12

Place and space in foreign subsidiary exit from conflict zones[1]: A commentary
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Going Back in Time

Crises and Disruptions in International Business is a timely and important book: the 21st century has been filled with regional and global crises and disruptions. International business (IB) scholars have even coined a new acronym, VUCA (volatility, uncertainty, complexity, and ambiguity), to characterize the current disruptiveness of the global economy (Petricevic & Teece, 2019; Buckley, 2020; van Tulder, Verbeke & Jankowska, 2020). The article, "Place, Space, and Geographic Exposure: Foreign Subsidiary Survival in Conflict Zones" (Dai, Eden & Beamish, 2013) has, I believe, still very much to say about how and why foreign firms respond in different ways when exposed to crises and disruptions.

Let us start with a bit of historical background to the Dai et al. (2013) JIBS article. Li Dai was a first-year doctoral student when she took my doctoral seminar on multinational enterprises and was also assigned to me as a research assistant at Texas A&M University in 2008. Li was interested in global issues, ranging from wars to sister cities, and she and I shared an interest in how geography affects international business (IB). The topic of how and why multinational enterprises (MNEs) exit from conflict zones emerged from our conversations about how to put these issues together for her dissertation.

At the time, Paul Beamish generously offered Li access to his Toyo Keizai (TK) dataset on Japanese MNE parents and their subsidiaries for her dissertation and became an informal member of her committee. Paul had just supervised two dissertations using the TK dataset, which complemented and informed Li's dissertation (Dai, 2012). The first, by Chris Changwha Chung, was on economic crises and three of his

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[1] I would like to thank the editors for selecting our JIBS article and for inviting me to write this commentary. I believe our article contributes to the IB literature on many dimensions and am glad to have the opportunity to reflect on these contributions in this commentary. I also thank Li Dai and Paul Beamish for their helpful comments and recollections. The views expressed in this commentary and any errors or omissions are my own.

articles are cited in Li's dissertation (Chung & Beamish, 2005; Chung, Li, Beamish & Isobe, 2010 and Chung & Song, 2004). The second dissertation Paul supervised, by Kevin Boeh, used a sub-national measure of "place" to specify subsidiary locations; this work was later published in Boeh and Beamish (2012). Paul brought with him deep knowledge of the TK data, having used it in dozens of published articles. He also brought years of real-world knowledge based on interactions with managers, case writing, and professional activities in nearly 90 countries. The three of us have continued to work together on the topic of MNE exit from conflict zones since then, with Li taking the lead role on our joint papers.

There are several innovations in our Dai, Eden and Beamish (2013) JIBS article that remain relevant for today's scholars interested in studying crises and disruptions. These innovations are outlined below.

Vulnerability as a Theoretical Framework

The theoretical framework underlying Li's dissertation was drawn from the literature in economic geography on the topic of vulnerability. Vulnerability is the perceived and actual susceptibility of an entity (e.g., an individual, business, or institution) to a specific threat. While geographers have written extensively on the disruptive impacts of earthquakes and hurricanes, the most useful article for us was Gallopin (2006). Gallopin's interest was rooted in socio-ecological systems and their vulnerability to environmental threats such as earthquakes and hurricanes. His work argued that the vulnerability of a system depended on its exposure to a specific threat and the system's capacity for response (its resilience or ability to bounce back).

Li's dissertation builds on these ideas, hypothesizing that vulnerability depends on three factors: (1) exposure to the threat; (2) what the entity could lose due to the threat (its resources at risk); and (3) the entity's ex ante and ex post coping mechanisms. The actual analogy in the dissertation (see Dai, 2012: 45) is a person's vulnerability to influenza (the flu), as depending on (1) exposure: how many others around you have the flu and how long you are in contact with them; (2) at-risk resources: what you could lose if you caught the flu (e.g., days off sick); and (3) coping mechanisms: ex ante (having had a flu shot) and ex

post (aspirin and vitamin C)).[2] The dissertation addresses three nested responses of a foreign subsidiary in a conflict zone: (1) whether the subsidiary stays or exits and, if the subsidiary chooses to exit, (2) whether the exit is whole or partial and (3) early or late. Thus, the three decision questions are: go/stay, partial/full, and early/late, with the second and third decisions conditional on the first. While our 2013 JIBS article focuses on the physical (i.e., geographical) exposure as a core component of vulnerability, the full vulnerability model – encompassing a firm's exposure, at-risk resources, and resilience – was later published in Dai, Eden and Beamish (2017).

