The Belt and Road Initiative as a Path for Chinese Tech Company Expansion
探究“一带一路”倡议之影响：以中国科技公司的海外拓展为例。

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Abstract: The People’s Republic of China (PRC) is a rising global economic and technological power. Many scholars argue that the PRC increasingly projects its influence abroad through vehicles such as the Belt and Road Initiative (BRI). While the direct economic, political, and cultural impacts of the BRI have been explored extensively — and even demonstrated causally by some authors — prior work has not focused on the impacts of BRI investment on the expansion strategies of Chinese technology companies. In this study, we seek to determine whether Chinese technology companies are disproportionately embedded in countries that receive more BRI investment from China. We measured the embeddedness for seven major Chinese technology companies in ten randomly selected BRI beneficiary countries, as well as the United States. We hypothesized that countries which receive more BRI investment from China are more likely to have a higher score for Chinese tech company embeddedness. Surprisingly, we found no correlation between a country’s index of debt to China and average embeddedness score. This finding suggests that Chinese tech companies may not use BRI investment in a country as a signal to embed in that country. Future work should expand this analysis to a greater selection of countries and utilize year-disaggregated data.

Keywords: The Belt and Road Initiative, Chinese technology company, overseas expansion

摘要：普遍观点认为，中国通过“一带一路”倡议影响各国。但该倡议如何影响中国科技公司在各国的拓展仍属未知。为此，本研究使用定量的方法，研究了七家中国科技公司在十个“一带一路”国家以及美国的发展状况。结果显示，“一带一路”倡议对于这些公司在各国的业务拓展并无显著影响。科技公司并未以该倡议作为海外拓展的导向。

关键词：“一带一路”，科技公司，海外拓展探究“一带一路”倡议之影响：以中国科技公司的海外拓展为例。

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1. Background

1.1 Chinese Foreign Relations after 1949

1949 was a critical point in Chinese international relations, when the Chinese Communist Party (CCP) defeated Chiang Kai-shek's Nationalist government. Three months prior, Mao Zedong had announced an alliance between the CCP and the Soviet Union. With the rise of the CCP to power, the newly founded People's Republic of China (PRC), which at the time encompassed a quarter of the world's population, had picked sides in the Cold War.

To prevent the spread of communism, the United States supported the Nationalists during the Chinese Civil War, and continued to support the Nationalist government after it fled to Taiwan. The CCP's victory prompted the U.S. Truman administration to institute a non-recognition policy towards the PRC, fortifying the American economic embargo of the PRC and greatly limiting U.S. relations with mainland China. The U.S. viewed China as an aggressive expansionist power and attempted to undermine the CCP when possible.[2]

In 1950, in response to the United States's increasingly aggressive positioning, Chinese and Soviet leaders signed the Sino-Soviet Treaty of Friendship, Alliance, and Mutual Assistance, promising to defend the other if Japan or the United States were to attack. The Soviet Union quickly called upon the treaty during the 1950 Korean War. When the South Korea Army (backed by U.S. forces) pushed North Korean People's Army (backed by the Soviet Union) reached the Yalu River — the border with China — forces from China's People's Volunteer Army joined the North Koreas and ultimately pushed U.S. forces back to the 38th Parallel. Although the Sino-Soviet alliance was quite successful in the first half of the 1950s, it began to unravel because Mao

[2] Xia, Y. (2008, July 16). The Cold War and Chinese Foreign Policy. Retrieved December 14, 2020, from https://www.e-ir.info/2008/07/16/the-cold-war-and-china/

disagreed with Soviet leader Nikita Khrushchev's plans of de-Stalinization. The alliance finally collapsed in 1959 in part due to competition between the PRC and Soviet Union. With the collapse of the Sino-Soviet alliance, the Cold War transitioned into a three-way standoff between China, the Soviet Union, and the United States. However, diplomatic relations continued between the U.S. and PRC chiefly through ambassadorial talks — 136 talks were held from 1955-1970.[3]

During the Cold War, PRC attempted to influence developing countries by putting pro-China governments into power. The PRC supported national liberation struggles to overthrow the governments of developing countries that aligned with the West. The PRC also cooperated closely with the independent governments, attempting to convince them to reject the West. However, without much to offer developing countries, the PRC's efforts didn't gain much traction. The rising threat of the Soviet Union to China in the 1970s convinced Mao Zedong to repair relations with the United States; both nations wanted to utilize the other to neutralize the Soviet threat. However, Mao still hoped for China to emerge as a global superpower and a model nation of "liberated" peoples.[4]

After Mao's death in 1976, Deng Xiaoping's rise to power led to a change in China's foreign policies. Deng abandoned Mao's support for revolutions abroad and instead focused on modernizing China by reforming China's domestic economy and opening it up to global markets (*改革开放*). As part of China's opening, the PRC and the United States established formal

[3] U.S. Department of State. (n.d.). U.S.-China Ambassadorial Talks, 1955–1970. Retrieved December 14, 2020, from https://history.state.gov/milestones/1953-1960/china-talks
[4] Xia, Y. (2008, July 16). The Cold War and Chinese Foreign Policy. Retrieved December 14, 2020, from https://www.e-ir.info/2008/07/16/the-cold-war-and-china/

diplomatic relations in 1979. Deng believed that the United States was the key to modernizing and developing China.[5]

1.2 Chinese Economic Relations

China's economic trends after 1949 were characterized by two major themes — economic isolation and globalization. The former was championed by Mao Zedong and the latter by Deng Xiaoping.

Mao believed that economic isolation and a razor-eyed focus on China's economic productivity could achieve socialist goals of income equality. He attempted to achieve this goal through two major economic policies. China's first Five-Year plan (1953-1957) emphasized industrial development through massive advancements in technology, which came at the expense of agriculture. Economic growth was driven by industrial progress, but these policies also increased state control over industrial enterprises and the Chinese people. The first Five-Year plan, which adopted a Soviet model of industrialization, ultimately did not succeed due to China's dense population and lack of agricultural surplus. The Second Five-Year plan, also known as the Great Leap Forward (1958-1962) abolished private plots for common ownership, equalized wages, and sought to expand production output through increased cooperation and physical labor rather than mechanized production. The Great Leap Forward impacted China's social structure by organizing the country's population into communes, which were large rural organizations controlled by the local government to monitor economic and social activity. Not only did Mao's economic policies fail to produce the economic growth he sought, but they also took an enormous toll on the Chinese

[5] Denmark, A. (2019, April 08). Analysis | 40 years ago, Deng Xiaoping changed China - and the world. Retrieved December 14, 2020, from https://www.washingtonpost.com/news/monkey-cage/wp/2018/12/19/40-years-ago-deng-xiaoping-changed-china-and-the-world/

population. The Great Leap Forward also led to a significant drop in agricultural production, and as a result, an estimated 20 million people died of starvation.[6]

On the other hand, Deng Xiaoping believed in promoting economic modernization through globalization. In 1975, he advocated for the Four Modernizations, which would set the stage for his reform efforts: agriculture, industry, science and technology, and defense. Deng began with agricultural reform. In 1979, the PRC implemented the Household Responsibility System, which divided communes back into family plots, and after meeting the government quotas for food production, allowed families to sell the rest of their crop yield for profit. China's agricultural productivity rose sharply as a result. Then, under Deng's leadership, the PRC opened the doors to trade and foreign investment. These policies welcomed the flow of Western ideas into China, which Deng believed would grow China's competitiveness in the global market. In 1980-1984, Deng established Special Economic Zones (SEZs) to attract foreign direct investment (FDI). China's SEZs provided favorable tax incentives to foreign firms and allowed for trade and investment to occur without the immediate authorization of the PRC.[7]

