Prospectus: The political determinants of FDI technological spillover and corruption

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1 Empirical Puzzle

In recent decades, the global flow of foreign direct investment (FDI) has steadily increased, rising to over $1.5 trillion dollars in 2014 (UNCTAD 2014). For developing countries, FDI flow is remarkably robust to global downturns, leading to enthusiastic endorsement by major international organizations as a key factor to economic development (Figure 1) (Mallampally and Sauvant 1999; World Economic Forum 2013). This claim is also shared widely within political science, where much of the literature starts with the assumption that countries seek FDI for its many benefits. These works focus on *how* countries can attract FDI, not *why* they want to do so (Jensen 2003; Li and Resnick 2003; Li 2006; Ahlquist 2006).[1]

Underlying this mode of thinking is the assumption that FDI brings various benefits to developing countries. Among these, an important promise that FDI holds to growth is the spillover of productivity from foreign to domestic firms. As well-known from neoclassical growth theory, diminishing returns to capital will at one point stop capital from accumulating further, preventing long-run economic growth from being driven by capital accumulation alone (Solow 1956). Therefore, long-run growth ultimately requires technological innovation, which FDI can supply.

This insight implies that FDI cannot promote the host country's growth simply from the amount of capital it brings. Scholars have confirmed that FDI can only have a growth-enhancing impact if there is technological spillover from the foreign to the domestic sector (Nunnenkamp and Spatz 2004). This empirical finding provides support for Findlay (1978)'s groundbreaking model of FDI and growth, in which technology spillover from foreign firms shift the domestic factor-price frontier to the right, allowing more output from the same input, ultimately resulting in a continually increasing capital stock for the domestic sector. In this view, FDI is welfare-enhancing, providing spillover benefits to local firms in ways that foreign firms do not take into account in their private calculations. This claim about the positive effect of FDI provides a justification for countries' using investment incentives to rectify the undersupply of FDI.

However, despite this prevailing view about the importance of FDI in providing technological spillover, there is little conclusive evidence of FDI having a positive effect on growth (Nair-Reichert and Weinhold 2001; Carkovic and Levine 2002) or poverty reduction (Guerra et al. 2009) (Figure 2). A substantial literature has developed to explain this puzzle, concluding that the growth-enhancing and spillover effect of FDI is conditional on the absorptive

[1]Two recent exceptions are Pinto (2013); Pandya (2013), which are the first to investigate the demand for FDI.

