1. Conceptual framework and analytical methods

Pengfei Ni,¹ Xiaolan Yang² and Peter Karl Kresl³

BACKGROUND: URBAN SUSTAINABLE COMPETITIVENESS AND ITS MEASUREMENT

Sustainable urban competitiveness is a hot topic increasingly attracting attention from city managers, social organizations, and city experts. Over a decade ago, Saskia Sassen asserted, ‘The city belongs to the twenty-first century more than the nation.’ Accompanying the advanced development in science and technology, newly industrialized countries have been rising sharply, and the urbanization process has expanded around the world. On the one hand, being growth engines, cities are playing an increasingly important role as key platforms for human beings and the centers of power and decision-making. On the other hand, cities in the world are confronting a number of common problems and challenges. First, with the free flow of production factors, goods, and services globally, fierce competition among cities is increasing. Second, there is an increasing number of problems related to the future development of cities, including increasing popular consciousness of civil rights among citizens, diminishing motivation for creation, readjustment of the power structure, contradictions from a diversified culture, social class divergence, source deficiency, environmental pollution and climate change. All the problems confronted by cities lead to the transfer of urban development objectives: from ‘competing for wealth’ to ‘creating and providing more complex and advanced social wellbeing’. Of course, all these socioeconomic challenges and problems make it necessary to propose the concept of sustainable competitiveness rather than only competitiveness. Additionally, it is necessary to provide for an understanding of this concept in order to achieve a broad concentration on ‘sustainable competitiveness’ in urban management practices. The evaluation of urban sustainable competitiveness is the best starting point for putting theoretical research into practice.

Two streams of research have always been popular. The first stream regards sustainable

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- 1 Pengfei Ni, Center of City and Competitiveness, CASS, No. 2 yuetanbeixiaojie, Xicheng District, Beijing, China, post code: 100836, Tel: 8610-68063478.
Email: ni_pengfei@163.com.
 - 2 Xiaolan Yang, School of Economics, Central University of Finance and Economics, China, post code: 100081, Tel: 8610-68063478.
 - 3 Peter Karl Kresl, Bucknell University, Lewisburg, PA, USA 17837, Tel: 570-490-5193.
Email: kresl@bucknell.edu.

development. Sustainable development of cities has always been a popular term attracting regular and sustained attention from environmental studies and city experts (Burton et al. 2013, Wheeler and Beatley 2004, Satterthwaite 1999, Breheny 1992). The other stream consists of studies on urban competitiveness. Since the 1990s, urban competitiveness has become a popular topic considered by geographers, economists, and city managers (Huggins and Clifton 2011, Martin and Simmie 2008, Ache et al. 2008, Wolff et al. 2007, Thompson and Ward 2005, Budd and Hirmis 2004, Porter et al. 2004, Turok 2004, Garden and Martin 2003, Camagni 2002, Rogerson 1999, Begg 1999, Kresl 1995). However, ‘sustainable development’ is newly attracting broad attention from researchers and related organizers. Typically, it is believed that cities are the key source of climate change, as well as the solution, so cities should mitigate climate change through ‘climate-conscious’ urban planning and management on the one hand and sustain ‘green growth’ on the other hand (Kamal-Chaoui and Roberts 2009, Kern et al. 2008, OECD 2008). The European Commission (EC) (2010) proposes a new European Union strategy for ‘smart, sustainable and inclusive growth’. Balkyte and Tvaronavičiene (2010) introduce the concept of ‘sustainable competitiveness’ by focusing on how competitiveness and sustainability interact with each other. Berg et al. (2014) trace ‘competitiveness-oriented’ urban policies in eight European cities over as long as two decades, indicating the major challenge in cities is to balance economic competitiveness with social progress and prevention of environmental deterioration. The recent ‘Global Competitiveness Report 2013-2014’ by the World Economic Forum (2013) modified its indicators to match a more sustainable and resilient method of growth. Almost at the same time, there has been consensus among the committee members of the Global Urban Competitiveness Project (GUCP) that the competitiveness of cities should be sustainable. In the recent 2014 GUCP conferences held in Amsterdam, one major topic was to establish proper indicators to evaluate and examine the sustainable competitiveness of cities. Ni (2013) proposed the concept of ‘urban sustainable competitiveness’ and tried to explain this concept with seven subgroup indicators. This indicator system has been applied in measuring 294 Chinese cities at the prefectural level and above in the ‘Chinese Urban Competitiveness Report 2013’. Obviously, how to keep and retain a city’s competitiveness while realizing sustainable growth is the first major question that every mayor and city manager needs to consider.

