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Longitude matters: Time zones and the location of foreign direct investment

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Abstract

Using bilateral foreign direct investment (FDI) data, we find that differences in time zones have a negative and significant effect on the location of FDI. We show that this finding is robust across different specifications, estimation methods and proxies for time zone differences. Time zones also have a negative effect on trade, but this effect is smaller than that on FDI. Finally, the impact of the time zone effect has increased over time, suggesting that it is not likely to vanish with the introduction of new information technologies.

Keywords: Foreign direct investment; Transaction costs; Time zones

JEL classification: F21; F23

1. Introduction

A lot has been written in the literature on geography and economic development about the importance of latitude. Hall and Jones (1999), for example, find a positive correlation between the distance to the equator and output per worker, mediated by the social infrastructure. Gallup et al. (1999) argue that the tropical climate in locations near the equator has an adverse effect on human health, agricultural productivity and consequently on economic growth. Acemoglu et al. (2001) claim that tropical diseases, associated with latitude, affected the kind of settlements and institutions colonizers established in the colonies, and thus had an important impact on their later development path. However, little attention has been paid to the economic effects of longitude.

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In this paper, we center our attention on a variable that is closely related to longitude: the difference in time zones between locations. In particular, we estimate the effects of time zone differences on bilateral stocks of foreign direct investment (FDI), using OECD data for 17 OECD source countries and 58 host countries from 1997–1999. We show that longitude–in the form of time zones–imposes important costs between the parties in a transaction. To our knowledge, this paper is the first one to present systematic evidence of the impact of time zone differences on the cost of doing business.

The empirical literature, in particular, the one related to the gravity model of bilateral trade, has used two types of variables to control for transaction costs. On the one hand, geographical characteristics of countries or country pairs, such as distance, adjacency, remoteness, and whether one or the two countries in the pair are landlocked or islands, are used to capture mainly transportation costs. On the other hand, variables related to cultural and historical ties between the countries, such as common language, cultural similarities or past colonial links, are frequently used to account for other transaction costs that may affect the cost of doing business.[1] However, none of these variables captures the transaction costs related to the need for frequent interaction in real time between the parties. Distance, in particular, does not capture this effect. If telephone, e-mail and teleconference communication are close substitutes for face-to-face interaction, North–South distance should not be such a large problem. In contrast, differences in time zones can matter even given today's easy and low-cost communications, for the obvious reason that people at night usually prefer to sleep.

An alternative way to communicate in real time is to travel. In this case, again, East–West transaction costs may be more important than North–South ones, since jet lag can affect the effectiveness of business travelers, or require longer trips to adjust to the time difference. Jet lag, in effect, may lead to an exception to the rule that people tend to sleep at night: those severely affected by jet lag in fact tend to sleep during the day!

The transaction costs associated to the difference in time zones should be important in activities that are intensive in information and require a great deal of interaction in real time. For this reason, we think that FDI offers a perfect setting in which to study the effects of time zone differences. Frequent real-time communications should be particularly important between headquarters and their foreign affiliates, as well as between a firm and its prospective foreign partners.[2] In this sense, while time zones may also affect bilateral trade, the need for real-time communication is probably smaller among trading partners, so we expect their effects to be relatively more important for FDI.

In a related paper, Kamstra et al. (2000) investigate the effect of daylight saving time changes on equity returns. They find that returns are significantly lower immediately after the weekend the change occurred. If sleeping disorders caused by minor time changes can affect the patterns of judgment, reaction time and problem solving of stock market participants, the jet lag associated to inter-continental travel should also lead to important

[1] Rauch (1999), for example, finds negative effects of physical and "cultural" distance on trade, and the effect is particularly large for differentiated goods.

[2] It is possible that the effect may go in the opposite direction in some specific sectors (such as perhaps software development), in which differences in time zones may allow multinational firms to gain some advantage by working around the clock. Unfortunately, our data do not report FDI by sectors. Interestingly, studies in the business and information technology literature identify time zones as a major obstacle of geographically dispersed teams in the software sector (see, e.g., Espinosa and Carmel, 2004). Thus, this issue remains an open issue for future research.