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Examining Inter-city connections in Southeast Asia based upon interlocking city network model

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ABSTRACT

In this paper, we employ an interlocking city network model to analyze the global urban network epitomized by advanced producer services firms in Southeast Asia. The purpose of this paper is aiming to examine inter-city connections of a wide range of nodes (cities) in this region thereby exploring a sub-network of world city network proposed by Globalization and World cities research network (GaWC) in Southeast Asia. Based upon interlocking network model, we collected relational data of the presence of 30 global advanced producer services firms from six sectors in a roster of Southeast Asian cities. Clearly, a multifarious inter-city connection with service value of cities is embodied in the relational matrix. In this regard, we can specifically measure the connectivity of each city through the office network of global advanced producer services firms, and identify most dominant cities embedded in world city network in Southeast Asia region, as well as hierarchical structures and regional tendencies of these selected cities by interweaving with global scale and local scale.

1. Introduction

In the context of globalization, world cities in the developed nations are emerging in an unprecedented pace. This undisputed trend of the globalized economy is further diffused to Asia-Pacific countries in this millennium, especially some world cities in this region (Zhao et al., 2003; Zeyun and Dawood, 2016). Not surprisingly, Southeast Asia is deemed as one of the most vibrant districts in Asia-Pacific region, whereby it is geographically attracting notable transnational economy and information flows. These robust international interactions greatly enable local cities in Southeast Asia to embed in the economic globalization. Accordingly, the first major research problem is ascribed to the study area of world city research; there are less amounts of scholars paying attention to conceptualize and analyze world city formation in the region of Southeast Asia comprehensively. The only exceptions are derived from few researchers (Bunnell et al., 2002; 2006; Dick and Rimmer, 1998; Liu et al., 2016). In the classical study of world city formation in the prosperous city-state of Singapore, this pivotal articulation tends to be deemed as the most populous and international oriented city in Southeast Asia. Not surprisingly, since unprecedented transformations of urban landscape, infrastructure system, as well as information and communication technology, this spectacular city-state is characterized as the predominant transit node and business hub involved in the global urban system (Dick and Rimmer, 2003). Meanwhile, Morshidi (2000) emphasized the importance of producer services development for creating miracle of world city status of Kuala Lumpur in this globalized and competitive era. The extraordinary competitive advantages of Kuala Lumpur has been increasingly configured though the social-spatial economy transformation as compared with some other rivalry in the arena of South-east Asia. In practice, the emergence of producer services industries driven by globalization in Malaysia dramatically reshape and reposition the relative employment composition and industry structure in this emerging country. Based upon this article, producer services development has spawned the reciprocal relationship with world city development. In particular the establishment of technology based producer services industry penetrating to local trade linkage and foreign export market could substantially stimulate its prestigious status of world city-ness. In this regard, I will focus on world city network formation in Southeast Asia region.

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As we trace back to the seminal research of previous scholars with regard to world city, these dominant nodes tend to conceive as some basing points to control and coordinate global economy in the new era of international division of labor and global spatial hierarchy (Friedmann, 1986; Friedmann and Wolff, 1982). Based on the pioneering world city hypothesis proposed by Friedman (1986) and Sassen (1995, 2001, 2011) envisaged that advanced producer services firms are indispensable parts pertaining to global city formation. Most importantly, this kind of firms is characterized as multinational companies and remarkably agglomerates in the world cities. With respect to financial firms, advertising, accounting, legal and business consulting are all epitomized in this sector (Beaverstock et al., 2000).