Concepts of Urban Sustainable Competitiveness

Urban sustainable competitiveness is the ability for a city to promote its advantages in technology, economy, society, environment, culture, management, and global connections and to search for systematic optimization in order to continually satisfy the complex and demanding social wellbeing needs of citizens. A qualified city with sustainable competitiveness synthesizes the natures of the following cities:

- The economic dynamic city;
- The innovation-driven city;
- The socially cohesive city;
- The environment-friendly city;
- The culture-diversified city;
- The open international city;
- The well-managed city.

We do not mean that a city should perfectly meet all the standards for these seven aspects. Instead, this term indicates a comprehensive understanding of future cities and provides a general perception that cities strive to approach.

Economic dynamic city. Persistent economic growth has always been pursued by cities, as it is the base for social cohesion, technological progress and human development. A city that could attract high value added, high creative firms and could retain the innovative and enterprising talents, would achieve persistent growth in productivity and wealth. Diversified labor division and cooperation made cities the centers of knowledge accumulation and creation (Jacobs 1969). The diversity in a city also affects the level of output and the level of wellbeing achievable in that city (Quigley 1998). An ideal competitive city should be a place where foreign firms would like to invest, where new firms emerge endlessly, where both small and large businesses coexist and compete in the market, where the entrepreneurship is rich, and where there is full employment and people work hard. A sustainable competitive city should perform well economically with a relative high economic growth rate.

Innovation-driven city. Innovation is an unlimited driving force for the persistent socioeconomic development of cities. Innovation is the most advanced form of competitiveness (Storper 1997). Innovation is the most important capability needed for a city to succeed within global competition and for cities to cultivate innovation-led growth through the accumulation of knowledge (Lever 2002a, Lever 2002b). 'In a globalized economy, the key resources for regional and urban competitiveness depend on localized processes of knowledge creation, in which people and firms learn about new technology, learn to trust each other, and share and exchange information' (Malecki, 2003). Kitson et al. (2004) argue that the presence of an innovative and creative class is a key factor 'supporting and underpinning an efficient productive base for the regional economy in the form of regional externalities'. Malecki (1997) proves the positive linear relationship between innovation, knowledge creation, and economic growth. An ideal city should be an innovation-driven society, where economic progress is advanced by knowledge accumulation and where knowledge industries make up a dominant portion of the local economy. In other words, knowledge is both an important input as well as a major output.

Socially cohesive city. A fair social system and compatible social spirit are necessary to guarantee the sustained growth and orderly operation of a city. Social cohesion and urban competitiveness have been recognized as two major issues in cities in the globalized world since the 1980s (Ache et al. 2008). In a study of Canadian cities, Ranci (2011) finds a high correlation coefficient between social cohesion and economic downturn in a study of European cities. Kitchen and Williams (2010) find that social conditions affect the expectations of residents on crime rate and security, thus affecting productivity. Ellen and O'Regan (2010) explore the influence of crime rates on urban populations and find that they lead to changes in urban growth. An ideal city should be a place where people live together with peace and fairness, where social conflict can be resolved through a rational judgment mechanism, and where the social mechanism can consider different opinions to balance competing interests.

Environment-friendly city. There seems to be a conflict between realizing economic growth, social cohesion, and technological innovation while protecting the quality of the environment in the short run, but this conflict can be resolved in the long term. Environmental pollution is an important factor affecting economic growth. Quality of

life and urban amenities have been found to matter in the location decisions of high-human-capital households (Glaeser and Shapiro 2001). According to Porter (1998), ‘strict environmental policy will inevitably enhance competitive advantages against foreign rivals’. Thus, the competitive advantages embodied in combining industry with strict environmental conditions become competitive advantages of a city. An observation of cities that promote their prosperity with scientific and technological innovations shows that many also have the world’s best urban ecological environments and quality of life, such as San Jose, Vienna, Stockholm, Helsinki, Seattle, and Singapore. A good environment is a factor that enhances the attractiveness of a city (Ni et al. 2014). An ideal city should be a livable place, where people and nature coexist in harmony, where the production process and other human activities perform as one part of a natural cycle coordinating with other circular systems in nature, where the economy is operated according to a low-carbon model, where the ecological and environmental construction play an indispensable part, and where the artificial environment and natural environment are integrated.

