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To cite this article: Teng Wang 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **295** 052050

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Exogenous or Endogenous? An Integrated Spatial Perspective on Energy Corporates' Environmental Performance: The Efficiency Mechanisms of Knowledge from Major Cities

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Abstract. As one of the most concerned topics in environmental protection, the environmental performance of energy firms is extensively studied while little notices the influence of firms' geo-location and major cities. To bridge this gap, we analyse the efficiency mechanism that links major cities and corporate environmental performance by integrating exogenous and endogenous spatial perspective. We find that through knowledge transfer and conversion, firms close to major cities centers could acquire more CEP knowledge from local stakeholders, and thereby improving environmental performance. The results are discussed along with managerial implications.

1. Introduction

With the rapid development of China's economy, environmental and ecological issues constantly snowball and draw attention. As one of the most influential economic entities, energy firms significantly affect the environment and ecology while their environmental performance gradually turns to a crucial concern in theory and practice. To promote energy firms' environmental performance, researchers conduct various research on the drivers of corporate environmental performance (hereafter, CEP), including organizational interests, institutional factors, and managerial preference[1]. However, most researchers underestimate the importance of the firm's spatial attribute, assuming the geo-location has little influence, which has been proven incorrect recently [2].

Despite the neglect in the majority, a few scholars notice the role of geography in affecting firms' environmental performance. For instance, Marquis proposes that not only the organizational field but also the community field will shape corporates' social performance [3]. DeBoer find that numbers of local green competitors and proximity to green locale are positively related to a firm's environmental performance [4]. The above literature contribute to the link between geo-location and CEP while failing to tease out the internal logic, leaving the fundamental question "how they link" an unsolved puzzle.

To bridge this gap, we propose that the influence of energy firms' geo-locations on the environmental performances, primarily derive from the efficiency mechanism of knowledge from nearby major city's stakeholders. Through knowledge transfer and knowledge conversion, energy firms could acquire CEP knowledge from major cities. Besides, compared with firms located in the out layers, firms in the central areas of major cities possess more opportunity to acquire knowledge, which means



spatial proximity would greatly affect knowledge transfer and knowledge conversion, and thereby the environmental performance. To further support the above propositions, we conduct theoretical analyses and build an integrated conceptual model in the following. On this basis, we discuss our findings and conclusion.

2. The definition of key constructs

2.1 Spatial perspective

The spatial perspective consists of exogenous spatial perspective and endogenous spatial perspective [2]. Exogenous spatial perspective attributes the variations of corporate actions or performances to the attributes of location that firms reside, the core logic is that a firm's geo-location determines its surrounding environment and resource, and then affects its actions or performance. Endogenous spatial perspective argues it is the interaction with other local peers that shape a firm's action or performance, rather than locational environment and resource.

2.2 Spatial proximity

According to Boschma [5], spatial proximity refers to “geographic or physical distance between economic entities, both in absolute and relative meaning”. In this study, the term “spatial proximity” refers to the geographic distance between focal energy firm’s headquarter and the central area of the nearest major city. Major city refers to the administrative division of high population such as Beijing, Shanghai, and other provincial capital cities, rather than any ordinary urban areas.

2.3 Corporate environmental performance

Corporate environmental performance (CEP) refers to “corporates’ actions to protect and advance natural environment and ecology, beyond the interests of the firm or regulative requirement”. The term ‘performance’ means to articulate the actual practices in environmental protection, but not those moral preference or commitment. Energy firms could perform environmental protection in various forms, such as donations to ENGOs, cleaner production process, reduction of energy use, and so forth.

3. Proximity to major city center and CEP: Inner mechanisms

3.1 Spatial proximity, major cities centers and efficiency mechanism of knowledge

Efficiency mechanisms follow the logic of “resources-efficiency-action” in promoting firms’ environmental performances. Scholars argue that firms would improve their environmental performance when knowing how to perform better. For instance, trained managers are more likely to integrate ethics codes into corporate strategic decisions, since they have the proper knowledge to apply ethics codes more efficiently [6]. From the spatial perspective, firms’ geo-locations influence environmental performances via the “location-knowledge-performance” path. Firms’ geo-locations determine the CEP knowledge they could acquire and then affect their environmental performances. In the efficiency mechanisms under exogenous and endogenous spatial perspective, the knowledge affects CEP identically while the major differences exist in the “location-knowledge” tie.

Exogenous spatial perspective regards non-firm stakeholders around focal firms as CEP knowledge base, believing that firms can extract CEP knowledge from local stakeholders, such as universities, local communities and NGOs [7]. CEP knowledge would be instructive in bettering the cost-efficiency of knowledge receivers’ environmental performances, and thereby drive more CEP. Endogenous spatial perspective suggests that firms can acquire CEP knowledge from peer stakeholders, based on the inter-firm knowledge spill over [8].