Although early research of world cities have been constituted in a pervasive and clear pattern, it is merely uncovers some robust vulnerabilities, especially about sources of data. The major limitation is associated with the dearth of the relational data of world city research (Short et al., 1996; Taylor, 1997). The deficiency of relational data renders previous scholars to only measure intra-city attributed characteristics and functional status of world cities using the traditional hierarchical approach and comparative study. In order to rectify this problem, many scholars were attempting to initiate a new method to discover the relational data for world city research. The most obvious achievements are composed of two streams, the first stream is drew from the infrastructure network of world cities, some scholars focused on air transportation networks (Derudder and Witlox, 2008; Ma and Timberlake, 2008; Smith and Timberlake, 1995; Li and Dawood, 2016) while some others are involved in internet backbone networks (Moss and Townsend, 2000; Townsend, 2001; Vinciguerra et al., 2010). In addition to the first stream, advanced producer services network tends to close connect to the study of Globalization and World Cities Research Network (GaWC) (Derudder et al., 2010; 2003; Taylor et al., 2002).

In this paper, we will conduct an interlocking city network model derived from GaWC to detect inter-city connections in Southeast Asia and then to elaborate and analyze the sub-network of this region embedded in world city network in the world economy.

2. Methodology

2.1. Data collection

The principle criterion of data collection in this paper is facilitated in a concrete standard. The major input of sourced data is greatly associated with the presence of global location strategy of global advanced producer services firms in Southeast Asia. Accordingly, the major trajectory of data collection procedure is constituted of three sections, which encompass firms' selection, cities' selection and service value of a firm in a selected city.

2.1.1. Firms

From the analogy of GaWC's immense empirical study of world city network, we employ a firms' selection strategy to choose a dataset of global advanced producer services firms, which possess branches or offices network in more than 15 cities, these firms tend to entail a salient regional tendencies in at least one global arena below: Pacific Asia, North America, and Western Europe. (Derudder et al., 2003). Clearly, 30 global producer services firms from six sectors are underpinned in this research based upon their offices network among cities in Southeast Asia. This broaden inter-sector classifications are identified with top 5 firms of each sector respectively, which includes accounting, banking/Finance, insurance, advertising, law and management consultancy sectors.

2.1.2. Cities

In line with firms' selection, the selection of cities is another dominant integral part of world city network research in Southeast Asian region. In order to yield a comprehensive outcome, we draw on previous empirical results of GaWC and personal observation of cities' size thereby selecting crucial cities from 11 Southeast Asia counties. The major dataset of cities is derived from capital cities of each country, as well as some dominant cities of each corresponding countries. Ideally, a total of 33 cities are selected with seamless covering of Southeast Asian region for subsequent analysis. Specifically, this roster of 33 cities encompasses 6 cities from Indonesia, Philippines, Vietnam and Malaysia, 3 cities from Myanmar, one city from Singapore, Thailand, Cambodia, Laos, Brunei, as well as East Timor.

2.1.3. Service value

According to previous empirical research inferred from GaWC , we assign the service value of a firm in a city based on two dramatic criterions: firstly, the size of office ,e.g. the quantity of the practitioners of a firm's website in a city, Secondly, the extra-locational functions ,e.g. Asia-pacific headquarter, national headquarter, normal office and branches. In this regard, this secondary data is attained from company official websites, and some other supplementary materials, such as the company annual reports, statistical yearbooks and web-based information. As a consequence, we conceptualized a simple notion which is designed as "service value" to assess the presence of a firm in a city with a scope between 0 and 3. In specific, if a city is occupied by a company's Asia-pacific headquarter, the city is considered as a service value of 3 with reference to this firm. Similarly, national headquarter of a firm in

a city is characterized by a service value of 2 while a normal office is designed with a service value of 1. In order to enhance network collaboration analysis, a national office has with more than 5 partners will increase one mark to 3 whilst a national headquarter without partner will be reduced to 1 as well. Besides, if a city does not have a firm's office, the service value will be scored with lowest mark of 0. Eventually, a matrix ***Vij*** is constructed with regard to its value.