1.3 Chinese Exports and Foreign Direct Investment (FDI)

Before 1949, China's economy was very weak compared to Western growth leaders primarily because China had not yet industrialized. After the PRC was founded in 1949, CCP leaders established an independent socialist economic and trade system with highly centralized planning management. Since then, particularly after Deng Xiaoping came to power, China's exported commodities have diversified, and the country has rapidly industrialized. China's foreign trade

[6] Young, E. P. (2020, December 8). Economic policies. Retrieved December 14, 2020, from https://www.britannica.com/place/China/Economic-policies
[7] E. (2020, August 12). Four Modernizations. Retrieved December 14, 2020, from https://www.britannica.com/topic/Four-Modernizations

development has been correlated with major economic advancements.[8] We can potentially utilize China's FDI in other countries as a quantitative measure of BRI.

1.4 The Belt and Road Initiative

The Belt and Road Initiative (BRI),[9] in line with Deng Xiaoping's policies for globalization, was created in 2013 and promotes China financing to develop hard infrastructure, soft infrastructure, and cultural ties between China and beneficiary countries across the world. "Belt" refers to land routes for road and rail transportation, also known as "the Silk Road Economic Belt." "Road" refers to sea routes, also known as the 21st Century Maritime Silk Road.[10] While there is some disagreement about the exact expanse of BRI, researchers agree that at the very least, BRI supports Chinese investment in countries in Africa, Asia, Europe.[11] Researchers at the Center for Security and International Studies (CSIS) ChinaPower project take a broad view on the initiative, arguing that as of October 2019, BRI connects China to 138 countries that collectively represent about 61% of the world's population.[12]

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[8] Liu, H. (2019). 70 Years of China's Foreign Trade: Becoming a Global Trader through Growth and Reform. Retrieved December 14, 2020, from http://www.chinatoday.com.cn/ctenglish/2018/hotspots/70y/journey/201909/t20190930_800180391.html

[9] BRI was formerly known as "One Belt, One Road" (一带一路, OBOR).

[10] Belt and Road Initiative. (2020, December 13). Retrieved December 14, 2020, from https://en.wikipedia.org/wiki/Belt_and_Road_Initiative

[11] Steil, B., & Rocca, B. D. (2019, May 8). Belt and Road Tracker. Retrieved December 09, 2020, from https://www.cfr.org/article/belt-and-road-tracker;
China Power Team. "How Will the Belt and Road Initiative Advance China's Interests?" China Power. May 8, 2017. Updated August 26, 2020. Accessed December 9, 2020. https://chinapower.csis.org/china-belt-and-road-initiative/;
Nedopil, Christoph (2020): "Countries of the Belt and Road Initiative"; Beijing, IIGF Green BRI Center, www.green-bri.org

[12] China Power Team. "How Will the Belt and Road Initiative Advance China's Interests?" China Power. May 8, 2017. Updated August 26, 2020. Accessed December 9, 2020. https://chinapower.csis.org/china-belt-and-road-initiative/

Table 1. Regional Breakdown of BRI Partner Countries

Region	Number of Countries
Asia	43
Africa	40
Europe	26
Americas	19
Oceania	10

Source: CSIS ChinaPower Project[13]

The BRI aims to build ties between China and beneficiary countries by financing hard infrastructure projects, developing soft infrastructure, and supporting cultural exchange programs (soft power). These goals are outlined in a BRI action plan developed by China's Ministry of Foreign Affairs and issued by the National Development and Reform Commission in March 2015.[14] The plans key points are summarized by CSIS's ChinaPower project:[15]

1. "Improving intergovernmental communication to better align high-level government policies like economic development strategies and plans for regional cooperation.

[13] China Power Team. "How Will the Belt and Road Initiative Advance China's Interests?" China Power. May 8, 2017. Updated August 26, 2020. Accessed December 9, 2020. https://chinapower.csis.org/china-belt-and-road-initiative/

[14] Action plan on the Belt and Road Initiative (Rep.). (2015, March 30). Retrieved December 10, 2020, from http://english.www.gov.cn/archive/publications/2015/03/30/content_281475080249035.htm

[15] China Power Team. "How Will the Belt and Road Initiative Advance China's Interests?" China Power. May 8, 2017. Updated August 26, 2020. Accessed December 9, 2020. https://chinapower.csis.org/china-belt-and-road-initiative/

2. Strengthening the coordination of infrastructure plans to better connect hard infrastructure networks like transportation systems and power grids.
3. Encouraging the development of soft infrastructure such as the signing of trade deals, aligning of regulatory standards...
4. Bolstering people-to-people connections by cultivating student, expert, and cultural exchanges and tourism."

There is evidence these policy objectives are being carried out. For example, BRI beneficiary countries have been found to receive an influx of FDI from China after signing on to the initiative.[16] Based on the BRI's policy objectives, it is likely that President Xi Jinping and the Chinese government seek to influence beneficiary countries economically, policially, and culturally.

As part of the Belt and Road Initiative, the Digital Silk Road elevates China's digital connectivity with the rest of the world through its China-centric infrastructure, expanding Chinese tech companies, accessing data collection, but also manipulation of digital information.[17] The Digital Silk Road is the start of China's plan to garner greater global hegemony as a technological superpower, in which they believe that tech advancements is key. It was introduced in 2015 in a

[16] Du, J., and Y. Zhang. 2017. "Does One Belt One Road Initiative Promote Chinese Overseas Direct Investment?" China Economic Review 47 (C): 189–205.
[17] China's Digital Silk Road: Strategic Technological Competition and Exporting Political Illiberalism. (2019, September 26). Retrieved December 14, 2020, from https://www.cfr.org/blog/chinas-digital-silk-road-strategic-technological-competition-and-exporting-political;
Greene, R., & Triolo, P. (2020, May 8). Will China Control the Global Internet Via its Digital Silk Road? Retrieved December 14, 2020, from https://carnegieendowment.org/2020/05/08/will-china-control-global-internet-via-its-digital-silk-road-pub-81857;
Blanchette, J., & Hillman, J. E. (2020, April 13). China's Digital Silk Road after the Coronavirus. Retrieved December 14, 2020, from https://www.csis.org/analysis/chinas-digital-silk-road-after-coronavirus

Chinese government white paper. China seeks to heavily infiltrate the global financial, information, and telecommunications networks through the framework of four major divisions-- global digital infrastructure, developing domestic military and economic technologies, ecommerce in digital free trade zones, and initiating an international digital environment. With these new initiatives, the United States views China's ascendance as a technological superpower as a threat to international security and sees it as a tool for oppression.

