

Impact of Marketplace Network Positions on Seller Performance Using Brokerage, Closure and Crisis Moderation Models

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Abstract – The importance of network effects for the competitiveness and efficiency of sellers in digital markets is increasing. We investigate the network topologies of marketplaces, especially broking and closure, and its impact on seller efficacy in different market situations. For this research, a network-oriented paradigm is developed, with the quantitative data from 3,951 observations of 1,023 Etsy vendors, including the variables of structural roles, market environment and financial crisis. We examine the effect that information availability via trading and connection durability via closure has on sellers' outcomes. Our findings show that the benefits of networks rely on the context and that sellers need to have the ability to explore, coordinate and adapt to unanticipated market situations.

Keywords – Digital Marketplaces, Seller Performance, Network Analytics, Brokerage, Closure, Structural Holes, Online Commerce, Crisis Dynamics.

I. INTRODUCTION

Digital marketplaces have revolutionized commerce by linking buyers and sellers across geographical boundaries, enabling many transactions and the creation of concrete relational structures of products, reputations and shared customers. Marketplaces function through methods that create buyer-seller relations, rather than through individual buyer-seller transactions. The role of sellers in these networks may affect the content of information they can access, how much competition they face and how they adapt. The large volume of data collected online shows that there are regularities in the value of transactions as well as in the frequency of activities and interactions, which indicate the existence of a non-negligible influence of previous trade relations on a buyer's future behavior [1].

Network design has an impact on business outcomes at the vendor level because a seller's network can shape their demand, competition, and market perceptions. However, not all network interconnections are good and effective. The same connections that enable the flow of information can also lead to greater organization overlap and a clearer competitive landscape. O'Reilly and Finnegan [2] also explore the relationship between seller performance and alternative network topologies on the marketplace in diverse markets.

Two basic structural strategies are of special importance: broking and closure. Broking is a role where you can connect otherwise disconnected contacts and gain access to unique knowledge via structural gaps. This position can assist in the discovery of new products, market signals and demand trends. But closure is about close, interlocking, local links, which may allow for regular contact, supervision, coordination and dependable information sharing. There are a number of strategic benefits to these techniques. Broking is generally linked with exploration as it integrates many diverse disciplines of knowledge. The term closure is mostly associated to exploitation, because of its efficiency and the fact that it leads to greater awareness and development of existing processes. These activities work on the vendor environment.

Previous studies of online marketplaces have shown that a seller's follower system with structural holes may enhance sales efficiency, yet with the level of sales efficiency hinging on seller properties and network state. Based on the theory of structural holes, we investigate the consequences of vendor followee systems for efficiency in social markets, and under which circumstances this effect becomes different. A data set has been recorded and analyzed of 3951 records of 1023 Etsy shops and their followee systems [3]. The empirical results confirm the important role of structural holes in the sellers' followee networks in their sales success. The effect is dependent on the situation, for example the degree of product diversification of those who sell the products, the relevance of the networks of followees, and the status heterogeneity. The positive effects of structural holes in sellers' followee systems are not sensitive to the amount of product variation, the number of projecting followees, or the extent of heterophily in followee position.

Group purchasers also make it very apparent to each other who is a competitive merchant. A broker might be able to learn new things, but then become more competitive; a closed network might be able to improve the coordination, but not be able to discover possibilities. Buyer-seller and intra-seller networks have been found to have either substitutive or complementary effects on the profitability of a seller's account, and they can have different degrees of network density and centralization. These claims help to develop a context-based view of the market composition [4].

The network position-performance relationship is more fragile in economic turmoil. Economic turbulence has resulted in uncertainty and diminishing demand and vendors are faced with a dilemma, pursue unknown potential or focus on existing connections and efficiencies. In the context of market crises, the research on organizational network suggests that idiosyncratic instead of common structural holes may result in better performance, enabling ambidextrous responses to bad conditions.

Therefore, broking performance is based on sellers' capacity to transform the informational access in benefits in a competitive environment with overlapping and limited resources. Closure might be particularly critical when vendors require stabilizing transactions, strengthening reliable connections, and controlling scarce resources [5]. Expanding upon this research, the authors present their work analyzing how closure and broking impact seller efficiency in a marketplace throughout its infancy and developed stages, contingent on a liquidity crisis of the seller. This paper explains how, within the same marketplace, network topologies can yield different performance outcomes under different market conditions.

The rest of this paper is organized as follows: Section II reviews research background and theoretical foundation of network structures in digital markets. Section III introduces the assumptions of this study. Data and methodology including data sources, sample description, variable measurement, analytical approach, model specification and hypotheses are presented in Section IV. Findings consisting of descriptive statistics and correlations, the role of network structures on seller's performance and the moderating effect of financial crisis are illustrated in Section V. Section VI concludes the paper with a summary of main findings and implications, limitations and suggestions for future research.