Linking Vulnerability to Place and Space

In May 2011, while Li was writing her dissertation, there was a Call for Papers for a Special Issue of JIBS on "The Multinational in Geographic Space", guest edited by Ulf Andersson, Sjoerd Beugelsdijk, Ram Mudambi, and Srilata Zaheer. The goal of the Special Issue was to "improve our understanding of the spatial dimension of IB activity and the interaction of location with governance and organization aspects of MNE activity – building on insights from economic and human geography and regional science". We realized that the exposure component of the vulnerability model in Li's dissertation could be the unit of analysis for a paper submitted to the JIBS Special Issue. Li started work on this topic with Paul and me while she was also writing her dissertation. The paper was submitted for the JIBS Special Issue in November 2011 and Li defended and submitted her dissertation in December 2011.

The JIBS article is quite different from Li's dissertation and makes multiple contributions to the IB and economic geography literatures in its own right. I discuss some of these contributions below.

Capturing "Place" using GIS Coordinates

First, the concepts of "place" and "space" are core concepts used throughout the article. A "place" is a

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[2]The analogy is appropriate given the current Covid-19 pandemic. I write this commentary at the end of January 2021 in College Station, Texas, going into my 11th month of "sheltering in place" to avoid exposure to the virus, with no clear end date in sight, and sitting somewhere on our local hospital's list of 30,000 registrants waiting for the vaccine.

distinct, nonempty, geographic location. A place (e.g., a building or a city) has a physical location with characteristics such as its GIS (geographic information system) coordinates (latitude and longitude) and geographic features (borders, terrain, population). While most IB research views countries as places, our article focuses on two subnational places: the location of the foreign subsidiary and the location of the conflict zone (or zones) in the host country. The place or location of the foreign subsidiary refers to its actual street address, coded into GIS coordinates. When an MNE has more than one subsidiary in a country, the GIS attributes must be captured for each location. In addition, subsidiaries close and new ones open so that the place data for subsidiaries must be calculated each year. To our knowledge, with the exception of Boeh and Beamish (2012), no prior IB research had been carried out at this level of analysis.[3]

Our database for conflict zones, including their geographic characteristics, is regularly used in political science: the UCDP-PRIO Armed Conflict Database maintained by the Uppsala Conflict Data Program and the International Peace Research Institute. The Uppsala database geocodes conflict zones as the smallest circle that surrounds violent events in a given country and year; thus, conflict zones are circles with a center and radius.[4] This measure of place must also be calculated annually because each conflict zone is likely to change over time, becoming more or less violent, and shifting its geographic boundaries.

Distance (Static Exposure) versus Diversity (Dynamic Exposure)

With geo-coordinates for both the foreign subsidiary and the conflict zone, the distance between the two becomes an obvious proxy for measuring exposure. How close or how far away is the foreign subsidiary from the war zone? The closer the two, the greater the exposure and the more likely that the foreign plant exits. The easiest proxy, which we use in Dai et al. (2013) , is simply a zero-one dummy variable to capture whether the subsidiary is inside or outside the conflict zone on an annual basis. More sophisticated

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[3] The TK dataset contained a number of foreign subsidiaries without street addresses. Li Dai used the Internet and old news articles to search for, and find, those street addresses, which were then translated into GIS coordinates.

[4] More recent versions of the Uppsala dataset allow conflict zones to have different geographic shapes, which would permit more accurate measures of exposure. See https://www.prio.org/Data/Armed-Conflict/UCDP-PRIO/. The data can be downloaded here: https://ucdp.uu.se/downloads/.

calculations, also used in the article, are based on the Great Circle Distance between the plant location and either the perimeter or the center of the conflict zone.

These distance metrics, however, are only capturing part of the story. They measure the *static or dyadic exposure* that one foreign subsidiary faces when located in or near one conflict zone in a given year. However, in a few of the host countries in our dataset there were several conflict zones within the country in the same year. Capturing the combined or *dynamic exposure* that a foreign subsidiary faces when there are multiple conflict zones turned out to be a much more difficult task than measuring the dyadic distance.