The BRI enables China to project regional and global influence in a variety of ways. First, BRI's goal of developing soft infrastructure such as aligning regulatory standards aids China's well-documented push to control international technology standards-setting bodies — influencing the direction of standards development in China's favor.[18] Technology standards-setting has become a key geopolitical priority for countries such as China. This stems from the recognition that those who do not set international technology standards (the followers) will incur high

[18] The U.S.-China Business Council. (2020, February). China in International Standards Setting - USCBC Recommendations for Constructive Participation (Rep.). Retrieved December 10, 2020, from https://www.uschina.org/sites/default/files/china_in_international_standards_setting.pdf;
China and the New Geopolitics of Technical Standardization (Issue brief). (2020, January). Retrieved December 10, 2020, from French Institute of International Relations website: https://www.ifri.org/en/publications/notes-de-lifri/china-and-new-geopolitics-technical-standardization;
Arcesati, R. (2019, January 29). Chinese tech standards put the screws on European companies. Retrieved December 10, 2020, from https://merics.org/en/analysis/chinese-tech-standards-put-screws-european-companies;
Ding, J. (2020, July 1). Balancing Standards: U.S. and Chinese Strategies for Developing Technical Standards in AI. Retrieved December 10, 2020, from https://www.nbr.org/publication/balancing-standards-u-s-and-chinese-strategies-for-developing-technical-standards-in-ai/;
The Rise of China in Technology Standards: New Norms in Old Institutions (Rep.). (2013, January 16). Retrieved December 10, 2020, from U.S.-China Economic and Security Review Commission website: https://www.uscc.gov/sites/default/files/Research/RiseofChinainTechnologyStandards.pdf

switching costs when they eventually need to adopt the standard.[19] Following the State Council's recognition in 2015 that China's standards-setting efforts were deficient,[20] the Standardization Administration of China (SAC) and China's National Academy of Engineering began to develop "China Standards 2035" (*中国标准*2035).[21] These emerging technology standards (i.e. AI, 5G, cybersecurity) are designed to advance China's "indigenous innovation" (*自主创新*) efforts, and if adopted by international standards-setting bodies, they will provide Chinese companies that have already adopted these standards in an advantageous position. China has made a particularly concerted effort to influence the direction of 5G standards, as documented by the Eurasia Group.[22] BRI supports these and other standards-setting efforts.

Second, BRI investment in hard infrastructure can place beneficiary countries in unsustainably high levels of debt to China.[23] BRI beneficiary countries that are heavily indebted to China may be more susceptible to influence from Chinese government officials. However, some scholars have pushed back and raised legitimate questions about to what extent BRI projects truly

[19] Schneider-Petsinger, M., Wang, J., Jie, Y., & Crabtree, J. (2019, November 7). US–China Strategic Competition - The Quest for Global Technological Leadership (Rep.). Retrieved December 10, 2020, from Chatham House website: https://www.chathamhouse.org/2019/11/us-china-strategic-competition/power-shift-international-technology-standard-setting

[20] China and the New Geopolitics of Technical Standardization (Issue brief). (2020, January). Retrieved December 10, 2020, from French Institute of International Relations website: https://www.ifri.org/en/publications/notes-de-lifri/china-and-new-geopolitics-technical-standardization

[21] 钟张涵, & 辜树仁. (2018, October 29). 台商在贸易战下布局"中国标准 2035". Retrieved December 14, 2020, from http://www.ftchinese.com/story/001079989?full=y

[22] Triolo, P., & Allison, K. (2018, November 15). The Geopolitics of 5G (Rep.). Retrieved December 13, 2020, from Eurasia Group PAUL TRIOLO website: https://www.eurasiagroup.net/live-post/the-geopolitics-of-5g

[23] Hurley, J., Morris, S., & Portelance, G. (2019). Examining the debt implications of the Belt and Road Initiative from a policy perspective. Journal of Infrastructure, Policy and Development, 3(1), 139. doi:10.24294/jipd.v3i1.1123

exhibit characteristics of debt-trap diplomacy.[24] Regardless, China BRI investments have been countered by the United States.

The United States is responding to China's BRI by making counter-investments to developing countries that have just begun to receive BRI funding. A 2019 paper found that, in Western multilateral development banks, the U.S. was more likely to vote for project/loan packages to BRI beneficiary countries.[25] The effect was amplified for countries that had signed onto the BRI but not yet received large amounts of China aid, which suggests that the U.S. disproportionately targets aid towards countries that are at-risk for falling into China's sphere of BRI influence.

Third, BRI beneficiary countries that receive more financial support from China (i.e. via BRI) are more likely to vote with China in international organizations such as the United Nations.[26] This finding provides some explanation for the successful candidacy of Chinese representatives to head component organizations of the U.N. Currently, Chinese representatives lead "four out of 15 U.N. and U.N.-affiliated agencies or groups that collectively function as the machinery of the U.N.

[24] Glosserman, B. (2020, September 1). 'Debt trap' diplomacy is a card China seldom plays in Belt and Road initiative. Retrieved December 14, 2020, from https://www.japantimes.co.jp/opinion/2020/09/01/commentary/debt-trap-diplomacy-bri-china/

[25] Vadlamannati, K. C., Li, Y., Brazys, S. R., & Dukalskis, A. (2019). Building Bridges or Breaking Bonds? The Belt and Road Initiative and Foreign Aid Competition. SSRN Electronic Journal. doi:10.2139/ssrn.3329502

[26] Dreher, A., Fuchs, A., Parks, B., Strange, A. M., & Tierney, M. J. (2016). Apples and Dragon Fruits: The Determinants of Aid and Other Forms of State Financing from China to Africa. SSRN Electronic Journal. doi:10.2139/ssrn.2855935;
A despot's guide to foreign aid. (2016, April 16). Retrieved December 14, 2020, from https://www.economist.com/middle-east-and-africa/2016/04/16/a-despots-guide-to-foreign-aid

system."[27] No other country leads more than one of these 15 bodies.[28] Additionally, this mechanism where voting with China is correlated with more Chinese aid via BRI supports China's inference in human rights mechanisms at the U.N.[29]

Fourth, the Chinese government seeks to use the BRI to exert greater soft power in beneficiary countries, winning hearts and minds for China. China has a persistent public image problem, and the Chinese government has sought to repair the country's image with public diplomacy initiatives.[30] The components of the BRI that promote cultural exchange between Chinese citizens and those of BRI beneficiary countries form one such public diplomacy initiative.[31] Analysis of beneficiary countries only along the BRI's land route found that China's investments did bring "significant improvement in China's soft power."[32] This finding did not hold true across the complete set of beneficiary countries (the land and sea routes).

[27] Trofimov, Y., Hinshaw, D., & O'Keeffe, K. (2020, September 29). How China Is Taking Over International Organizations, One Vote at a Time. Retrieved December 10, 2020, from https://www.wsj.com/articles/how-china-is-taking-over-international-organizations-one-vote-at-a-time-11601397208

[28] Ibid.

[29] The Costs of International Advocacy - China's Interference in United Nations Human Rights Mechanisms (Rep.). (2017, September 5). Retrieved December 10, 2020, from Human Rights Watch website: https://www.hrw.org/report/2017/09/05/costs-international-advocacy/chinas-interference-united-nations-human-rights

[30] Wang, Y. 2008. "Public Diplomacy and the Rise of Chinese Soft Power." The Annals of the American Academy Political and Social Science 616: 257–273. doi:10.1177/0002716207312757.

[31] Cheng, L. K. 2016. "Three Questions on China's 'Belt and Road initiative'." China Economic Review 40: 309–313. doi:10.1016/j.chieco.2016.07.008.;
Johnston, L. A. 2018. "The Belt and Road Initiative: What Is in It for China?" Asia and the Pacific Policy Studies 2018: 1–19.