II. BACKGROUND STUDY

Electronic marketplaces have changed the way commerce is done in today's society because they enable buyers and sellers who are geographically dispersed to connect with one another through technology. Digital markets are relationship driven ecosystems in which transparency, information exchange, customer engagement, other actors in the market, and strong network positioning determine performance instead of the traditional competition paradigm which focuses on firms' internal resources and tangible assets. Studies have shown that when analyzing digital platforms, network effects and ecosystem hold true when building value because users of the platform recognize the value in connectivity, information exchanges and opportunities created [6]. Therefore, seller performance is defined by examining the unique characteristics of sellers and where they are positioned in the network which can affect access to resources and opportunities for a competitive edge.

Social networks theory is a key concept for understanding the influence of networks on economic outcomes. In a network environment people are in different places, which means they have access to information, resources and opportunities. Persons acting as a liaison between different groups may benefit from the diversity of information and the power to affect the transfer of knowledge through structural gaps [7]. In a digital marketplace, for instance, a selling broker can gain access to more consumers, trends and competition. Recent research on marketplace networks also showed that a seller's position in the network can have an impact on its sales success because of its ability to access unique information, as well as unique business opportunities.

Network transparency does not necessarily lead to improved effectiveness. Study fields are available in the trade. If numerous companies are gathering similar data and projecting similar market openings then there will be a tremendous competitive push for a big number of supplier networks. Social capital theory suggests that networks and connections provide valuable resources in terms of a reduction in uncertainty and an increase in the willingness of those in the network to engage. The collapse of the digital marketplace has made suppliers resilient by interacting with consumers. This boosts reliability in turn and better application of existing market prospects available.

General environmental issues may also impact on the salience of broking and closure. Various market situations have varying degrees of competition, information transfer, institutional help and technical improvements that could influence future assessments by the vendors on which technique to use: exploration or exploitation. Furthermore, changes in the economy might shift the strategic importance of network locations as uncertainty drives a greater need for efficiency in resource use, relationship stability and agility. Studies on organizational resilience have pointed out that organizations functioning in dynamic contexts need to find a balance between actions to encourage innovation and actions to ensure

operational stability [9]. The use of digital platforms and networked competition is becoming more popular. Few studies, however, have revealed what effect the various topologies of marketplace networks have on the success of the sellers under different market conditions.

In recent research, benefits of network growth or relational embeddedness have been emphasized and contextual factors have been ignored. Considering the difference in economic instability and the changing market conditions, Knight [10] explored the effects of the broking and termination on the efficiency of the seller. The purpose of this research is to uncover the extent of seller maneuverability for sustaining performance through network analysis and the use of digital marketplace theory.

III. HYPOTHESES DEVELOPMENT

Broking Experience With Different Market Scenarios

Broking is believed to enhance the likelihood of a successful sale for a seller by providing a quick identification of new opportunities and a knowledge lead. A manager in a broking role will get a snapshot of preferences from a range of clients across various groups and may identify changes in demand and other items that wouldn't be evident from any one group. This information can be especially beneficial in markets that have heterogeneous preferences and marketplaces that are quickly changing in terms of technology and where marketers can capitalize on innovative ideas generated by flexible products.

The positive relationship between structural gaps and the sales efficacy of a vendor in a social market provides empirical evidence for the notion that bridging a variety of ties can be associated with economic benefit [11]. Broking exposes you to other sellers who are looking to sell to your customers. However, buyers and sellers in developed markets are more likely to possess the financial resources, market infrastructures and strategic options to act upon information in a manner different from their rivals. Thus, the benefits of broking should outweigh the competitive costs of broking in mature markets in the exploratory context.

H1a: Broking positively affects sellers' efficiency in the complex marketplace.

In less developed markets, the force of group buyers may not be offset by the value of broking. While it may be beneficial for a vendor with a wide product line to have access to several different markets, the benefits of this information may be limited by the nature of slight product differentiation, resource constraints, or other institutional factors. Broking can lead to an increase in competition, but not to an increase in competitive advantage, if the brokers' clientele is the same as that of their competitors and they are listening to the same demand signals.

This is where the difference between exclusive and shared structural holes comes in to the crisis literature. As long as broking is not in contest with other users, there is a performance gain but there is not the same performance gain if there are shared structural gaps. Regular customers cooperation may not be as secure and as effective when it comes to distribution in a developing market. Vendors in an open network may be at risk of the costs of cooperation and competitiveness but not the benefits of discovery. Seller performance is expected to be negatively related to the broking in the emerging markets.

H1b: Broker influences the seller performance negatively in developing markets.

Market Closure at Different Levels of The Market

In developed markets, it is likely that the sense of closure will negatively impact the performance of sellers as they may be unable to receive the variety of information, they need to react to dynamic and competitive market conditions due to how their networks are overloaded. Sellers who are 'in the mix' of being surrounded by many similar relationships and contacts may be providing redundant messages, have stuck to their known buyer patterns, product lines, etc. This can limit the ability to seek out new opportunities, or act fast on a client's new requirements.

Direct competition among suppliers providing services to the same group of consumers can also be promoted by dense ties, which can reduce the benefits of cooperation. The studies on buyer–seller networks demonstrate that density does not have an all-positive effect, its involvement in profitability depends on its interplay with other structural aspects such as within seller density and centralization [12]. In more established markets, the redundancy of information and competitive overlap of closure might be more important than cohesive tie-up, especially when exploration and differentiation are paramount.

H2b: Closure adversely affects seller efficiency in developed markets.