Culture-diversified city. The cultural environment of a city is important for attracting people. The integration of different cultures enhances the competitive advantage of cities. Culture directly influences individual behavior through its impact on values and preferences (Rabin 1993). It is the dominant resource and decisive factor of production (Flarey 1996). It can be translated as the social norms and the individual beliefs that sustain Nash equilibrium as focal points in repeated social interactions (e.g. Myerson 2013, Schotter 2008, Greif 1994). The correlation coefficient for the basic talent index and cultural amenities is positive and significant (Florida 2002). The range and quality of cultural facilities and assets serve to support and underpin an efficient, productive base for the regional economy in the form of regional externalities (Kitson et al. 2004). An ideal culturally diverse city should be an open space where people and business adore the open and free cultural environment, and where old and new cultures merge into a splendid cultural picture.

Open international city. Castells (2011) points out that a city ‘is not a place but a process’, indicating that cities exist in interrelated global networks. A number of researchers hold the view that global connection is even more important than local connection, since it is an essential way to improve and upgrade a city’s capabilities by participating in the global value chain (Markgren 2001, Angel and Engstrom 1995, Ni and Pan 2010). Bathelt et al. (2004) conclude that innovation and new knowledge are best understood as a combination of local and global interactions. An ideal open international city is where the efficient exchanges of information and material flows happen. Due to the wide applications of ICT, cities become smart cities which are categorized, on the one hand, by the ICT-enabled production and living system, and on the other hand, by innovations in public management and services due to the broad participation of citizens.

Well-managed city. Government plays an indispensable but challenging role in the promotion of urban prosperity. Among other things, it can help compensate for market failure. Well-administered and well-governed cities that are open to new ideas, cultures, and technologies can act as a nation’s best catalyst of economic growth and human development (UN-Habitat 2010). An ideal well-managed city should provide efficient public services for citizens and firms in order to enable citizens to live and work freely in the city, to protect their legal rights, and to satisfy the requirement of firms for a free market environment. The legal appeals of firms and citizens could be expressed and realized with respect.

Figure 1.1 Analysis Framework of Urban Sustainable Competitiveness

Generally, economic dynamic, technological innovation, environmental quality, social cohesion, cultural diversity, global connection and government management comprise the different elements of sustainable development. They go hand in hand, interacting and reinforcing each other.

Based on the above perceptions, we measured urban competitiveness of a city from the seven perspectives: economic dynamic, technological innovation, environmental quality, social cohesion, cultural diversity, global connection and government management. The sustainable competitiveness is obtained by integrating the seven subgroup components.

Applied Sustainable Competitiveness Indicator

Based on the discussion of the important factors in deciding sustainable development, we choose typical indicators to measure the competitiveness components, which construct the sustainable competitiveness indicator system.

Economic Dynamic: GDP per capita and GDP growth rate. GDP per capita is GDP divided by the city population. It represents short-term economic efficiency. GDP growth rate is the average value of the GDP growth rate from 2001 to 2009, indicating long-term growth potential.

Technological Innovation: patent applications per 10,000 people, which is the total number of patents divided by the urban population. Patent applications are a direct expression of innovation. They are also an important indicator of a knowledge-based economy (Bontis 2004, Ni 2012).

Social Cohesion: inverse crime rate. As mentioned above, the crime rate is the most popular variable to represent social order. The higher the crime rate is, the worse the social environment. To keep consistent direction with other indicators, we used the inverse of the crime rate.

Environmental Quality: inverse carbon dioxide (CO₂) emissions per capita, total carbon dioxide emissions divided by the population. Among the variety of indicators referring to environment, carbon dioxide is an important indicator available for cities. It reflects energy conservation, environmental pollution, and climate change. Similarly, the inverse value was used here to keep accordance with other indicators.

