network subgroups, e.g., membership in network cliques, and to (iii) network positions, e.g., positional similarity in the network as a whole

Empirical Setting

The opportunity to demonstrate the empirical value of my hypotheses is provided by a longitudinal dataset collected on hospital organizations in Lazio an Italian Region over the period 2006 to 2009

I focus on healthcare setting for four reasons: first, hospital performance is well-documented and allows testing for the existence of peer effects among hospitals. The Regional Health Agency also provided access to data on patient transfer relations that I use to measure collaboration between each and every pair of hospitals in the Region

Sources of high quality information are available and publicly accessible which provide information and useful knowledge for the government and management of the regional health system

Hospitals operate in technical and institutional environments (Ruef and Meyer, 1983) in which the survival of hospitals depends critically on their ability to satisfy performance expectations of multiple stakeholders. Hospitals are held accountable for their outcomes, therefore, they must garner legitimacy and obtain support from external constituencies

Peer referrals are common in hospitals, whereby hospitals are more likely to interact with specialties of other hospitals with whom they have prior, established relationships (C.Stadtfeld et al.,2016)

Data

The data are collected from archival sources contained in the regional hospital information system database (SIO)

All elective patient transfer relations collected over 4 years 2006-2009

45'828 dyads (37'272 null)

110 healthcare providers: public and private accredited hospitals (university policlinics, hospital trusts, research hospitals, private accredited, classified, LHU hospitals) distributed over 12 LHUs (administrative and geographical units)

Variables

Variable	Definition	Type	Mean	Std. Dev.	Min	Max
CPI differences	Performance differentials	float	0.28	0.294	0	1.963
Direct interaction	At least one patient transfer	binary	0.187	0.39	0	1
	Number of patients transferred	count	1.442	10.107	0	774
Clique co-membership	Number of shared cliques	count	11.616	35.096	0	255
Structural equivalence	Correlation rows / columns of patient transfer matrix	float	0.071	0.137	-0.072	1

Methodology

I used a dyadic panel model. The dataset is dyadic because each observation refers to one of the possible pair of hospitals in the sample, e.i. *Hi Hj*. The dependent variable is also dyadic, measuring similarity n performance. This dataset are panel because the dyads are repeatedly observed over time. The first lag of the dependent variable makes the model dynamic. Because the outcome is continuous and the key independent variables are at network level, I use a multilevel regression estimated by the Generalized Methods of Moments (GMM) (Arellano and Bover 1995) and Blundell and Bond (1998) and clustered the standard errors at sender and receiver levels. The empirical model adopted in this study takes the following form:

$$E(Y_{ij,t}) = (\alpha Y_{ij,t-1} + \beta_1 I_{ij,t} + \beta_2 I^2_{ij,t} + \beta_3 C_{ij,t} + \beta_4 G_{ij,t} + \beta_5 G^2_{ij,t} + \beta_6 P_{ij,t} + \beta_6 P^2_{ij,t} + \beta_6 P^2_{ij,t} C_{ij,t} + \delta X_{ij,t})$$

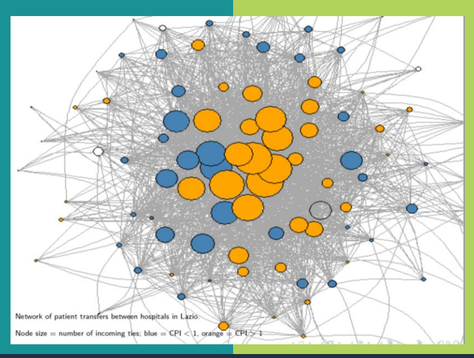
where $Y_{ij,t}$ is the difference in performance between hospital *i* and hospital *j* at time *t*; $Y_{ij,t-1}$ is the one period lagged dependent variable; $I_{ij,t}$ is the strength of ties; $\beta_2 I^2_{ij,t}$ is the strength of ties raised to the power of 2; $C_{ij,t}$ indicates the direct connect between hospital *i* to hospital *j*; $G_{ij,t}$ is clique co-membership; $\beta_5 G^2_{ij,t}$ is the clique co-membership raised to the power of 2; $P_{ij,t}$ indicates the degree of positional similarity; $\beta_6 P^2_{ij,it}$ is the positional similarity raised to the power of 2; $\beta_6 P^2_{ij,t} C_{ij,t}$ is the interaction effects for connection and structural equivalence; $X_{ij,t}$ summarizes the effect of covariates in the model, which may refer to *i, j* or both. Regarding parameters α is the effect of the lagged dependent variable, capturing persistence in performance similarity; the β measure the strength of the variables of theoretical interest; and δ measures the effects of control variables. Because the data are dyadic, continuous organizational covariates, (i.e. num. of staffed bed) enter into the model as absolute difference between the pair of hospitals. The smaller the difference is, the more similar the hospitals are with respect to the considered variable. For covariates taking categorical (LHU membership) and binary values, an exact match is used to identify hospitals in the same category