In emerging markets, closure is expected to lead to better performance by the sellers because of a more efficient utilization of the existing ties. Dense networks can help in establishing trust, low-cost information and coordination, and credible information about known buyers and market practices. The improvements are particularly prominent in situations where sellers have fewer chances of earning a profit due to thorough investigation, less secure institutions, and resource constraints. Having close relations enables sellers to smooth demand, improve responsiveness and/or offer competition on reliable service and/or effective execution.

This is corroborated by the more general evidence that network density can be a relevant part of the seller's profitability in combination with other properties of the network [13]. Closure can lead to redundancy, but this cost is less important if the ongoing novelty, exchange and coordination of resources is less important than efficiency. Thus, the benefits of closure in terms of exploitation in emerging economies are expected to outweigh the informational limits of closure.

H2b: Closure has an effect on seller's efficiency that is positive in developing marketplaces.

The Financial Crisis as A Moderator Variable

Market crises have been demonstrated to generate performance advantages from uncontested structural defects that facilitates ambidextrous responses instead of shared brokers roles that offers less defensible advantage [14]. Trading on the marketplace with the general buyers. Financial contraction could lead to more competition and less information converts to better performance. Thus, the crisis is expected to have a negative effect on broking performance value in mature markets.

H3: Brokering improves the performance of the sellers in existing markets, while a financial crisis reduces that.

The crisis-oriented network study has demonstrated that the cohesion and the efficiency of the network is crucial to the flexibility of the organization and to its commercial recovery when disturbed [15]. Exclusion, therefore, creates an opportunity for sellers in the marketplace to capitalize on trusted relationships while simultaneously decreasing the risk of the expense of research. This adjustment can have significance in all market situations but in particular when it is the seller's primary reliance on established relationships and operating discipline. In conditions of crisis, the role of existing relations is increasing, so one would expect the closure performance to become more significant.

H4: The financial crisis positively moderates the relationship between the two variables of closure and seller performance.

IV. DATA AND METHODS

Data Source, Sample Design and Variable Construction

The paper analyzes transactions of a large online marketplace in mature and growing market categories. Seller competitive networks are based on common purchasers. The seller-marketplace-period panel contains network position, performance results and contextual information. Time invariant seller characteristics are controlled by using first differences. The number of baseline parameters are 41,420 and 3,002 for established and emerging markets in separate models respectively and 40,603 and 2,983 in the entire models.

Table 1. Marketplace Descriptive Statistics

Variable	Developed Markets (M ± SD)	Emerging Markets (M ± SD)
Number of items	54,343 ± 131.695	159,640 ± 225.359
Number of sellers	5,389,490 ± 3,901.050	284,688 ± 219.336
Factory ownership	0.014 ± 0.116	0.070 ± 0.255
Seller age (years)	15.594 ± 6.925	19.142 ± 7.210
Degree centrality	186.421 ± 311.791	17.109 ± 20.523
Closure	0.576 ± 0.256	0.790 ± 0.274
Brokerage	-0.115 ± 0.145	-0.353 ± 0.281

Notes. Values are expressed as mean ± standard deviation (M ± SD). Network measures include brokerage, closure and degree centrality. Factory ownership is measured as a dichotomous variable.

Descriptive statistics demonstrate structural variations, industrialized markets contain 54,343 items, 5,389,490 sellers, 186.421-degree centrality, and 0.576 closure, and emerging markets have 159,640 things, 284,688 vendors, 17.109-degree centrality, and 0.790 closure. The properties of the dataset are shown in **Table 1**. For each marketplace-period, we establish a seller-seller rivalry network by associating sellers who share buyers. Let $A_{mt} = (a_{ijmt})$ be the undirected adjacency matrix for marketplace m at time t where $a_{ijmt} = 1$ if sellers i and j share at least one buyer and $a_{ijmt} = 0$ otherwise. The degree centrality of seller i is given by

$$Deg_{imt} = \sum_{j \neq i} a_{ijmt}, \quad (1)$$

It counts the number of competitors that share buyers with the focal seller, and is the canonical definition of degree centrality in undirected graphs. To allow for comparison across marketplaces with various numbers of merchants, degree is standardized as

$$DegNorm_{imt} = \frac{Deg_{imt}}{N_{mt}-1} \quad (2)$$

where N_{mt} is the number of active sellers in marketplace m at time t . We measure closure as the local clustering coefficient of each seller's ego network in the competition graph. Let the neighbors of seller i be all sellers j with $a_{ijmt} = 1$, and let L_{imt} be the number of edges between these neighbors. The closure is

$$Closure_{imt} = \frac{2L_{imt}}{Deg_{imt}(Deg_{imt}-1)}, \quad (3)$$

for $Deg_{imt} \geq 2$, and zero otherwise, yielding values in $[0, 1]$ that indicate how densely interconnected the focal seller's competitors are. To interpret closure as a relative position within each marketplace-period, closure is standardized as

when $Deg_{imt} \geq 2$, and zero otherwise, providing values in $[0,1]$ that measure the density of interconnections among the focused seller's competitors. To understand closure as a relative position in each market-period, we normalize closure as