[32] Jan P. Voon & Xinpeng Xu (2020) Impact of the Belt and Road Initiative on China's soft power: preliminary evidence, Asia-Pacific Journal of Accounting & Economics, 27:1, 120-131, DOI: 10.1080/16081625.2020.1686841

BRI may not be the public diplomacy success that the PRC hoped for. A 2019 paper[33] found that while the BRI was, on average, positively received in all regions except South Asia, there was no significant difference in public perception of the BRI between beneficiary and non-beneficiary countries; membership in the BRI does not seem to grow appreciation for the program. At the same, countries around the world are becoming increasingly wary of, or even hostile towards, China and the BRI. There is growing concern that the BRI (among other industrial policies) give Chinese companies an unfair advantage over their European rivals in third party countries.[34] Meanwhile, the India government, which sees BRI as China's attempt to "expand and leverage its strategic advantages in the region,"[35] has espoused concerns about the transparency and debt burdens of the initiative. According to the Pew Research Center in October 2020, negative views of China are higher than any other point in the last decade, among the public in Australia, the United Kingdom, Germany, the Netherlands, Sweden, the United States, South Korea, Spain and Canada.[36]

[33] García-Herrero, A., & Xu, J. (2019, February 6). Countries' perceptions of China's Belt and Road Initiative: A big data analysis (Working paper). Retrieved December 10, 2020, from Bruegel website: https://www.bruegel.org/2019/02/countries-perceptions-of-chinas-belt-and-road-initiative-a-big-data-analysis/

[34] Mair, S., Strack, F., & Schaff, F. (Eds.). (2019, January). China – Partner and Systemic Competitor: How Do We Deal with China's State-Controlled Economy? (Issue brief). Retrieved December 10, 2020, from The Federation of German Industries (BDI) website: https://english.bdi.eu/publication/news/china-partner-and-systemic-competitor/

[35] Trenin, D., Haenle, P., Gabuev, A., Valášek, T., Baruah, D. M., Haenle, P., . . . Bin, M. (2019, April 25). How Are Various Countries Responding to China's Belt and Road Initiative? Retrieved December 10, 2020, from https://carnegietsinghua.org/2019/04/25/how-are-various-countries-responding-to-china-s-belt-and-road-initiative-pub-79002

[36] Silver, L., Devlin, K., & Huang, C. (2020, October 27). Unfavorable Views of China Reach Historic Highs in Many Countries. Retrieved December 09, 2020, from https://www.pewresearch.org/global/2020/10/06/unfavorable-views-of-china-reach-historic-highs-in-many-countries/

1.5 Research Question

While the direct economic, political, and cultural impacts of the BRI have been explored extensively — and even demonstrated causally by some authors — little work has focused on signals that BRI investment sends to Chinese technology companies.In this study, we seek to determine whether Chinese technology companies are disproportionately embedded in countries that receive more BRI investment from China. Chinese technology companies may believe, for example, that they will face a relaxed regulatory environment and supportive local populace in BRI beneficiary countries. This signal could lead large, multinational Chinese technology companies (which aren't directly involved in BRI deals) to follow the trail of Chinese government investment and influence and lay down roots in countries that receive more BRI funding. We hypothesize that countries which receive more BRI funding from China are more likely to have a higher concentration of Chinese tech companies. We explore this research question and hypothesis using a purely correlational methodology.

2. Methods

We randomly selected 10 countries as well as the United States, for 11 countries in total. We surveyed the degree to which the seven Chinese tech companies were embedded in each of these 11 countries.

2.1 Choice of Companies

We decided which Chinese tech companies to investigate by gathering existing lists of top Chinese tech companies and choosing a list that captures a broad range of technology companies. We looked at lists of Chinese technology companies from a variety of sources. We looked at lists of

top Chinese tech companies[37] as well as "up and coming" Chinese tech companies.[38] We also looked specifically at China's National AI Team,[39] and we generated a few custom lists of our own. Ultimately, after looking through these lists, we chose to collect data on the list of seven "up and coming" Chinese companies:[40]

- Alibaba
- Baidu
- Huawei
- Lenovo
- Tencent
- Xiaomi
- ZTE

2.2 Choice of Countries

We randomly selected 10 countries from the Council on Foreign Relations (CFR) Belt and Road Tracker list of 67 BRI beneficiary countries.[41] We also selected a single non-BRI beneficiary

[37] List of Largest Internet Companies in the World (Ranked by Revenue). (2020, July 28). Retrieved December 13, 2020, from https://www.markinblog.com/largest-internet-companies/; Fortune. (2020, August 18). Global 500. Retrieved December 14, 2020, from https://fortune.com/global500/

[38] Henriquez, J. (n.d.). The big seven: China's up-and-coming technology companies. Retrieved December 14, 2020, from https://www.techrepublic.com/article/the-big-seven-chinas-up-and-coming-technology-companies/

[39] Larsen, B. (2019, November 18). Drafting China's National AI Team for Governance. Retrieved December 14, 2020, from https://www.newamerica.org/cybersecurity-initiative/digichina/blog/drafting-chinas-national-ai-team-governance/

[40] Henriquez, J. (n.d.). The big seven: China's up-and-coming technology companies. Retrieved December 14, 2020, from https://www.techrepublic.com/article/the-big-seven-chinas-up-and-coming-technology-companies/

[41] Steil, B., & Rocca, B. D. (2019, May 8). Belt and Road Tracker. Retrieved December 09, 2020, from https://www.cfr.org/article/belt-and-road-tracker

country: the United States. We included the U.S. in this analysis to help frame and contextualize the results for the BRI countries. Table 2 contains the list of selected countries.

Table 2. Countries Selected for Analysis

10 BRI Countries *(Random Selection)*	**1 Non-BRI Country**
Bangladesh	United States
Ethiopia	
Jordan	
Georgia	
Moldova	
Mongolia	
Nepal	
South Africa	
UAE	

2.3 Measure of a Company's Embeddedness in a Country

We created a measure for the embeddedness of a company in a particular country. To do this we first identified six data points that might indicate a company's level of embeddedness in a particular country. Then, for each of the 77 combinations of company and country, we collected data on those eight indicators. Because each company differs greatly in size, we rescaled the collected data points (within each company) to a 1-5 scale so that we can average the company scores for any given country. We collected on the following six indicators of embeddedness:

- **Is the website in the local language of the country?** Access to the website in the local language of the country is an indication that that country is part of the market of the tech company. We found this by searching through each website to see if it had options to translate it to the country's local language. However, having a website in the local language is an indirect measure of a company's embeddedness, so we only gave it a 10% weight.
- **Number of company press releases mentioning the country.** More company press releases mentioning a country indicate that the country is more important to that company. We looked through each company's official press release pages and tallied the number of press releases in which each country was mentioned. However, the number of press releases is an indirect measure of a company's embeddedness, so we only gave it a 10% weight.
- **Market share of relevant industry**. The company's market share in a country indicates the demand for the company's product/services. We collected data from StatCounter GlobalStats, which proved to be relatively consistent across countries and industries. However, since StatCounter GlobalStats only reports market share for a small selection of industries and products, which limits reliability and consistency, we only gave this indicator a 10% weight.
- **Does the company have a physical location in that country?** When a company invests in a physical office or store in a country, it indicates that ease of access to that country is valuable to the company in some way. We conducted quick online searches to determine whether each company had a physical location in each country. When a foreign company invests in maintaining a physical presence in another country signals a strategic, long term commitment, so we only gave this indicator a 20% weight.
- **Number of local employees**. A greater number of local employees can indicate the company's commitment to maintaining a presence in that country. For each company-country combination, we tallied the number of local employees with LinkedIn accounts. A foreign company directly signals its commitment to another country by maintaining a local employee base, so we gave this indicator a 20% weight.
- **Number of partnerships and acquisitions**. This measurement indicates how thoroughly the company is integrated with the local government and local firms. We conducted brief searches because we wanted to focus on newsworthy partnerships and acquisitions. A foreign company directly signals its commitment to another country's market by acquiring local companies or establishing partnerships with local companies, so we gave this indicator a 30% weight.