2.2. Model specification

This research is attributed to the application of the interlocking city network model, and the model specification is drawn on from GaWC (Taylor, 2001; Taylor et al., 2002). Essentially, the premise of the model is to measure city connectivity of Southeast Asian cities so that we can thoroughly analyze sub network of world city network in Southeast Asian arena. On the basis of world city network rationale and model specification, we simplify the model in a matrix of ***Vij***. This matrix indicates the presence of ***m*** APS firms in ***n*** cities, and ***Vij*** represents the service value of city i in terms of firm f. Therefore, each pair of dyad city is depicted in a relational matrix following:

$$R_{ab,j} = V_{aj} \times V_{bj} \quad (1)$$

where, $R_{ab,j}$ defines the connectivity between paired city a and b with regard to firm j, and V_{aj} and V_{bj} signify the service value of firm j in city a and b respectively.

Besides that, the aggregate urban connectivity of all APS firms between city a and b is summarized as below:

$$R_{ab} = \sum R_{ab,j} \quad (2)$$

In addition to the dyad city connectivity, we also need to elucidate the connectivity of individual city incorporated into interlocking city network model, and the basic formula is generated below:

$$GNC_a = \sum R_{ai} \ (a \neq i) \quad (3)$$

where, GNC_a indicates the global network connectivity of city arising from the aggregate connectivity of city an in terms of all other cities across all APS firms. In order to accommodate different analysis, results are indicated in both relative and absolute value.

3. Results and discussion

As we can see from Table 1, it indicates all of the connectivity of 33 Southeast Asian cities with reference to their corresponding rankings. In line with the spatial distribution pattern of cities, we could find uneven distribution of connectivity departed from this roster of Southeast Asian cities. Singapore is articulated at the highest network connectivity among this region, as a wide range of salient vanguards from Maritime Southeast Asian cities following its trajectory and yielding a relatively high connectivity embedded in preeminent position of this ranking. Specifically, Maritime Southeast Asian cities encompass Malaysia, Philippines, Singapore, Indonesia, East Timor and Brunei, this region also refers to island Southeast Asia as well (Tarling, 1992). While the Maritime Southeast Asian cities play a robust role in the sub network of world city network in this region, it seems that the Mainland Southeast Asian cities do not exhibit a good performance in the high rankings in terms of connectivity. Typically, they tend to occupy average rankings from this list. Based on the observation of uneven geographical distribution of network connectivity of Southeast Asian cites, a regional pattern of advanced producer services (APS) provision can be corroborated from this discovery. Clearly, this uneven distribution of advanced producer services provision is attributed to uneven development of social-economy in this region. In specific, due to convenient transportation accessibility, Maritime Southeast Asian countries attract huge amounts of foreign direct investment; this indispensable advantage enhances industrialization and urbanization among this region in the context of the globalization. Not surprisingly, this unprecedented economic transformation in Maritime Southeast Asia enables the seamless APS provision in several maritime and aviation hubs in this region thereby boosting their network connectivity. As compared to the aforementioned arena, Mainland Southwest Asia still exits with some shortages for its FDI attractions and weak industrialization development due to its unstable economic base. Since the primary industry is still an integral part of this region, followed by further restriction close door policy for some counties, APS development may encounter some barriers in this regional dimension, thus, the mainstream of uncompetitive network connectivity in this regard is considered to be reasonable.

Table 2 clearly demonstrates the city-dyad connectivity in Southeast Asia. The top 10 city-dyads featuring Southeast Asian cities are elaborated in this table. In this case, all top 10 city- dyads are taken across five preeminent Southeast Asian cities, which are Singapore, Bangkok, Kuala Lumpur, Jakarta and Manila. Clearly, they should be deemed as the leading cities incorporated into world city network in this region. Apart from the top five, the remaining cities of total selected Southeast Asian cities do not appear in this list, which demonstrates economy disparities in this region.

At the same time, the strongest city-dyads are includes Singapore –Bangkok and Singapore – Kuala Lumpur, which denote connectivity of 1.00. Simultaneously, the configuration of triangular spatial structure pertaining to Singapore, Bangkok and Kuala Lumpur is able to reinforce its gateway articulations status in this district. In other words,

APS provision inferred by the city –dyad connectivity is characterized by the triangular cluster pattern as well.