I worried about solving this problem for some time and then realized that the problem of a focal place (subsidiary) surrounded by a variety of other places (conflict zones) of different sizes and distances from the focal place was analogous to the solar system and that exposure was akin to gravity - that was as far as my thought experiment could carry us at the time. The answer to the problem came from a serendipitous dinner party in College Station with a group of about twenty theoretical and nuclear physicists from Lawrence Livermore Labs and Sandia, to which I was invited as a spouse (my husband was running the executive education program in the Bush School) in June 2011. At dinner, I posed the problem to the scientists and received an immediate, unanimous response: Coulomb's Law, which provides a mathematical formula for computing the combined gravitational effect (both centripetal and centrifugal/push and pull) of multiple places (planets) on a focal place (planet).[5] I went home and read up on Coulomb's Law.

Equipped with the formula for solving the problem, Li (now a new faculty member at Loyola Marymount University in Los Angeles) went to the UCLA Technology Sandbox, an interdisciplinary computing facility formally known as the UCLA Institute for Digital Research and Education, and enlisted the help of a leading-edge GIS expert to develop measures of dynamic exposure using ArcGIS software. Li's husband, Dan Xie (a theoretical physicist) had collected the GIS coordinates data using street addresses in the TK dataset and did the mathematical calculations to integrate Coulomb's Law. This Commentary gives me the opportunity to thank Dan Xie, the UCLA GIS expert, and the theoretical and nuclear physicists

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[5] For simple explanations of Coulomb's Law see https://en.wikipedia.org/wiki/Coulomb%27s_law and https://www.physicsclassroom.com/class/estatics/Lesson-3/Coulomb-s-Law.

who helped us identify an appropriate measure for capturing dynamic exposure to conflict zones.

Our dynamic exposure variable based on Coulomb's Law, to my knowledge, has not yet been used by other IB scholars, perhaps because we were not clear enough in our article about the measure's novelty and usefulness. I have recently highlighted the variable in Eden and Nielsen (2020), where Bo Nielsen and I argued that IB researchers have examined IB research questions through four lenses - Difference, Distance, Diversity, and Disparity – roughly in chronological order, starting with difference. Diversity" – the third "D" – is a newer focus that looks at variations within and across countries, paying attention to the "multiplicity of actors and networks and the multiplexity of their interactions" (Eden and Nielsen, 2020: 1615). Bo and I make the point that Diversity needs new research metrics and methods and refer to Dai et al. (2013)'s method for capturing the multiple exposures faced by one foreign subsidiary that is surrounded by conflict zones of different sizes, at different distances from the subsidiary, at different points in time.

The results of the econometric work in Dai et al. (2013) show that both static exposure and dynamic exposure have separate and negative impacts on the foreign subsidiary's survival. The largest impact comes from simply being located inside a conflict zone - a one standard deviation increase in the odds ratio for static exposure causes a 52% increase in the probability of exit; in turn, we found that for dynamic exposure, the result is a 9% increase in the probability of exit (Dai et al., 2013: 565).[6] In a post hoc analysis, we employ a two-by-two matrix with the location of the foreign subsidiary relative to the conflict zone on one axis and the exit-stay decision on the other axis. We find that 48% of foreign subsidiaries inside a conflict zone leave the country compared with 17% of subsidiaries located in the country but outside the conflict zone.

Capturing "Space" as Peers and Sisters

Turning now to "space" as a construct, the key insight underlying space is that it emphasizes how places are related or linked to one another; that is, "the variety of relationships linking two or more places,

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[6] The smaller effect for dynamic exposure may reflect the fact that a subsidiary in a large country with two or more conflict zones may not be located inside the zones. It is the location inside a war zone that drives the exit decision.

examples of which include distance, connectivity or shared ties, and spatial dependence" (Dai et al., 2013: 558). In the article we conceptualize space as the concentration and dispersion of firms in geographic space. We focus on two types of firms: home-country peers and same-parent subsidiaries (sisters). Peers are subsidiaries from the same home country that are unrelated to the focal subsidiary; sisters are related to the focal subsidiary; and both types are located in the same host country and may be inside or outside a conflict zone.[7] Treating space as relationships with peers and sisters enablesd us to use insights from the IB and economics literatures to develop hypotheses; e.g., we draw on the concepts of hysteresis, agglomeration economies, herding behavior, interdependence, motivation versus capability, and operational flexibility.

In our empirical work, we use entropy measures of concentration and dispersion (Dai et al., 2013: 563) to capture the peer and sister networks in each country. What we find is that the likelihood of survival for a subsidiary located in a conflict zone is six times higher when there is a dispersed network of sisters in the host country; clearly, the sister network provides resources and coping mechanisms that enable the focal firm to stay. When the focal subsidiary is co-located with peers inside a conflict zone, the subsidiary is more than twice as likely to exit; on the other hand, when the subsidiary and its peers are co-located outside a conflict zone, the focal firm is much more likely to stay (Dai et al., 2013: 571).