Cultural Diversity: the languages used in international restaurants. Generally speaking, the best indicator to reflect diversity in culture is to count the people from different countries and races. The more diverse the nationalities of residents that are included in one city or the more diverse their races, the more colorful the culture is, and the more compatible a city is. However, it is hard to obtain the exact data on nationality and race, so we had to take the languages used in international restaurants as an alternative.

Global Connection: Global Network Connectivity. Cities are connected globally through a variety of forms, including business flows, material flows, information flows, and transport infrastructure. However, in the area of globalization, the connections derived from multinational advanced producer services best reflect the nature of increasing connectivity among cities (Taylor 2004). This indicator was constructed based on Taylor's method for determining a world city's global connectivity (Taylor et al. 2001, Taylor 2001). The method and data source are specified in the next section.

Government Management: Doing Business Index. The doing business index focuses on measuring the various costs a firm must bear to start a business in a city. It is a synthesis of the time and money that a firm uses to obtain official legal approval. It is a proper reflection of government efficiency and the degree of interpretation from government. Managed by the World Bank, this indicator was set up through a broad yearly survey of the largest cities of more than one hundred countries.

Theoretically, the perfect indicator to evaluate performance on sustainable competitiveness should be one that can reflect agglomeration and changes in a city's size, for example population data. However, the research methods deny the use of population data. First, cities should pursue an optimal size rather than use the thinking of 'the larger the better'. Second, there are restrictions on population movement across countries. Third, the resource and factor agglomeration process can be manipulated by official power in some countries, especially developing countries. Therefore, we did not directly use population data to measure sustainable competitiveness.

THE SELECTION OF SAMPLE CITIES

City Definition

In this report a city refers to the concentrated residential area under the governance of an administrative management center, including not only the urbanized area, but the affiliated suburbs and villages. From this definition, it can be seen clearly that the city we refer to is a city in the administrative sense. But the following terms need to be distinguished.

City and region: since the supreme administrative organization of the city governs some

lower level administered places which are also called cities, a city only refers to the district itself, excluding other lower level cities under it. For example, some county-level cities are registered and managed under the prefectural-level cities, but here they are excluded.

City and urbanized area: the difference between city and urbanized area is that city is a region in the administrative sense, while urbanized area refers to a region in the social and economic sense, so that urbanized area means an urbanized region excluding the surrounding villages.

City and metropolitan area: due to the accessibility of data, some cities adopt the concept of urbanized area, while others adopt the concept of metropolitan area. We have provided explanations in these cases, cities without explanations are cities in the administrative sense.

Sample Selection

Five hundred cities across the world were selected as research targets. They are chosen based on a few steps and each step follows some rule. Firstly, we searched from one continent to another, from one country to another, and we made a rough list of possible cities from major countries. Secondly, the number of candidates in each country or region was identified according to their relative population and income per capita. Thirdly, specific sample cities were selected in each country or region sequentially according to their size and relative positions in their countries. Fourthly, evaluation was made for candidate cities in each country with consideration of the availability, accuracy and standardization of the statistical data of each city. Eventually, those with more standard and accurate data available were selected as sample cities.

City Distribution

In terms of geographical distribution, the 500 cities selected through the above steps are located in about 130 countries or regions in 6 continents. Specifically, 187 of the cities are in Asia, 136 in Europe, 107 in North America, 33 in Africa, 28 in South America, 33 in Africa, 28 in South America and 9 in Oceania. In terms of development stage, the 500 cities may be divided into 6 groups by the standard of GDP per capita (based on official exchange rates of 2005). Forty-nine of the sample cities have a GDP per capita of more than 500,000 dollars, 58 between 400,000 and 49,999 dollars, 66 between 30,000 and 39,999 dollars, 81 between 10,000 and 29,999 dollars, 90 between 5,000 and 9,999 dollars and 156 less than 5,000 dollars. In general, these 500 cities represent the economic efficiency of different regions.

Data Source and Data Collection

Population: Some cities only provide residential population data, but some provide permanent population or temporary population data too. In our study, cities' population has been unified with the permanent account. The data sources for population data are various, including official websites of cities, states or countries, and statistical yearbooks of cities, countries and regions.

GDP data are from the official statistics, which are loaded from the following sources: the websites of statistics bureaux of cities, regions or states, the statistical yearbooks of cities, regions or states in each country, EU statistical reports and the related websites. If only

the GVA data were available, we could then calculate the country's or the city's GDP in accordance with its similar quantitative relationship with its GVA.