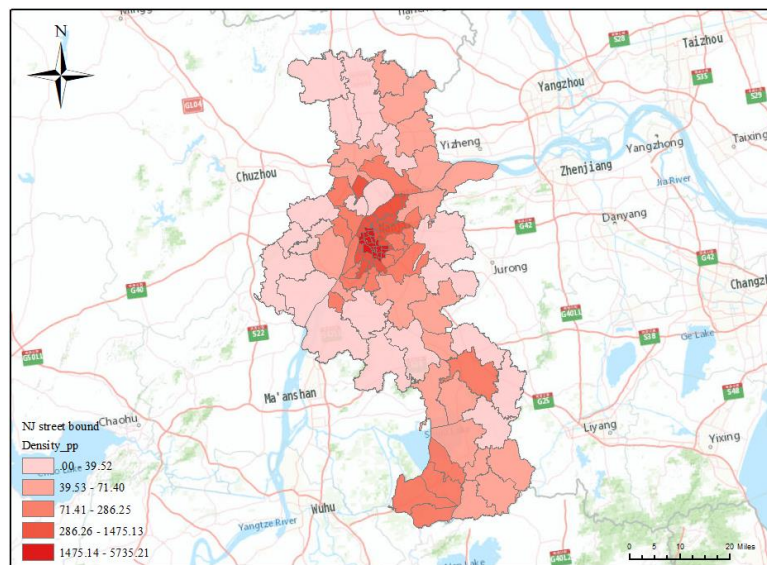


Figure 1. The population density of Nanjing

While the available CEP knowledge is decided by the constitute and size of local stakeholders, firms close to the central area of the major city would possess more advantage in accessing knowledge than their remote peers. In figure 1, the color depth represents the population density in each street (jiedao). All the pink regions belong to the administrative region of Nanjing, whereas the population highly concentrates in the central area of this major city. Besides residents, the other stakeholders also tend to locate concentrated in the central area of the major city [9]. Therefore, we argue that spatial proximity to major cities centers could greatly affect the CEP knowledge firms could obtain.

3.2 Proximity to major city center and CEP: the role of knowledge transfer

We argue that energy firms acquire knowledge from two modes: knowledge transfer and knowledge conversion. Since knowledge spillover includes not only ‘take up by others’ (knowledge transfer), but also ‘combine with suggestions of their own’ (knowledge conversion) [10]. Knowledge transfer refers to the flow of knowledge between entities at different levels, such as individuals or organizations, which usually does not involve changes in the content of knowledge [11]. The firm's location decides the types and amounts of its surrounding stakeholders while influencing its spatial relationship with those local stakeholders. By communicating with local stakeholders, companies can obtain knowledge about CEP. Plus, companies can acquire CEP knowledge through direct observation or display of effects[12], which also mostly occur within some particular distance. Therefore, firms close to major cities centers can observe and thereby learn from their local peers, during which the transfer of CEP knowledge occurs. Obtaining CEP knowledge could help firms in advancing environmental performance. With other factors being equal, the advancement of action efficiency would encourage firms to improve environmental performances. We summarize our arguments in the following statement.

Proposition 1: *Spatial proximity to major city center grants firms more knowledge transfer and thereby promoting their environmental performance.*

3.3 Proximity to major city center and CEP: the role of knowledge conversion

Knowledge conversion refers to the adaptation of knowledge form or the knowledge content, knowledge conversion emphasizes the adjustment or improvement of acquired knowledge. Combine with the internal condition and external environment, firms can converse or upgrade acquired knowledge, making them better or more proper. Considering the highly context-dependent trait, CEP knowledge acquired from knowledge transfer can only function well in similar situations. Similar to the knowledge in other fields, CEP knowledge not only differs by industries but even varies by organizations. Hence,

knowledge receivers must adapt acquired CEP knowledge according to make it more in line with actual organization situations.

Besides self-boost mechanisms such as 'learning by doing', communication with stakeholders is also of importance in knowledge conversion, which means the firm's geo-location plays an important role. Firms located in densely populated regions such as major cities centers could have more opportunities to interact with stakeholders, Compared with the peers in rural areas, firms close major cities have more opportunities to communicate with stakeholders such as suppliers, distributors, and community organizations. This geographic advantage could enable them to collaborate with stakeholders and create "shared values" in aspects of the environment. Therefore, firms' geo-locations not only facilitate CEP knowledge transfers from stakeholders toward them but also lend a hand when those firms adjust and advance their CEP knowledge. Through knowledge conversion, those energy firms could also improve their environmental performances. We summarize our arguments in the following statement.