We used the following equation to calculate our embeddedness measure:

$$0.1 * LocalLang + 0.1 * PressReleases + 0.1 * ShareLocalMarket + 0.2 * LocalOffice + 0.2 * NumberEmployees + 0.3 * PartnersAcquisitions = EmbeddednessPerCountry$$

A complete spreadsheet can be found in this URL link (https://docs.google.com/spreadsheets/d/1l1Ld5swOVM5zQswHqOoFqLQScRQ16d8ODj2qTXAMNX0/edit?usp=sharing).

2.4 Merging Embeddedness with a Measure of BRI Investment

After creating a measure for the degree to which a company is embedded in each of our selected countries, we needed to merge that data with a measure of China's investment in a BRI beneficiary country. For this, we referred back to the CFR Belt and Road Tracker,[42] which reports three such proxies for the tracked BRI beneficiary countries:

- Imports from China (% of GDP),
- Foreign Direct Investment (FDI) from China (% of Inward FDI),
- CFR's (Proprietary) Index of Debt to China (% of GDP).

We choose to focus on the Index of Debt to China over the two other measures for a few reasons. First, the measure of FDI from China was not a good option because it was only available for some of the randomly sampled countries. Second, while the measure of imports from China is available for all countries, it measures a less direct path for foreign influence compared to debt owed to China. For this reason, we chose CFR's Index of Debt to China as the basis of our analysis.

For the United States, which is not tracked by CFR, we manually estimated the Index of Debt to China. To do so, we simply estimated U.S. debt owed to China in 2017 as a percentage

[42] Steil, B., & Rocca, B. D. (2019, May 8). Belt and Road Tracker. Retrieved December 09, 2020, from https://www.cfr.org/article/belt-and-road-tracker

of 2017 U.S. GDP. In June 2017, the U.S. owed $1.147 Trillion to China.[43] U.S. GDP in June 2017 was $19.49 Trillion.[44] Dividing the first number by the second, we estimate the Index of U.S. Debt to China at 5.9%.

3. Results & Discussion

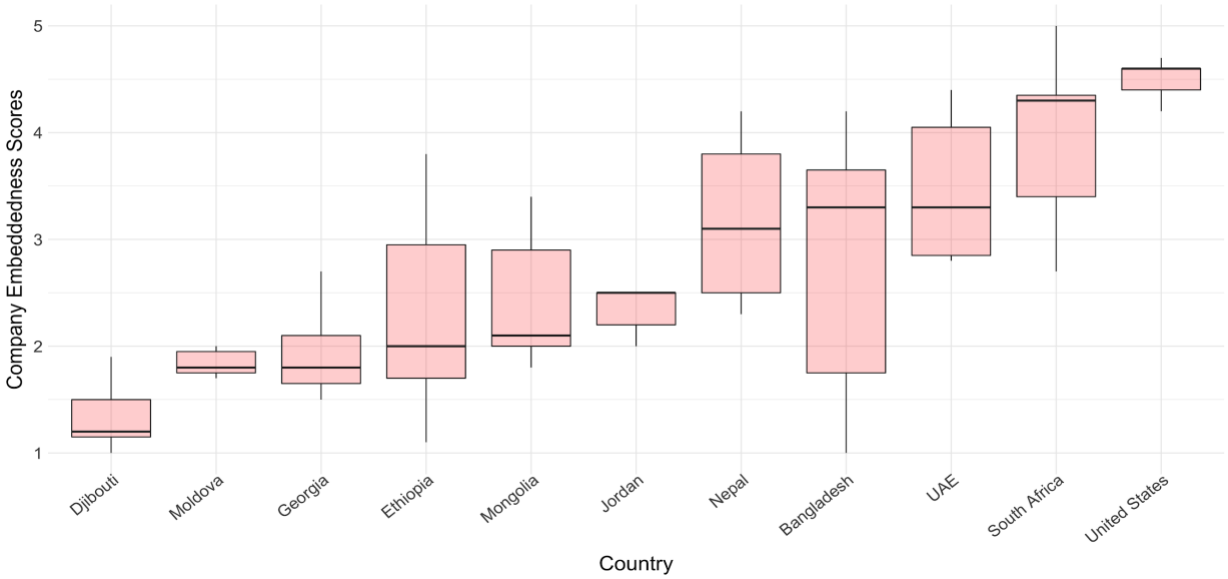
3.1 Company Embeddedness Scores

We begin by assessing the company embeddedness scores for each country. Figure 1 shows that the median embeddedness score is highest for the United States at around 4.6 points and lowest for Djibouti at around 1.1 points. Using the interquartile range (IQR) to measure the distributions, Bangladesh has the widest distribution of embeddedness scores while Moldova has the tightest distribution. Figure 1 also shows that the randomly sampled countries possess a broad distribution of embeddedness scores, which indicates that our methodology for calculating embeddedness is, at the very least, doing a good job of differentiating between countries.

[43] China Power Team. "Is it a Risk for America that China Holds over $1 Trillion in U.S. Debt?" China Power. February 2, 2016. Updated August 26, 2020. Accessed December 9, 2020. https://chinapower.csis.org/us-debt/

[44] World Bank Group. (2020, October). World Development Indicators - Economy. Retrieved December 09, 2020, from https://datatopics.worldbank.org/world-development-indicators/themes/economy.html

Figure 1. Company Embeddedness Scores per Country



3.2 Company Embeddedness vs. Debt to China

In Figure 2, we visualize average company embeddedness against the amount of BRI investment for each country.[45] Furthermore, we create a trendline based on a least squares mean (LSM) linear regression. Contrary to our hypothesis, we find that as the CFR Index of Debt to China increases, countries are likely to have a *lower* average embeddedness score. This downward-sloping trendline is consistent (but closer to a slope of zero) when we replace the CFR Index of Debt to China with imports from China. However, we could also very easily interpret Djibouti as an outlier and remove that point.