Some cities' GDP data was estimated based on country data. Estimation is an approach that uses the statistics of a nation to estimate the figure for a city and it was applied in data collection for cities in Latin America and Africa. As the GDP data of some cities in South America and Africa are hard to obtain, we can only make reference to the GDP data of the country or other cities in the country; we estimated the GDP data of such cities on the basis of the relevant information or some researcher's experience.

Patent application data has been collected from the World Intellectual Property Organization (WIPO) which could be downloaded from the WIPO website.⁴

Data on crime rates were from official statistics and reports which were obtained from bureaux websites of related cities, countries and regions, the statistics yearbooks of related cities, countries and regions, the EU statistical reports, the wikipedia website,⁵ the population ranking list of the World Bank, the websites of mayors and related public news media.

Carbon dioxide emissions data of the 500 cities were downloaded from the website of UNSD.⁶

Doing business index results were sourced from the 'Doing Business Report' (2013). The Doing Business report series includes annual reports going back to 2004, a wide variety of subnational studies, and a number of special reports dealing with regions in which the doing business environment in various of countries, cities or regions has been evaluated.⁷

Global network connectivity: the global network connectivity index was constructed following Taylor's global world city connectivity (GNC). According to Taylor (Taylor et al. 2002), cities are firstly coded using a six-point scale service value system according to the location strategies of multinational financial companies. If a city was scored '0' by a firm, it means that this firm did not locate any office in the city. If a city was scored '5', it means that the firm has located its headquarters in this city. Secondly, connectivity between two cities was calculated by multiplying the service values of the same firm in two cities. For example, service values of firm j in city a and city b are defined as v_{aj} and v_{bj} respectively. The city-dyad connectivity is $C_{abj} = v_{aj} \cdot v_{bj}$. Thirdly, the total world city connectivity between city a and city b is obtained by aggregating the city-dyad connectivity of all the firms. The function is as below:

$$CDC_{a \leftrightarrow b} = \sum_j CDC_{ab,j} = \sum_j V_{aj} \times V_{bj} \text{ (where } a \neq b \text{)}$$

Therefore, the total global network connectivity for city a follows the below equation:

$$GNC_a = GNC_b = \sum_b CDC_{ab} \text{ (where } a \neq b \text{)}$$

Our global connectivity is distinguished from the original vision, as we take economic connections created by multinational corporations covering a variety of sectors instead of financial services. The multinational corporations were sourced from Forbes 2000.

Based on a study of the indices and standards of the United Nations Statistical Division

4 <http://www.wipo.int/>.

5 http://en.wikipedia.org/wiki/Main_Page.

6 <http://unstats.un.org/unsd/ENVIRONMENT/qindicators.htm>.

7 <http://www.doingbusiness.org/reports/>.

(UNSD), World Bank World Development Indexes, OECD Database and other international organizations, we determined an approach for the conversion of data of each country and set up the most appropriate, comparable and widely used statistical standards for data collection and processing. Eventually, we were able to build a uniform database to cover the 500 international cities.

ASSESSMENT AND CALCULATION METHODS

Since the data representing different competitiveness components are various in unit, non-dimensionalization processing has been conducted to convert data into non-unit values. The rescaling of the six variables follows the standardized equations as below:

(1) z-score rescaling

$$X_i = \frac{(x_i - \bar{x})}{Q^2}$$

where x_i is the original data, $\bar{x}$ is the mean value, Q^2 is the standard deviation and X_i is the standardized data.

(2) Exponential rescaling

$$X_i = \frac{x_i}{x_{0i}}$$

where x_i is value of the original data, x_{0i} is the maximum value and X_i represents the transferred data.

(3) 0-1 scaling

$$X_i = \frac{(x_i - x_{min})}{(x_{max} - x_{min})}$$

where X_i is the transferred value of x_i , x_i is the original data, x_{max} is the maximum value of the data set and x_{min} is the minimum value.

Each of the six sustainable competitiveness components referring to Social Cohesion, Environmental Quality, Cultural Diversity, Technological Innovation, Global Connection and Government Management has been represented by one single variable. Different standardized methods have been used according to the characteristics of different variables.