$$\widetilde{Closure}_{imt} = \frac{Closure_{imt} - \bar{Closure}_{mt}}{s(Closure_{mt})}, \quad (4)$$

where $\bar{Closure}_{mt}$ and $s(Closure_{mt})$ are the mean and standard deviation of closure across sellers in marketplace m and period t . Brokerage is operationalized as an effective size measure from the structural-holes framework. The effective size of seller i in a binary undirected ego network of size $n_{imt} = Deg_{imt}$ triangles among neighbors is

$$ES_{imt} = n_{imt} - \frac{2t_{imt}}{n_{imt}}, \quad (5)$$

This is the total number of alters minus the mean number of connections each alter has with other alters, following the traditional definitions of effective size in the structural-holes discourse. To obtain a context-specific brokerage metric, effective size is normalized for each market-period as

$$Brokerage_{imt} = \frac{ES_{imt} - \bar{ES}_{mt}}{s(ES_{mt})}, \quad (6)$$

where $\bar{ES}_{mt}$ and $s(ES_{mt})$ are the average and standard deviation of effective size among sellers in the marketplace at time t . Seller performance is a continuous dependent variable tracked at the seller-marketplace-time level. The empirical analysis focuses on the first order changes in performance, defined as

$$\Delta Perf_{imt} = Perf_{imt} - Perf_{im,t-1}, \quad (7)$$

where $Perf_{imt}$ denotes the performance level of seller i in marketplace m at time t . This transformation is consistent with the first difference treatment of explanatory variables and eliminates time invariant seller particular heterogeneity. The major explanatory variables are first differences of the standardized brokerage and closure measures and the normalized degree centrality. The changes are as follows:

$$\Delta Brokerage_{imt} = Brokerage_{imt} - Brokerage_{im,t-1}, \quad (8)$$

$$\Delta \widetilde{Closure}_{imt} = \widetilde{Closure}_{imt} - \widetilde{Closure}_{im,t-1}, \quad (9)$$

$$\Delta DegNorm_{imt} = DegNorm_{imt} - DegNorm_{im,t-1}. \quad (10)$$

$Crisis_{mt}$ is a marketplace-period indicator, which entered into the models in first difference form,

$$\Delta Crisis_{mt} = Crisis_{mt} - Crisis_{m,t-1}, \quad (11)$$

thus, capturing transitions into or out of crisis settings. The models allow for interactions of the time trend with time-invariant seller attributes. Let Age_i be the age of the seller, and $Mnft_i$ be a binary indicator for factory ownership. The corresponding interaction trends are

$$AgeTrend_{imt} = Age_i \times \Delta t_t, \quad (12)$$

$$MnftTrend_{imt} = Mnft_i \times \Delta t_t, \quad (13)$$

where Δt_t is the first difference of the time index across periods. Seasonal and temporal controls are first-differenced seasonal dummies, $\Delta Season11_t$ and $\Delta Season12_t$ and linear time difference Δt_t .

Analytical Framework, Estimating Technique and Model Specification

The analytical methodology relates the established network measures, contextual indicators, and controls to changes in seller performance using a series of first-difference linear models calculated independently for developed and emerging markets. Descriptive statistics and correlation matrices for items, sellers, factory ownership, seller age, degree centrality, closure and brokerage offer initial diagnostics on the joint behavior of variables and on the co-movement of network measures. The formal tests of the hypotheses, however, rest on the panel regressions.

The baseline first-difference model for mature markets ties changes in performance to changes in brokerage, closure and degree centrality, and seller-level and time controls. The specification at the baseline is

$$\Delta Perf_{imt}^{(D)} = \beta_0^{(D)} + \beta_1^{(D)} \Delta Brokerage_{imt}^{(D)} + \beta_2^{(D)} \Delta \widetilde{Closure}_{imt}^{(D)} + \beta_3^{(D)} \Delta DegNorm_{imt}^{(D)} + \gamma^{(D)'} Z_{imt}^{(D)} + \lambda^{(D)} \Delta t_t + \varepsilon_{imt}^{(D)}, \quad (14)$$

where (D) is the developed-market sample, $Z_{imt}^{(D)}$ collects covariates ($AgeTrend_{imt}$, $MnftTrend_{imt}$, $\Delta Season11_t$, $\Delta Season12_t$) and $\varepsilon_{imt}^{(D)}$ is an error term. We specify a similar baseline model for emerging markets with all parameters allowed to differ from the established markets.

$$\Delta Perf_{imt}^{(E)} = \beta_0^{(E)} + \beta_1^{(E)} \Delta Brokerage_{imt}^{(E)} + \beta_2^{(E)} \Delta \widetilde{Closure}_{imt}^{(E)} + \beta_3^{(E)} \Delta DegNorm_{imt}^{(E)} + \gamma^{(E)'} Z_{imt}^{(E)} + \lambda^{(E)} \Delta t_t + \varepsilon_{imt}^{(E)}, \quad (15)$$