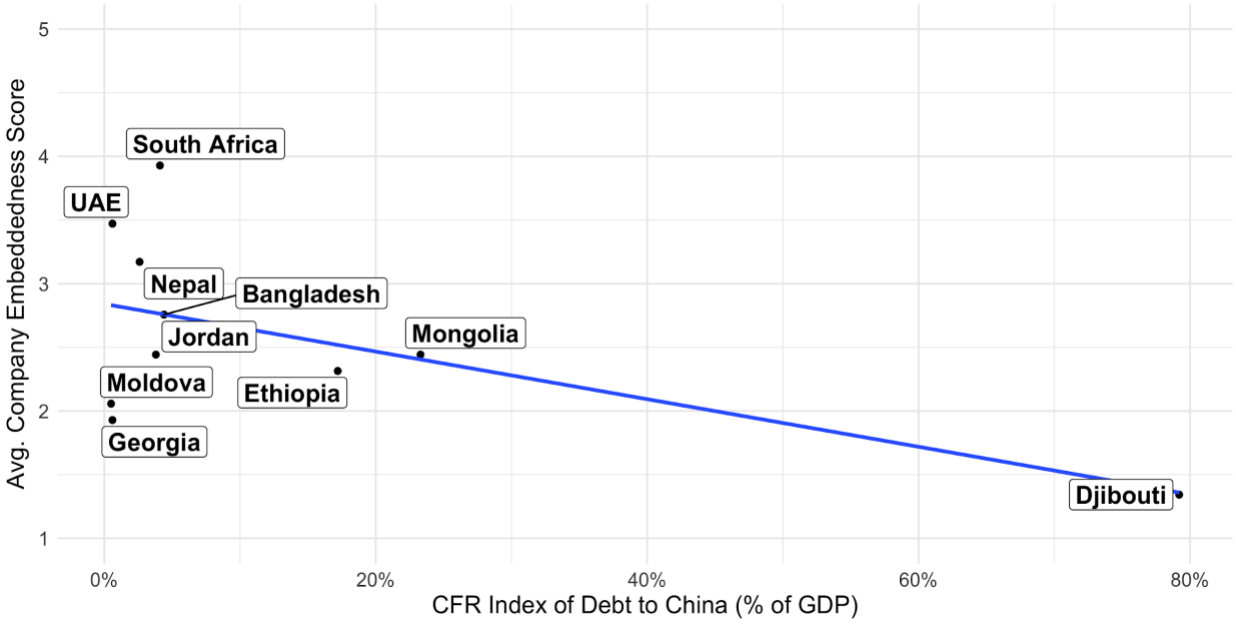
When we label Djibouti as an outlier and remove it from the analysis, we see that the trendline flattens dramatically and its slope becomes much closer to zero (see Figure 3). We use these data for our model. This version of the analysis seems to indicate that tech company

[45] As stated earlier, the CFR's Index of Debt to China (% of GDP) is the indicator we selected to measure China's investment in a
BRI beneficiary country.

embeddedness and BRI investment (via the proxy of CFR's Index of Debt to China) are uncorrelated. In other words, our data show that BRI investment may not significantly influence Chinese tech companies' activities in that BRI beneficiary country.

However, whether the trend is negative or nonexistent, we can still glean insight from these results. If we choose to believe that that trend is negative, we could interpret these findings as supporting a story where China's BRI funding is disproportionately targeting countries that lack a Chinese tech company presence. Perhaps the PRC prefers to lend heavily in countries that don't already have a heavy presence of Chinese companies in order to ensure that the PRC can exert a small degree of influence over a broader swath of countries.

Figure 2. Average Company Embeddedness Scores per Country (2020) by CFR's Index of Debt to China (2017) — *Excluding the United States*



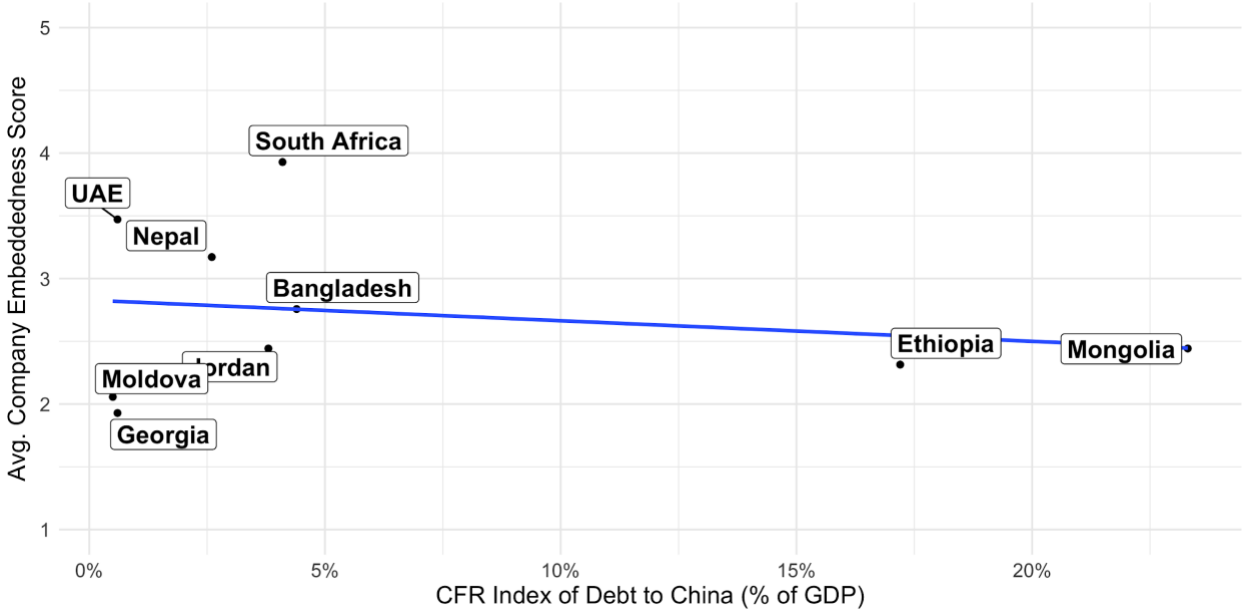
Alternatively, if we interpret these findings as uncorrelated, then we can say that the seven Chinese tech companies in this analysis don't seem to use BRI as an indicator that they'll have success in those countries. This could support a narrative that the PRC is not (successfully, at least)

pressuring Chinese companies to follow BRI funding and expand Chinese influence in beneficiary countries; perhaps the PRC isn't influencing Chinese companies to expand into countries marked for targeted Chinese investment.

We fit a linear regression model to the data shown in Figure 3 (excludes Djibouti and the U.S.). The intercept estimate is 2.828 and the coefficient for the CFR Index of Debt to China is -1.64. The linear regression equation written as: $y = 2.828 - 1.64x$.

The intercept estimate has a standard error of 0.3 and the coefficient for the CFR Index of Debt to China has a standard error of 3.045. The R^2 value is 0.04, so approximately 4% of the change in embeddedness score can be explained by the change in CFR Index of Debt to China. When subjected to a t-test, the model has a p-value of 0.607, so we cannot reject the null hypothesis.