Table 1: Major Southeast Asian cities' connectivity in terms of advanced producer services network

Ranking	City	Connectivity
1	Singapore	1.00
2	Jakarta	0.70
3	Bangkok	0.69
4	Kuala Lumpur	0.69
5	Manila	0.59
6	Hanoi	0.39
7	Ho Chi Minh	0.38
8	Yangon	0.30
9	Phnom Penh	0.24
10	Bandar Seri Begawan	0.24
11	Vientiane	0.22
12	Penang	0.21
13	Johor Bahru	0.18
14	Cebu	0.18
15	Ipoh	0.16
16	Kuching	0.15
17	Surabaya	0.15
18	Bandung	0.09
19	Davao City	0.09
20	Bekasi	0.08
21	Medan	0.08
22	Da Nang	0.05
23	Tangerang	0.03
24	Shah Alam	0.03
25	Hai Phong	0.03
26	Can Tho	0.03
27	Zamboanga	0.03
28	Cagayan de Oro	0.02
29	Nay Pyi Daw	0
30	Dili	0
31	Bien Hoa	0
32	Antipolo	0
33	Mandalay	0

Notes: Connectivity is relative value (proportion of maximum value)

Following the second tier cities of sectoral network, meanwhile, Manila, Yangon and Hanoi also display some remarkable power in some sectors, notably for accountancy sector (Hanoi), advertising and banking/finance sector (Manila), as well as law sector (Yangon).

In addition to the regional patter of world city network, we also need to examine a sectoral pattern of this network on the basis of the geographical involvements of APS provision.

Table 3 demonstrates the 10 most connected Southeast Asian cities derived from each specified sector of advanced producer services network. As we can see from Table 3, Singapore maintains a premier status of each sector and surpasses the other cities dramatically. This multifarious subsector network enhances irreplaceable prestige of Singapore embedded in advanced producer services network. Clearly, Singapore is characterized as the undisputed dominance position of whole producer services provision in Southeast Asia.

Apart from Singapore, not surprisingly, Jakarta, Bangkok and Kuala Lumpur are the other three cities constantly appear in clear-cut top 10 rankings of all six sectors. Clearly, these three cities have same rankings in terms of accountancy, advertising, banking/finance and management consultancy, which entails their consistent second tier positions of the sectoral network following Singapore. The only two exceptive sectors of sectoral network are insurance and law, Kuala Lumpur is located at second position in the insurance sector whereas Bangkok is ranking the second position in the law sector.

Table 2: Top ten city-dyads in Southeast Asia

Ranking	City-dyad	City-dyad connectivity
1	Singapore and Bangkok	1.00
2	Singapore and Kuala lumpur	1.00
3	Singapore and Jakarta	0.98
4	Singapore and Manila	0.76
5	Bangkok and Jakarta	0.63
6	Jakarta and Kuala lumpur	0.61
7	Bangkok and Kuala lumpur	0.59
8	Jakarta and Manila	0.51
9	Bangkok and Manila	0.51
10	Kuala lumpur and Manila	0.51

These rankings feature the third tier of sectoral network with regard to some competitive emerging cities. Meanwhile, a wide range of the remaining cities configure the forth tier of sectoral network, which resemble a reverse forces of Southeast Asian cities intertwining between globalization and localization.

4. Conclusions

Based upon empirical study of the advanced producer services network of Southeast Asian cities, we can identify the relative regional pattern and sectoral pattern of these cities embedded in world city network. Unsurprisingly, the uneven regional pattern of the advanced producer services network is attributed to the disparity of social economy development among Southeast Asian cities. It corroborates a proposition that Singapore is the central articulation of whole network along with some Maritime Southeast Asian cities with competitive forces entrenched in this regional arena. In contrast to Maritime Southeast Asian cities, Mainland Southeast Asian cities are bound up of weak prosperous advanced producer services provision.