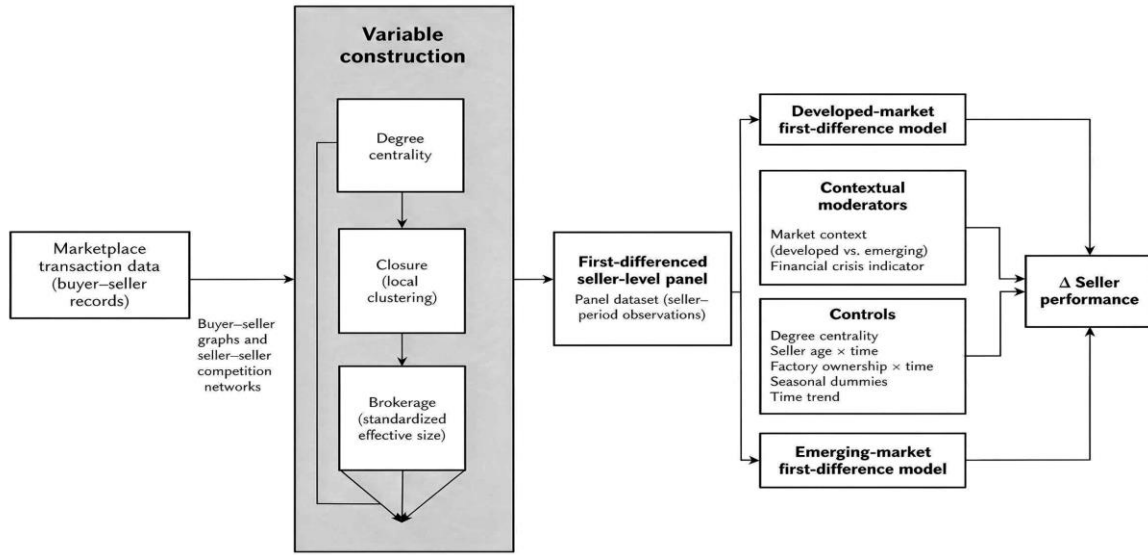


Fig 1. Framework for Empirical Research

Fig. 1 illustrates this empirical approach in one conceptual form, and depicts the input of marketplace transaction records into buyer-seller graphs, which are transformed into seller-seller competition networks. Such networks provide seller-level degree, closure (local clustering), and brokerage (standardized effective size), that are differenced over time and integrated with crisis indicators, seller-trend interactions, and temporal controls. The variables are entered in separate first difference linear models of developed and emerging markets relating changes in network structure and context to changes in seller performance in a manner compatible with the theoretical framework.

where (E) indicates the emerging-market sample and $Z_{imt}^{(E)}$ contains the same types of covariates as in the developed-market model. In estimating these models individually, we allow the links between network modifications, controls, and performance to vary freely between settings, corresponding with the different institutional frameworks of developed and emerging economies. We enhance the models with crisis main effects and interactions between crisis and network changes to include financial crisis as a moderator of network effects. The whole model for either context $c \in \{D, E\}$ is

$$\begin{aligned} \Delta Perf_{imt}^{(c)} = & \beta_0^{(c)} + \beta_1^{(c)} \Delta Brokerage_{imt}^{(c)} + \beta_2^{(c)} \Delta \widetilde{Closure}_{imt}^{(c)} + \beta_3^{(c)} \Delta DegNorm_{imt}^{(c)} + \beta_4^{(c)} \Delta Crisis_{mt} \\ & + \beta_5^{(c)} (\Delta Brokerage_{imt}^{(c)} \times \Delta Crisis_{mt}) + \beta_6^{(c)} (\Delta \widetilde{Closure}_{imt}^{(c)} \times \Delta Crisis_{mt}) \\ & + \beta_7^{(c)} (\Delta DegNorm_{imt}^{(c)} \times \Delta Crisis_{mt}) \\ & + \gamma^{(c)'} Z_{imt}^{(c)} + \lambda^{(c)} \Delta t_t + \varepsilon_{imt}^{(c)}. \end{aligned} \quad (16)$$

To avoid notation clutter, the interaction terms can be represented as

$$\Delta BrokerageCrisis_{imt} = \Delta Brokerage_{imt} \times \Delta Crisis_{mt}, \quad (17)$$

$$\Delta ClosureCrisis_{imt} = \Delta \widetilde{Closure}_{imt} \times \Delta Crisis_{mt}, \quad (18)$$

$$\Delta DegCrisis_{imt} = \Delta DegNorm_{imt} \times \Delta Crisis_{mt}, \quad (19)$$

to explicitly depict the crisis-modulated part of the linear predictor. Expressing all the covariates in a compact language, the linear predictor for context c can be expressed as

$$\begin{aligned} \eta_{imt}^{(c)} = & \beta_0^{(c)} + \beta_1^{(c)} \Delta Brokerage_{imt}^{(c)} + \beta_2^{(c)} \Delta Closure_{imt}^{(c)} + \beta_3^{(c)} \Delta DegNorm_{imt}^{(c)} \\ & + \beta_4^{(c)} \Delta Crisis_{imt}^{(c)} + \beta_5^{(c)} \Delta BrokerageCrisis_{imt}^{(c)} + \beta_6^{(c)} \Delta ClosureCrisis_{imt}^{(c)} \\ & + \beta_7^{(c)} \Delta DegCrisis_{imt}^{(c)} + \gamma^{(c)} Z_{imt}^{(c)} + \lambda^{(c)} \Delta t_t, \end{aligned} \quad (20)$$

and the full model becomes

$$\Delta Perf_{imt}^{(c)} = \eta_{imt}^{(c)} + \varepsilon_{imt}^{(c)}. \quad (21)$$

All models are estimated via OLS on the first-differenced panels, separately for developed and emerging markets.