Figure 3. Average Company Embeddedness Scores per Country (2020) by CFR's Index of Debt to China (2017) — *Excluding Djibouti and the United States*



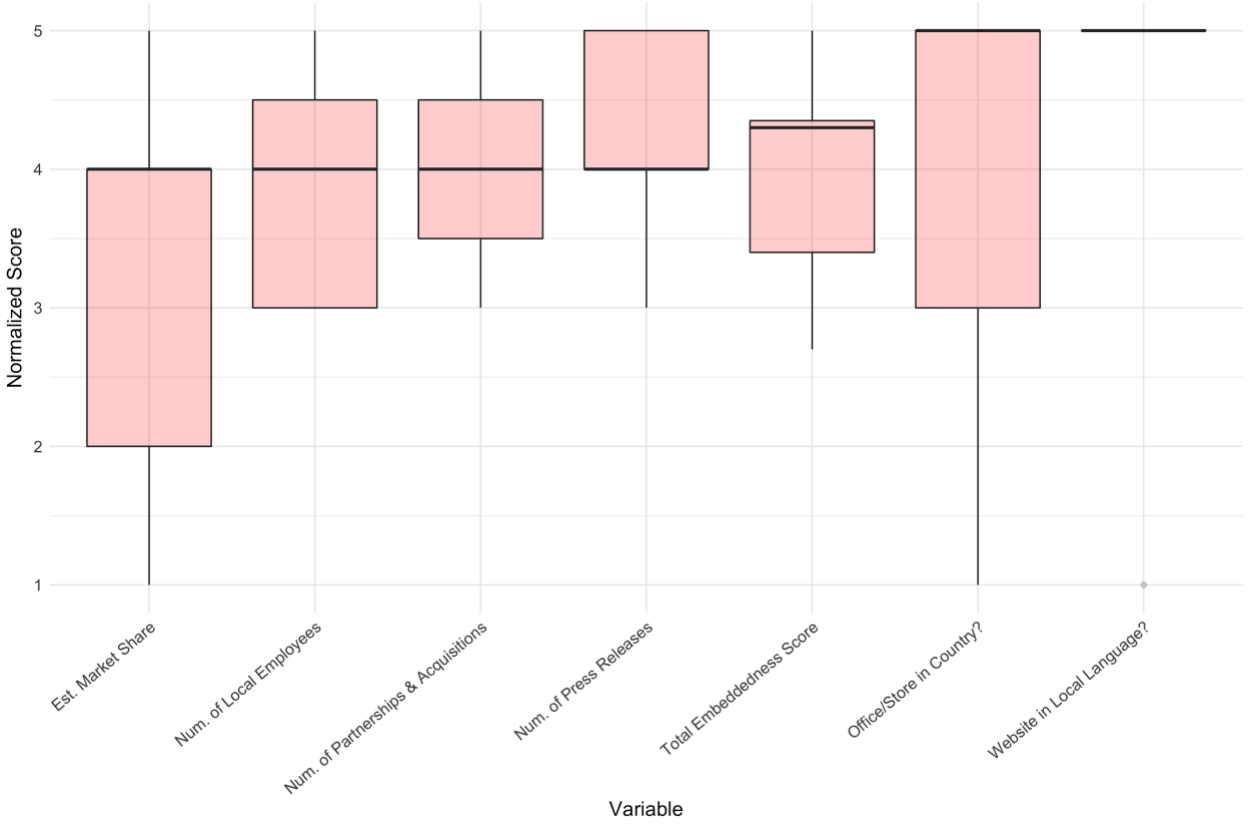
3.3 Country Spotlights

We selected three countries for more careful analysis: South Africa, Djibouti, and the United States. For each country, we pick apart the embeddedness measure and assess the component scores. We chose to further investigate South Africa and Djibouti because they had the highest and lowest average embeddedness scores (respectively), and we investigated the United States to provide readers with a basis for comparison.

3.3.1 South Africa: A Spotlight

The median component embeddedness scores for South Africa are consistently high; each component median is at or above 4 points (see Figure 4). However, there is a high degree of variability between companies for most of the components — estimated market share, in particular. This indicates that different types of tech companies may be more focused on embedding in South Africa than others. Baidu and Alibaba, both internet services companies have average embeddedness scores in South Africa of 2.7 points and 3.2 points respectively. By contrast, Huawei, a telecommunications company, received a perfect 5 points.

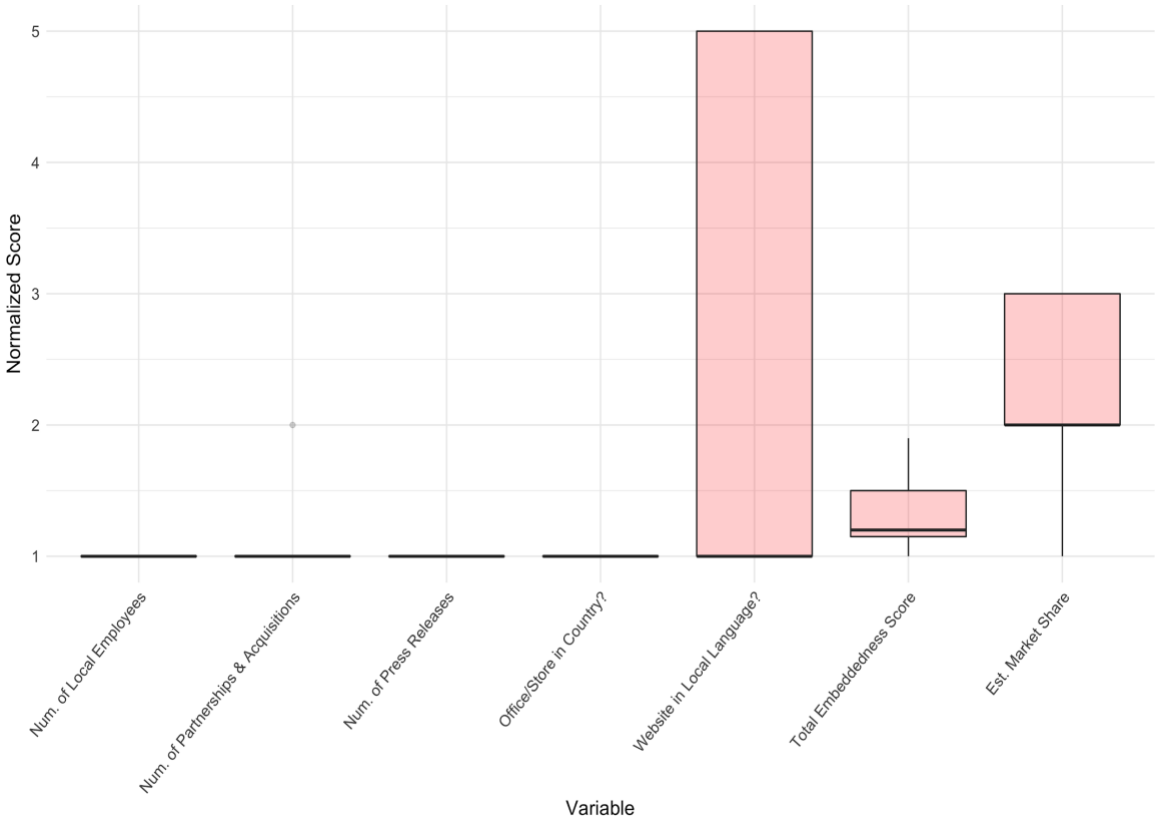
Figure 4. Normalized Scores for Each Embeddedness Variable for South Africa



3.3.2 Djibouti: A Spotlight

The median component embeddedness scores for Djibouti are consistently low, except for the "website in a local language" component score (see Figure 5). The median for every component was the lowest possible score (1 point) except "estimated market share." Furthermore, three of the seven companies have a website in the local language. This indicates that while the tracked companies are only slightly embedded in Djibouti, at least a few of the companies have a demonstrable presence in the country.