Economic Dynamic is composed of GDP per capita and GDP growth rate. These two variables have been standardized individually and then synthesized together with weightings of 1/3 and 2/3 respectively.

The comprehensive Sustainable Competitiveness index was synthesized with equal weighting methods.

$$Z_i = \sum_j z_{ij}$$

where Z_i represents the sustainable competitiveness index and z_{ij} represents the seven competitiveness component subgroups.

REFERENCES

- Ache, P., H. T. Andersen, T. Maloutas, M. Raco and T. Tasan-Kok (2008), *Cities Between Competitiveness and Cohesion: Discourses, Realities and Implementation*, Springer.
- Angel, D. P. and J. Engstrom (1995), Manufacturing systems and technological change: the US personal computer industry, *Economic Geography*, 79–102.
- Balkyte, A. and M. Tvaronavičiene (2010), Perception of competitiveness in the context of sustainable development: facets of ‘sustainable competitiveness’, *Journal of Business Economics and Management*, 11, 341–365.
- Bathelt, H., A. Malmberg and P. Maskell (2004), Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation, *Progress in Human Geography*, 28, 31–56.
- Begg, I. (1999), Cities and competitiveness, *Urban Studies*, 36, 795–809.
- Berg, L. v. d., J. v. d. Meer and L. Carvalho (2014), *Cities as Engines of Sustainable Competitiveness*, Ashgate Pub. Co.
- Bontis, N. (2004), National intellectual capital index: a United Nations initiative for the Arab region, *Journal of Intellectual Capital*, 5, 13–39.
- Breheny, M. J. (1992), *Sustainable Development and Urban Form*, Pion.
- Budd, L. and A. Hirmis (2004), Conceptual framework for regional competitiveness, *Regional Studies*, 38, 1015–1028.
- Burton, E., M. Jenks and K. Williams (2013), *Achieving Sustainable Urban Form*, Routledge.
- Camagni, R. (2002), On the concept of territorial competitiveness: sound or misleading? *Urban Studies*, 39, 2395–2411.
- Castells, M. (2011), *The Rise of the Network Society: The Information Age: Economy, Society, and Culture*, John Wiley & Sons.
- Ellen, I. G. and K. O'Regan (2010), Crime and urban flight revisited: the effect of the 1990s drop in crime on cities, *Journal of Urban Economics*, 68, 247–259.
- European Commission (2010), *Europe 2020: A Strategy for Smart, Sustainable and Inclusive Growth*, Brussels: European Commission.
- Flarey, D. L. (1996), Managing in a time of great change, *Journal of Nursing Administration*, 26, 16–17.
- Florida, R. (2002), The economic geography of talent, *Annals of the Association of American Geographers*, 92, 743–755.
- Garden, C. and R. L. Martin (2003), A study on the factors of regional competitiveness, In a draft final report for The European Commission Directorate-General Regional Policy.
- Glaeser, E. L. and J. M. Shapiro (2001), *City Growth and the 2000 Census: Which Places Grew, and Why*, Brookings Institution, Center on Urban and Metropolitan Policy.
- Greif, A. (1994), Cultural beliefs and the organization of society: a historical and theoretical reflection on collectivist and individualist societies, *Journal of Political Economy*, 912–

950.