V. RESULTS AND DISCUSSION

This section offers the empirical results of the study. First, the descriptive statistics and correlation analysis are carried out to investigate the features and the relationships of variables. It then provides regression estimates of the effects of marketplace network topologies on seller performance, and also examines the moderating effects of financial crisis conditions on these connections in developed and emerging nations.

Descriptive Statistics and Correlations

Summary statistics for all variables are given in **Table 1** and **Table 2**. The average brokerage in the established market is -0.12 and -0.35 in developing markets. The table shows that vendors in the developed markets have larger intermediary roles than vendors in the developing markets. The average closure is 0.58 for the advanced market and 0.79 for the developing market, which means that vendors in the advanced market have less interconnected systems than vendors in the developing market.

In the developed market, the average seller degree centrality is 186. This means that averagely, a vendor has approximately 186 rival vendors seeking similar customers as the major vendor. Conversely, the average vendor network centrality in the undeveloped market is approximately 17, meaning that every vendor is facing 17 rivals targeting similar customers. The network centrality comparison of mature and developing marketplaces clearly indicates that the mature markets provide additional benefits at the same time that it is more competitive than the developing market. The projection findings of M1 (Model 1) and M2 (Model 2) are shown in **Table 3**, respectively. As we observe uniform outcomes in both models, we elaborate on our findings on M2.

Table 2. Correlation Matrix for Variables in The Marketplace

Variable	1	2	3	4	5	6	7
1. Number of items	1						
2. Number of sellers	-0.144***	1					
3. Factory ownership	0.205***	-0.081***	1				
4. Seller age	0.205***	-0.262***	0.146***	1			
5. Degree centrality	0.539***	0.113***	0.129***	-0.125***	1		
6. Closure	0.148***	0.279***	0.014**	-0.618***	0.543***	1	
7. Brokerage	0.072***	0.240***	0.001	-0.288***	0.268***	0.694***	1

Note. Pearson correlation coefficients are reported. $p < .10$, $p < .05$, $p < .01$.

Network Structure Effects On Performance

Table 3 shows that broking has a significantly positive effect on the success of merchants in sophisticated markets ($\beta_1=0.667$, $p<0.05$). This positive effect is mitigated, even negative in emerging markets ($\beta_1=-0.977$, $p<0.01$). These results support H1b but not H1a. In addition, closure has a considerably positive influence on emerging markets ($\beta_2=0.422$, $p<0.1$) However, the effect of closures in mature markets is not only less favorable but also clearly negative ($\beta_2=-0.766$, $p<0.01$). The results provide support for H2b and not H2a.

Table 3. Results of Estimation Utilizing the First-Differencing Approach

Variable	Developed Markets		Emerging Markets	
	M1	M2	M1	M2
Network Structure Variables				
Δ Closure	-0.378**(0.156)	-0.766*** (0.160)	0.466*(0.281)	0.422*(0.282)
Δ Brokerage	0.268*** (0.247)	0.667** (0.253)	-1.002*** (0.390)	-0.977*** (0.397)
Δ Degree centrality	-0.0001(0.0001)	-0.0001(0.0001)	-0.002(0.003)	-0.003(0.003)

Crisis Effects				
Δ Crisis	−0.992*** (0.083)	−1.128*** (0.085)	0.190 (0.242)	0.173 (0.248)
Network × Crisis Effects				
Δ Closures × Crisis	1.355*** (0.105)	1.373*** (0.108)	0.395** (0.221)	0.471** (0.224)
Δ Brokerage × Crisis	−0.396*** (0.156)	−0.412** (0.159)	0.408** (0.233)	0.433** (0.235)
Δ Degree × Crisis	−0.002*** (0.0001)	−0.002*** (0.0001)	−0.015*** (0.003)	−0.015*** (0.003)
Seller and Time Controls				
Age × Δt	—	0.005*** (0.0004)	—	−0.001 (0.001)
Mnft × Δt	—	0.189*** (0.019)	—	0.084*** (0.024)
Δt	−0.076*** (0.005)	−0.141*** (0.007)	−0.013 (0.013)	−0.003 (0.020)
Δ Season 11	0.031 (0.042)	0.021 (0.043)	0.027 (0.114)	0.031 (0.115)
Δ Season 12	0.107*** (0.041)	0.098** (0.042)	−0.074 (0.110)	−0.071 (0.111)
Constant	0.125*** (0.027)	0.068** (0.028)	−0.177** (0.072)	−0.167** (0.073)
Model Statistics				
Adjusted R ²	0.135	0.141	0.036	0.039
Observations	41,420	40,603	3,002	2,983

Note: Standard errors in parentheses. Δ indicates changes of variables during time. $p < .10$, $p < .05$, $*p < .01$.