Figure 5. Normalized Scores for Each Embeddedness Variable for Djibouti



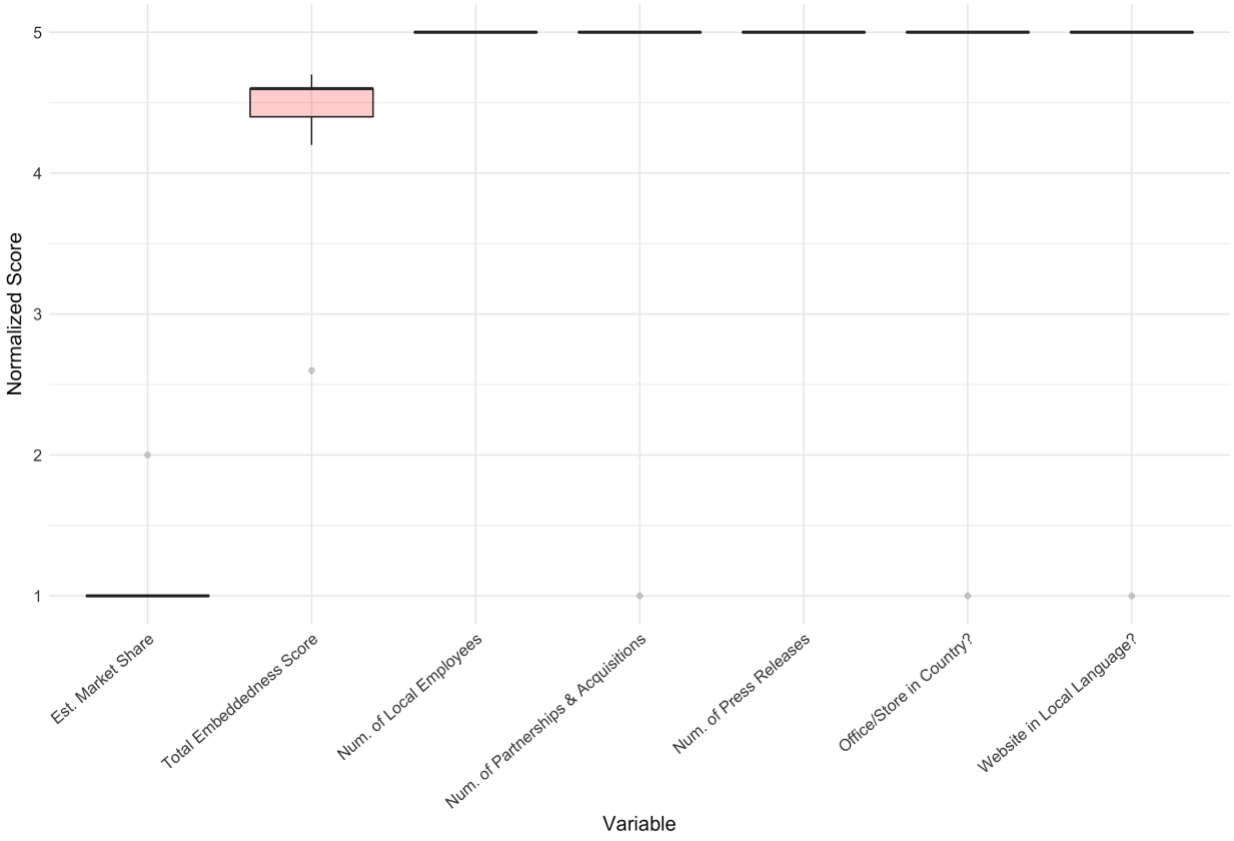
3.3.3 The United States: A Spotlight

The median component embeddedness scores for the United States were all at 5 points (the maximum score) except for "estimated market share," which only has 1 point (the minimum score). Figure 6 also shows that these component scores had very low variance; for each component score, six out of seven companies had the same score. These results indicate that the tracked Chinese tech companies are seeking to embed in the United States more than in most BRI countries, but they are not capturing significant U.S. market share; they are focused, for example, on partnerships with U.S. firms and setting up offices that take advantage of U.S. technology talent.

Our model ($y = 2.828 - 1.64x$) predicts that a country with a CFR Index of Debt to China of 5% would have, on average, an aggregate embeddedness score of 2.75. The United

States has an embeddedness score of 4.27 points. This indicates that the target Chinese tech companies are more embedded in the United States than they are in an average BRI country with the same CFR Index of Debt to China.

Figure 6. Normalized Scores for Each Embeddedness Variable for the United States



4. Conclusion

Using quantitative analysis, the current study examined whether Chinese technology companies embedded more in the countries which received more BRI investment. The results surprisingly implied that the embeddedness of those companies in a foreign country was not significantly influenced by BRI investment.

Future work could greatly improve the validity of this analysis. We only looked at a small sample of 10 BRI beneficiary countries, which might not be representative of the broader population of BRI countries. Future work should replicate our methodology for all BRI countries.

We should also investigate a larger pool of tech companies. Similar to how we were only able to evaluate a small number of BRI countries, we were also only able to collect data on seven firms, and by necessity, our analysis excluded many interesting, large Chinese internet companies, for example: JD.com, Suning.com, ByteDance, and Meituan-Dianping.

We should also evaluate many more non-BRI countries through the same methodology. Currently, our analysis only assesses a single non-BRI country: the United States. The U.S. is the predominant economic and military superpower, and it holds a unique position in international markets and as a source of top talent. In short, the U.S. is probably not representative of non-BRI countries as a whole. We should apply our embeddedness methodology to a randomly sampled set of non-BRI countries, which would ideally have the same number of countries as the list of BRI countries.

Our chosen measure for BRI investment, CFR Index of Debt to China, is another potential source of error. The most recently available data from the CFR tracker are from 2017, so our measure of BRI investment is a few years out of date.[46] Unfortunately, this does create a discrepancy and potential source of error because our embeddedness data are from 2020 and our BRI investment data are from 2017. A more accurate measure of BRI investment would utilize the data collected by Boston University's Global Development Policy Center which are presented in the Center's recently published data visualization tool: "China's Overseas Development Finance." This dataset reports China's overseas investment for individual projects, which is a far more robust approach for measuring Chinese investment in BRI beneficiary countries compared with country-level debt statistics.

[46] Steil, B., & Rocca, B. D. (2019, May 8). Belt and Road Tracker. Retrieved December 09, 2020, from https://www.cfr.org/article/belt-and-road-tracker

Our analysis was correlational. We discuss two considerations for future causal analyses. First, we should compare each tech company's presence in a country before and after the country signed onto the BRI. This study could still rely on our embeddedness measure, but we would need to calculate the measure per country, *per year*, for a few years before and after the country signed onto BRI.

Second, we should examine the intentions of these Chinese firms in the context of why they have decided to enter a certain country. This could be for a number of reasons, including looking to break into the country's market, winning a government contract, or tapping into a local talent pool. The firm's objectives will strongly influence its approach to embedding itself in a target country-- the scale in which it wants to infiltrate the market, and the time frame. More specifically, the objectives of a company must align with the characteristics of a target country for the company to embed itself there. These considerations seem to heavily outweigh any indicator that a tech company might receive from BRI investment in a country.

Finally, through the course of this research, the authors were unable to find research into whether there is a correlation (or causal link) between the amount of BRI funding received by a beneficiary country and that country's favorable views of China. This is an interesting avenue for future work.