Results

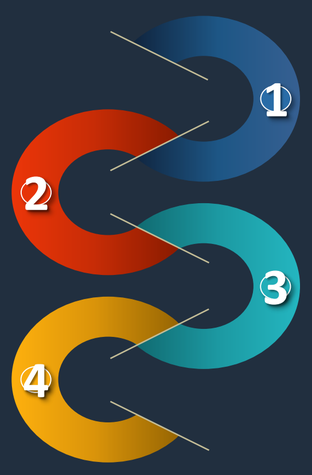
Variable	Model 0	Model 1	Model 2	Model 3	Model 4
Lagged CPI (diff.)	. .81110064***	.80458309***	.80439828***	.79693618***	79149801***
Tie strength		-.00012043	-.00012103	-.00010518	-.00048492**
Direct tie		-.04520273***	-.04524559***	-.03858156***	-.0447823***
Clique co-membership			-.00048676	-.00052646	-.00113183
Structural equivalence				-.14817162***	-.35200682***
Squared tie strength					1.726e-06*
Squared clique co-membership					.00001455
Squared structural equivalence					.3253148***
Interaction effect Direct tie*Structural equivalence					.08845321***
Geographical distance	-.00043122***	-.00050836***	-.00050865***	-.00061213***	-.00068475***
Competitive interdependence	-.14463582***	-.14174899***	-.14188843***	-.13968556***	-.13532698***
Service Complementarity	-.01461249***	-.01094972***	-.01090509***	-.00967657***	-.00776553***
Number of beds (diff.)	.00008502***	.00009324***	.00009317***	.00008839***	.00008742***
Number of discharges (diff.)	-6.751e-07***	-7.629e-07***	-7.643e-07***	-7.946e-07***	-8.058e-07***
Surgical DRG (diff.)	.03441298***	.02749632***	.02752238***	.02341608***	.02078299***
LHU (matches)	-.0094513*	-.00121273	-.00121091	-.01421903***	-.00927625*
Organizational form (matches)	.01090733***	.01203994***	.01203527***	.01594943***	.01641053***
Metropolitan location (receiver effects)	-.0006506	-.0006089	-.00060202	-.00082102	-.00095147
Level of care (matches)	.00625379*	00559209	.00515895	.00464946	.00460906
Both disconnected (matches)	-.11401722*	-.11277599*	-.11287915*	-.11935851*	-.12234309*
Cons	.12789819***	.13078182***	.13133828***	.14392827***	.15007947***

Legend: *p<0.05; **p<0.01; ***p<0.001

Collaborative ties among hospitals through patient transfers



Discussions



Peer effects at network subgroups

I found that clique co-membership is not significantly associated with performance similarity between connected organizations: organizations that share the same cliques have no effect on performance over time – other things equal-. I believe that the fact that peer effects do not operate at network subgroups is a new result that opens new direction for future research about the level at which peer effects operate.

Interaction effect: structural equivalence & cohesion

I found support for the interaction effect between structural equivalence and direct relation, suggesting that organizations occupying the same network positions are more expose to additional influence in a way that are strongly connected (direct relation) and share similar indirect partners (indirect relation), hence they are more likely to perform similarly (Burt,1987).

Peer effects at dyadic level

I found a non-linear effect of the strength of direct social on the propensity of interconnected organizations to perform similarly: as the intensity of direct relations increases, performance similarity increases at first, then it reaches a minimum point beyond which peer pressure further increases in dyadic relations, are accompanied by an increase in performance differentials

Peer effects at network level

I found that peer effects operate more strongly at network level. In particular, I found a non-linear effect of structural equivalence on the propensity of interconnected organizations to perform similarly over time. As positional similarity increases interorganizational performance similarity increases at first, then it reaches a minimum beyond which competition further increases, are accompanied by an increase in performance differentials.

Conclusion & Future Work

A critical empirical issue that I addressed in my research stemmed from the considerable support in network and economic literature for explaining similarity in behavior as a result of the existence of peer effects. Consequently, attempting to explain peer effects and interorganizational network would suffer from the problem about the network level of analysis. I overcome this issue by empirically testing the effect of peers from dyadic to global network levels of analysis

B using dynamic panel data I showed that peer effects operate more strongly at dyadic and network levels wherein a U-shaped effects shown. By relying on the embeddedness perspective (Uzzi, 1996,1997), I explore how organizations are embedded in a network of interorganizational relations that they actively established

This work builds on previous research in peer effects and interorganizational literature and I extend the continuing debate over the level at which peer effect operate (Mizruchi and Marquis, 2006; Pallotti et al., 2015). The results provide an insight about which level is more appropriate for understanding similarities in performance between organizations overtime

Further research could use advanced network statistical methods for understating the co-evolutionary processes linking network structures and organizational behavior, e.g. Stochastic Actor-oriented by using a quadratic function of the values of the sender and receiver (Lomi and Snijders,2018).

Comparative analysis could provide further insights on why and at which network levels hospitals tend to perform similarly