Consequently, this tendency of geographical disparities of APS provision has rendered a new sub-network of world city network with reference to Southeast Asian cities, which demonstrates the core –peripheral regional pattern for this network. Specifically, Maritime Southeast Asian cities are deemed as core area of this network whilst Mainland Southeast Asian cities are assumed as the peripheral

area. In addition to regional pattern of this remarkable network, the sectoral structure has some sorts of the homogenous results with aforementioned empirical findings. Singapore is still anchored in the apex positions of all APS sectoral networks. With exception of Singapore, some other cities are have relatively average connectivity in all sectoral networks; the only three exceptions are Jakarta, Bangkok and Kuala Lumpur, which appear in top 10 rankings of all sectors.

Table 3: Network connectivity of leading Southeast Asian cities in each APS sector

Ranking	Accountancy		Advertising		Banking/Finance	
1	Singapore	345	Singapore	156	Singapore	234
2	Jakarta	240	Jakarta	114	Jakarta	166
3	Manila	240	Manila	114	Manila	166
4	Hanoi	240	Bangkok	114	Bangkok	166
5	Bangkok	240	Kuala Lumpur	114	Kuala Lumpur	166
6	Kuala Lumpur	240	Ho Chi Minh	96	Ho Chi Minh	137
7	Phnom Penh	240	Yangon	52	Hanoi	105
8	Vientiane	200			Penang	62
9	Yangon	188			Bandar Seri Begawan	56
10	Bandar Seri Begawan	156			Surabaya	48
	Insurance		Law		Management consultancy	
1	Singapore	153	Singapore	81	Singapore	99
2	Kuala Lumpur	112	Bangkok	62	Jakarta	74
3	Jakarta	100	Jakarta	53	Bangkok	74
4	Bangkok	80	Yangon	48	Kuala Lumpur	74
5	Surabaya	53	Manila	28	Manila	46
6	Bandung	53	Kuala Lumpur	28	Ho Chi Minh	24
7	Bekasi	53	Ho Chi Minh	26	Kuching	13
8	Medan	53				
9	Johor Bahru	42				
10	Penang	42				

Notes: Data is absolute value of connectivity

According to previous empirical findings of this research, we can clearly identify the hierarchical tendencies of Southeast Asian cities embedded in world city network. Singapore is situated at the core position of the world network; following Singapore, Jakarta, Kuala Lumpur and Bangkok which are classified in second tier of this network. In line with these five preeminent cities, some other capital cities of each country are regarded as third tier of this network, and the remaining cities are ranked as the last tier.

In addition, due to the fact of strategic alliances and regional collaborations of economic development among south east Asian countries , we cannot only restrict to original GaWC data to study inter-city connections in this region, instead, a sub-network of advanced producer services provision in the area of southeast asia region is configured in this research so that we can have more profound understanding of inter-city relationship and hierarchical structure with reference to its regional scale and local context. Meanwhile , this study entails a systematically analysis of advanced producer services network of Southeast Asian cities based upon rigorous assessment of regional structure and sectoral structure in this region, this dual assessments can largely capture a new blueprint in the combinations of macro and micro insights. Finally, the majority of companies are examined in aforementioned chapters tend to be multinational companies, accordingly ,we could explicitly understand the location strategy of multinational companies in the region, this complex of global-local linkages reshape and restructure the world city network of Southeast Asian cities.

Hence, the grounded endeavor of this paper is aiming to explore the sub-network of world city network with regard to advanced producer services provision of Southeast Asian cities. Based upon this empirical study, we can thoroughly illustrate the discourses and the regional as well as setoral pattern of this sub-network thereby identifying the hierarchical tendencies of Southeast Asian cities within this network. Although this research is a systematic and comprehensive study, it is still fraught with some shortcomings and challenges, especially in its data acquisition. Hence, in the future research, we will conduct more multivariable quantitative method to enhance these findings.

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