- Huggins, R. and N. Clifton (2011), Competitiveness, creativity, and place-based development, *Environment and Planning-Part A*, 43, 1341.
- Jacobs, J. (1969), *The Economy of Cities*, New York: Random House.
- Kamal-Chaoui, L. and A. Roberts (eds) (2009), Competitive cities and climate change, OECD Regional Development Working Papers No. 2, OECD Publishing.
- Kern, K., G. Alber and S. Energy (2008), Governing climate change in cities: modes of urban climate governance in multi-level systems, *Competitive Cities and Climate Change*, 171.
- Kitchen, P. and A. Williams (2010), Quality of life and perceptions of crime in Saskatoon, Canada, *Social Indicators Research*, 95, 33–61.
- Kitson, M., R. Martin and P. Tyler (2004), Regional competitiveness: an elusive yet key concept? *Regional Studies*, 38, 991–999.
- Kresl, P. K. (1995), The determinants of urban competitiveness: a survey, in P. K. Kresl and G. Gappert (eds), *North American Cities and the Global Economy*, Thousand Oaks, CA: Sage, pp. 45–68.
- Lever, W. F. (2002a), Correlating the knowledge-base of cities with economic growth, *Urban Studies*, 39, 859–870.
- Lever, W. F. (2002b), The knowledge base and the competitive city, in I. Begg (ed.), *Urban Competitiveness: Policies for Dynamic Cities*, The Policy Press.
- Malecki, E. (1997), *Technology and Economic Development: The Dynamics of Local, Regional, and National Change* (2nd edn), New York: John Wiley.
- Markgren, B. (2001), Is proximity a geographical question in business relationships? Working Papers, Uppsala: Uppsala University, Department of Business Studies.
- Martin, R. and J. Simmie (2008), The theoretical bases of urban competitiveness: does proximity matter? *Revue d'Économie Régionale & Urbaine*, 333–351.
- Myerson, R. B. (2013), *Game Theory*, Harvard University Press.
- Ni, P. (2012), *The Global Urban Competitiveness Report - 2011*, Edward Elgar Publishing.
- Ni, P. (2013), *The Global Urban Competitiveness Report - 2013*, Social Science Documentation Publishing House.
- Ni, P., P. Kresl and X. Li (2014), China urban competitiveness in industrialization: based on the panel data of 25 cities in China from 1990 to 2009, *Urban Studies*.
- Ni, P. and W. Pan (2010), The strategic outline for building Chengdu into a world-class modern garden city, *Urban Insight* (in Chinese), 4, 110–124.
- OECD (2008), Competitive cities in a changing climate: an issues paper, in *Competitive Cities and Climate Change*, OECD Conference Proceedings, Milan, 9–10 October 2008, Paris: OECD Publications.
- Porter, M. E. (1998), Clusters and the new economics of competition, *Harvard Business Review*, November, 77–90.
- Porter, M. E., C. H. Ketels, K. Miller and R. Bryden (2004), *Competitiveness in Rural US Regions: Learning and Research Agenda*, Boston, MA: Harvard Business School Institute for Strategy and Competitiveness.
- Quigley, J. M. (1998), Urban diversity and economic growth, *Journal of Economic Perspectives*, 12, 127–138.
- Rabin, M. (1993), Incorporating fairness into game theory and economics, *Advances in Behavioral Economics*, 297.

- Ranci, C. (2011), Competitiveness and social cohesion in western European cities, *Urban Studies*, 48, 2789–2804.
- Rogerson, R. J. (1999), Quality of life and city competitiveness, *Urban Studies*, 36, 969–985.
- Satterthwaite, D. (1999), *The Earthscan Reader in Sustainable Cities*, London: Earthscan.
- Schotter, A. (2008), *The Economic Theory of Social Institutions*, Cambridge: Cambridge University Press.
- Storper, M. (1997), *The Regional World: Territorial Development in a Global Economy*, New York: Guilford Press.
- Taylor, P. J. (2001), Specification of the world city network, *Geographical Analysis*, 33, 181–194.
- Taylor, P. J. (2004), *World City Network: A Global Urban Analysis*, New York: Routledge.
- Taylor, P. J., G. Catalano and D. R. F. Walker (2002), Measurement of the world city network, *Urban Studies*, 39, 2367–2376.
- Taylor, P. J., M. Hoyler, D. R. Walker and M. J. Szegner (2001), A new mapping of the world for the new millennium, *The Geographical Journal*, 167, 213–222.
- Thompson, N. and N. Ward (2005), Rural areas and regional competitiveness, Report to Local Government Rural Network, Centre for Rural Economy, University of Newcastle upon Tyne.
- Turok, I. (2004), Cities, regions and competitiveness, *Regional Studies*, 38, 1069–1083.
- UN-Habitat (2010), *The State of African Cities 2010: Governance, Inequality and Urban Land Markets*, United Nations.
- Wheeler, S. M. and T. Beatley (2004), *The Sustainable Urban Development Reader*, New York: Routledge.
- Wolff, F., K. Schmitt and C. Hochfeld (2007), Competitiveness, innovation and sustainability: clarifying the concepts and their interrelations, Berlin: Öko-Institut, retrieved November 26, 2008.
- World Bank (2013), *Doing Business 2013: Smarter Regulations for Small and Medium-Size Enterprises*, World Bank.