Proposition 2: *Spatial proximity to major city center grants firms more knowledge conversion and thereby promoting their environmental performance.*

4. Regression and conceptual model

4.1 The regression model

To examine the influence of spatial proximity to major cities centers on corporate environmental performance, knowledge transfer and conversion, we propose regression model (1), model (2), and model (3) in the following. Symbol i represents each firm, *Distance* represents the spatial proximity to major cities centers, *Transfer* represents knowledge transfer, and *Conversion* represents knowledge conversion. *Controls* represents the control variables. ε represents random error terms. β represents parameters to be estimated.

$$CEP_i = \beta_0 + \beta_1 Distance_i + \beta_2 Controls_i + \varepsilon_i, \quad (1)$$

$$Transfer_i = \beta'_0 + \beta'_1 Distance_i + \beta'_2 Controls_i + \varepsilon_i, \quad (2)$$

$$Conversion_i = \beta''_0 + \beta''_1 Distance_i + \beta''_2 Controls_i + \varepsilon_i, \quad (3)$$

To examine the influences of knowledge transfer and conversion on CEP, we construct model (4) and model (5), meanwhile, we integrate the above models and construct the regressions model (6) and model (7) to further examine the mediating effects of knowledge transfer and knowledge conversion.

$$CEP_i = \beta_0''' + \beta_1''' Transfer_i + \beta_2''' Controls_i + \varepsilon_i, \quad (4)$$

$$CEP_i = \beta_0'''' + \beta_1'''' Conversion_i + \beta_2'''' Controls_i + \varepsilon_i, \quad (5)$$

$$CEP_i = \beta_0''''' + \beta_1''''' Transfer_i + \beta_2''''' Distance_i + \beta_3''''' Controls_i + \varepsilon_i, \quad (6)$$

$$CEP_i = \beta_0'''''' + \beta_1'''''' Conversion_i + \beta_2'''''' Distance_i + \beta_3'''''' Controls_i + \varepsilon_i, \quad (7)$$

4.2 The conceptual model

Based on the previous analysis, we further build the conceptual model (Figure 2). As the model shows, geo-location decides a firm's spatial proximity to major cities centers, while the spatial proximity shaping a firm's environmental performance via knowledge transfer and conversion. Through different forms of interactions such as communications or observations, CEP knowledge flows toward focal firms, which could be instructive and boost the efficiency of CEP practices in those firms. With other things equal, higher capabilities would lead to more CEP engagement.

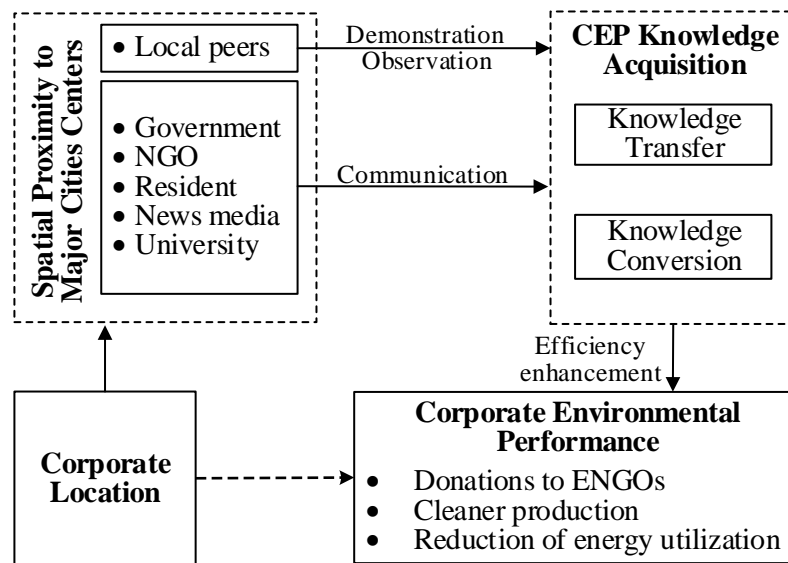


Figure 2. The conceptual model

5. Conclusion and implication

In this study, we explore the inner mechanisms of how major cities influence energy firms' environmental performance from the spatial perspective. Integrating exogenous spatial perspective and endogenous spatial perspective, we find that CEP knowledge plays a key role in this link while firms obtaining CEP knowledge via knowledge transfer and knowledge conversion. Besides, firms' spatial proximity to the central areas of major cities decides the CEP knowledge they could obtain, which means firms close to major cities centers could trigger more knowledge transfer and conversion.

Based on the above findings, we suggest that stakeholders of different types should collaborate to provide energy firms CEP knowledge. For instance, local governments and university should jointly build knowledge sharing platforms, invite energy firms to learn and communicate. For energy firms, we suggest them to pay more attention and learn from surrounding stakeholders, while engaging environment protection based on their capabilities and resources.

Acknowledgments

This paper is based upon research conducted by Institute of International River in Hohai University and Jiangsu Provincial Collaborative Innovation Center of World Water Valley and Water Ecological Civilization. We specially acknowledge the research fund from Postgraduate Research & Practice Innovation Program of Jiangsu Province (KYCX17_0513). We also acknowledge the research fund from National Social Science Foundation of China (16ZDA046).

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