The results of the improved interaction effects suggest that the same network architecture can differently impact the performance of sellers depending on the location of their clients (i.e. poor or developed countries). The closure and broking can have a positive impact on the effectiveness of vendors in emerging and developed markets because of several reasons. The large negative effects of broking in developing countries, and the market shutdown in mature markets, imply that there was a tacit knowledge ransom that the sellers had paid from their common users. These are a significant cost of competition in the form of implicit social interactions. Placing clients with numerous suppliers may provide increased competition whether it puts the seller in a broking or termination situation. In well-established markets where there is rapid technological advancement and industry shifts, the role of the broker can help the seller to look at other market opportunities. Such a benefit outweighs the anticipated costs of seller rivalry in these markets.

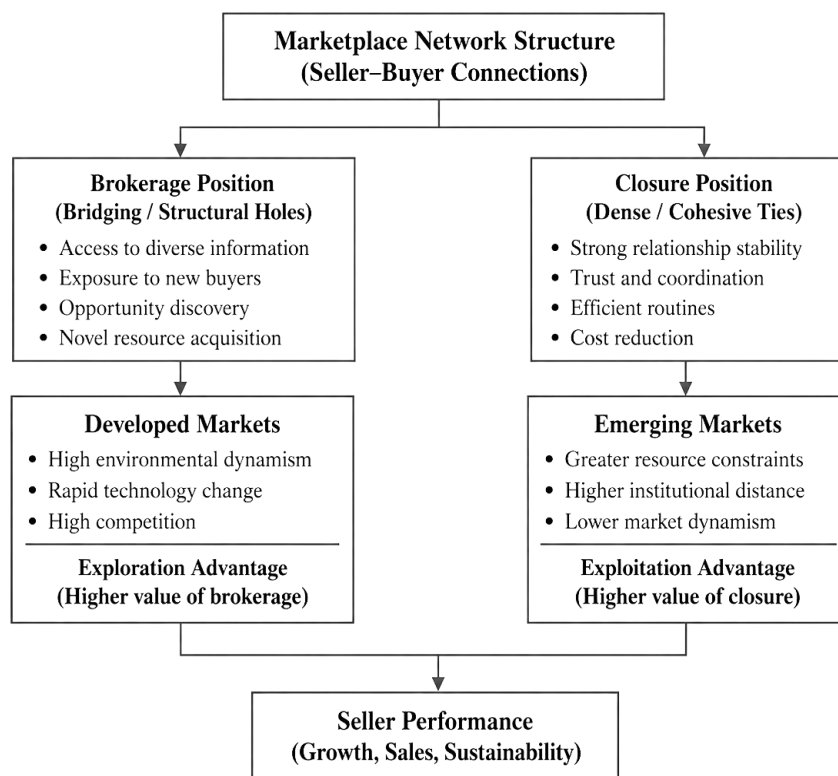


Fig 2. Marketplace Network Mechanisms Under Different Market Circumstances

In the developing market, however, where there is less uncertainty about products, the benefits of the exploratory value are not as great, and the broking position cannot offset the negative aspects of seller competition. This turns the whole impact

of broking in developing markets detrimental. With a solid system, the vendors' performances need to improve and become more competitive for closures [16]. But in modern markets the competitive costs placed on sellers by the closure network outweigh this exploitative benefit of closure. This means that the overall impact of closure on developed markets is a negative one. **Fig. 2** describes the processes in which broking is useful in developed markets and closing is useful in emerging nations.

Crisis Moderation Effects

In relation to the interaction impact of the economic crisis and performance brokerage of sellers, our results show that the economic crisis reduced the brokerage success in emerged market ($\beta_5 = -0.412$, $p < 0.05$), supporting H3. The decreasing effect, however, is less pronounced and is even reversed in developing markets ($\beta_5 = 0.433$; $p < 0.05$). Combining the influence of the economic crisis with the influence of vendor performance closures, our results suggest that the economic crisis has a significant impact on closures in both emerging markets ($\beta_6 = 1.374$, $p < 0.01$) and developed markets ($\beta_6 = 0.472$, $p < 0.05$), consistent with H4.

These different effects on closures and brokerage may indicate that the performance exploitation is more important than prospect discovery during economic contractions, particularly in markets with a strong economic slump. Brokers serving in broker roles need to be cautious of the broker position. Seeking new prospects could be at the expense of leveraging existing relationships and efficiencies. As illustrated in **Fig. 3**, in crisis, the importance of exploiting the efficiency is higher than exploring the opportunities.