Diversity and Econometric Methods

The last contribution of Dai et al. (2013) to the disruption and crises literature that I want to highlight is the "best practice" econometric techniques in this article, which provide a model for other IB researchers.

First, geographers have been modeling the impacts of natural disasters on firms and communities for many years (Adger, 2000, 2006; Gallopin, 2006). Their empirical modeling has typically used regression analysis; however, natural disasters tend not to be normally distributed, because they are more likely to be rare events. Adriani & McKelvey (2007) argue that rare events need Pareto-based statistics (i.e., data points are independent-multiplicative, and distributions are asymmetric with long tails) rather than

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[7] An obvious extension would have been to include peers from other home countries that are also located in the host country (these data were unavailable to us).

Gaussian-based statistics (data points are independent-additive with normal distributions). There are specific empirical techniques for modelling rare events; however, few IB scholars are currently using rare-event empirical techniques. Adriani and McKelvey (2007: 1221) argue that they should be, stating that "…there is a far higher probability of fractals, Pareto distributions and power laws in IB than in domestic settings. In short, IB managers face Pareto much more than Gaussian distributions." Here again, our article was a trail blazer, using rare-event logit models to test the likelihood of foreign exit.

Second, our article includes several additional tests to show the practical significance of the results.[8] For example, the rare-event results are presented as logistic regressions using odds ratios to show what would happen if an independent variable varied by one standard deviation. In addition, the two-by-two matrix mentioned earlier, in a post hoc analysis illustrates practical significance.

A third contribution, which also speaks to practical significance but extends past that, is the use of the propensity score matching technique. In another post hoc analysis (Dai et al., 2013: 571), we build a counterfactual model, as recommended in experimental economics, and by our JIBS Special Issue Editors Ram Mudambi and Sjoerd Beugelsdijk. We use propensity score matching to generate a hypothetical counterfactual that mimics a natural experiment with non-experimental data. IB researchers are now urged to do matched control groups to calculate the average treatment effect (the difference between the real and counterfactual outcomes); see, for example, Nielsen and colleagues (2020) or Reeb, Sakakibara and Mahmood (2012). Our paper was among the earliest JIBS articles to use this experimental technique.

Conclusion

As I have attempted to illustrate in this commentary, Dai et al. (2013) was a true multidisciplinary project. The simplicity of the question – *How does exposure to a conflict zone affect a foreign subsidiary's stay-versus-exit decision?* - was deceptive. To answer the question, we needed to draw on theoretical insights

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[8] My personal view is that empirical IB research should include a section on the power of the results. An empirical IB article that cannot demonstrate any power or practical significance of its results is basically "dancing on the head of a pin" and provides little information of value to either practitioners or other scholars. The paper may make theoretical contributions, but its empirical work has little impact.

and empirical tools from a variety of disciplines in both the social sciences and physical sciences. Indeed, it "takes a village" (as Li Dai reminded me) to answer a research question that lies at the crossroads of IB, economic geography, political science, and physics.

The article advances our knowledge of "whether, why, how, and when" firms react if they are exposed to specific threats. We theorize and show how place and space affect these decisions, and the differing impacts of static and dynamic exposure. The article also makes a variety of empirical contributions to the IB literature, including (1) using street-level GIS data and ArcGIS software to capture sub-national location and (2) Uppsala data from political science on conflict zones to calculate (3) static exposure, i.e., the distance between a focal firm and a specific threat, and (4) dynamic exposure, i.e., the gravitational push/pull effects of multiple and diverse threats on a focal firm, using Coulomb's Law, and (5) performing a variety of leading-edge econometric tests using rare-event and experimental-economics techniques.

Overall, I hope that my commentary will encourage other IB scholars to work on topics involving disruptions and crises, particularly at the sub-national level. While the research question in Dai et al. (2013) may seem very specific – *Do foreign subsidiaries stay or leave a host country at war?* – the theoretical framework involving vulnerability, exposure, place, and space is widely applicable to a variety of firm decisions characterized by VUCA (volatility, uncertainty, complexity and ambiguity). Predicting and understanding how, when, and why "place" and "space" react to a specific external threat, particularly a rare event threat, is a puzzle worthy of attention by all IB researchers.

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