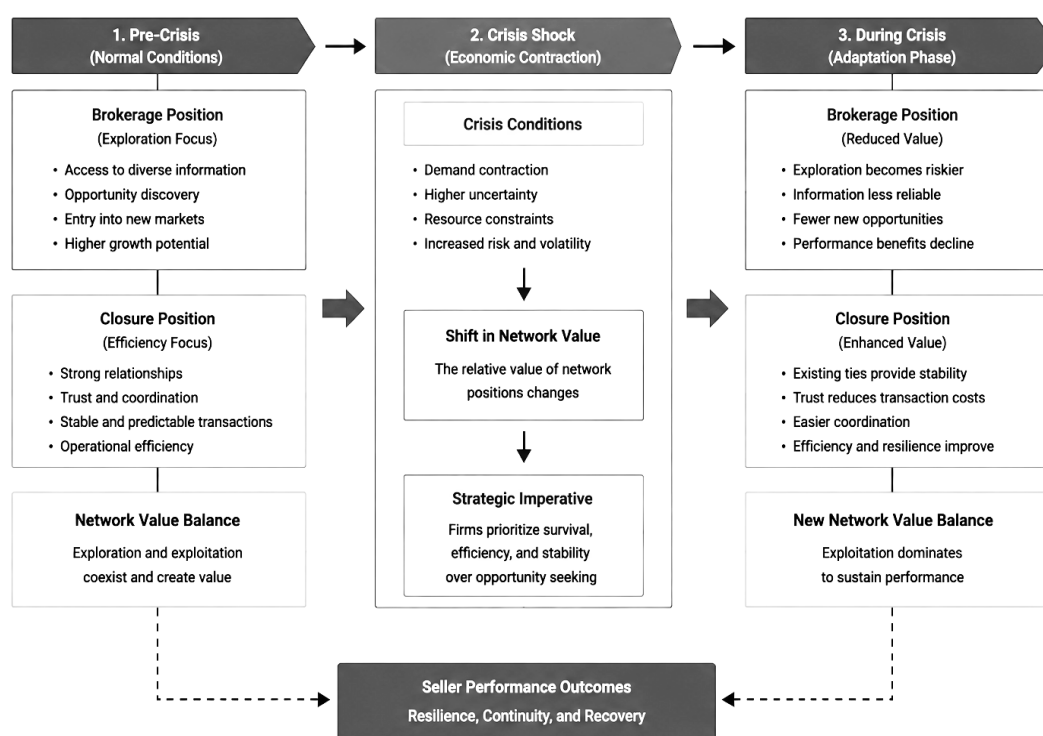


Fig 3. Economic Crises and Network Value Evolution

This is in line with earlier studies in networks that suggested that brokering during crises is important, not only depending on whether sellers have access to “unconnected groups,” but also if they are competing for access to the same type of groups. King and Maier [17] prove that in crisis situations, the structural error creates a larger impact on performance improvement only when there is no challenge to the broker since exclusive brokers can adapt and be stable simultaneously. But, with other players in the same kind of bridge situation, the informational advantage of bridging is lessened as competitors can find the same kinds of bridges, and the distinctiveness of the broker's position is lessened. The results suggest that the economy shocks reduce the general attractiveness of broking as a way of transferring unconnected knowledge into sustainability performance.

Moreover, in crisis situations, there is an increase of need to closure, which indicates the need for relational stability in uncertain situations. During an economic downturn, vendors need less, have less, and are pressured to not be at risk economically. Dense links are advantageous in this type of environment, as trust and communication and coordinated action by market participants add value. Sellers may opt to enhance existing buyer relations, make the service more dependable, and decrease the uncertainty of the sale, rather than risking options. This interpretation is an extension of prior network arguments and implies (as do earlier interpretations) that closure is a stabilizing mechanism, which in this instance allows the sellers to sustain their performance in an external market, where uncertainty prevails.

The study also provides an understanding of the general exploration-exploitation phenomenon and suggests that the optimum between exploiting the current capacity and exploring new opportunities depends on the economic condition. In a normal market, the exploratory advantage of a broker is to connect a seller with a variety of information, and potential demand trends. However, during a crisis, benefits of exploration might be undermined by the price of uncertainty, the scarcity of resources and heightened competition. Meanwhile, some recent studies on crisis showed that organizations are more successful if they selectively search for crisis opportunities and simultaneously achieve operational stability rather than only engage in opportunity search in the external environment [18].

Our results indicate that from the marketplace management point of view, network openness does not necessarily have a positive impact on the seller's interests when they are under economic pressure. Strategic value is thus a result of one's capacity to acquire unique positions in broking and to establish strong links. Thus, in circumstances of particularly competitive markets, sellers may need to move away from expansion strategies to relationship building, keeping clients and operating efficiently. This also explains why closure becomes a more crucial issue in periods of economic downturn because the seller can tap into existing networks and minimize their risk with market opportunities that are not known.

VI. CONCLUSION

This paper shows that the involvement of the seller in a digital market also depends on the net structure of relationships, and that the same is true for the performance of the seller. Broking and closure are viewed as mutually reinforcing yet context-specific processes, in which access to diverse forms of knowledge and existing ties offer different types of strategic benefits. We propose that the network architecture with the environmental unpredictability and the dynamic nature of marketplace should be taken into account of the literature on marketplace competitiveness. The results will lead to network strategies that will enable the sellers to experiment with network expansion and to build long-term relationships of 'relationality' as part of an equilibrated strategy. The research integrates both network and marketplace performance considerations in order to provide important insights for researchers and practitioners interested in competitiveness in emerging digital ecosystems.

CRedit Author Statement

The author reviewed the results and approved the final version of the manuscript.

Data Availability

The datasets generated during the current study are available from the corresponding author upon reasonable request.

Conflicts of Interests

The authors declare that they have no conflicts of interest regarding the publication of this paper.

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Competing Interests

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