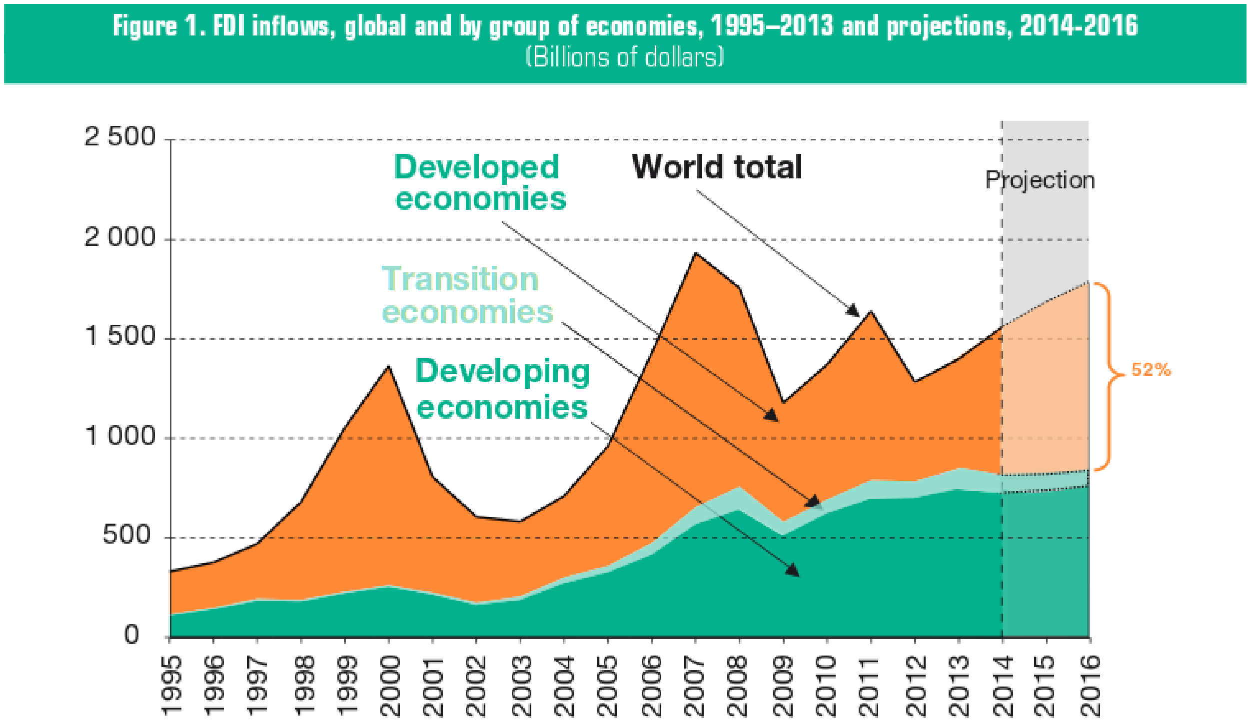
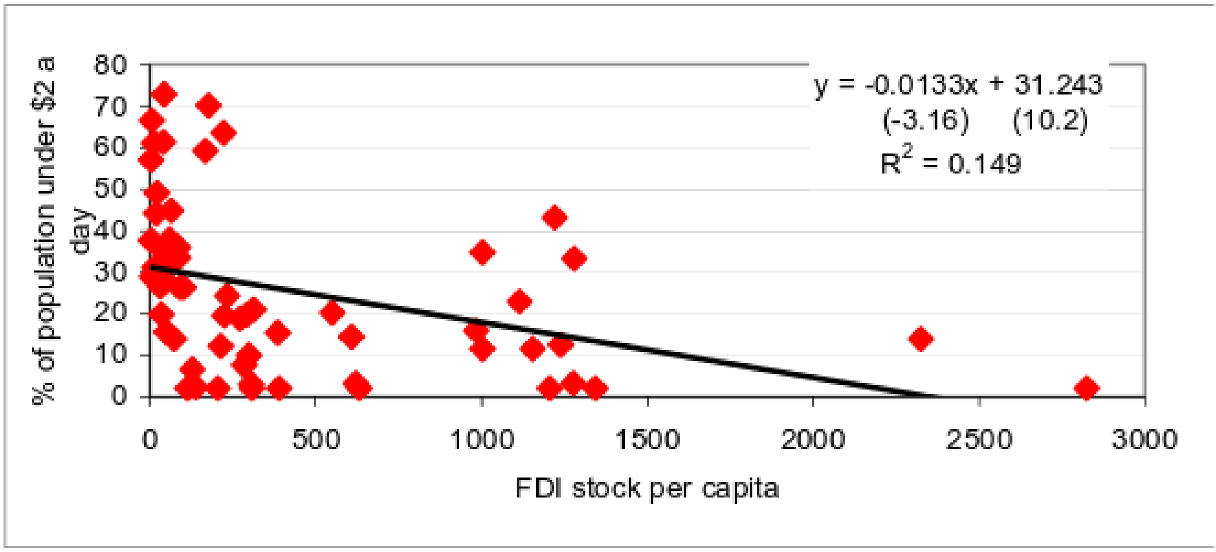


Figure 1: FDI flow to the developing economies has been increasing steadily and proves robust to economic downturn. Source: UNCTAD (2014, xiii)

capacity of local firms. Cross-nationally, scholars find that FDI is more likely to have a positive growth effect when the technological gap between the local and foreign firms is small (Nunnenkamp and Spatz 2004) and when host countries have strong financial and institutional development (Durham 2004). Similarly, absorptive capacity, measured by the level of schooling in the host economy, conditions the transfer of technology between foreign and local firms across regions in China (Fu 2008) and countries in Latin America (Willem 2004).

Despite the resounding conclusion that the effect of FDI is highly conditional and that investment incentives do not work, why do countries still fixate so much on bringing in FDI (Blomström 2002)? For example, Ireland provides foreign investors with lower tax rate, lower land price, and cash grants for R&D that do not need to be repaid. China also offers a tax holiday (two years of no tax and three years of half the normal tax rate) in special economic zones to attract more foreign firms (Telford and Ures 2001). We see the same widespread use of investment incentives in Southeast Asia (Fletcher 2002). In Vietnam, provincial governments even defy the central government's directive and offer extra-legal incentives to FDI firms (Anh et al. 2007). Not only do these measures not work in attracting more FDI, they also deprive countries of revenues that could be spent on improving the local labor quality and investment climate—factors that are much more conducive to spillover effect and growth.

If the effect of FDI on technological spillover and growth uncertain, why is there so much focus on attracting it? To understand this puzzle, I propose that we need to take into



Source: Own elaboration, from UNCTAD and UNDP data (data for the year 2000). T-statistics in brackets.

Figure 2: Relationship between FDI and poverty

account the calculus of government officials, who may be more interested in foreign firms as a source of private benefits rather than technological spillover. The focus of the dissertation is to understand when officials want spillover versus private benefits.

2 Stylized Facts

In this section, I present some stylized facts that motivate the puzzle and the hypothesized link between FDI and corruption:

- The spillover effect of FDI on growth is highly variable. For example, FDI is found to be growth-enhancing in East Asia, but not in Latin America (Zhang 2001). Similarly, the effect of FDI on domestic investment also varies across countries and regions. FDI is found to crowd in investment in some countries (e.g. Ghana, Senegal, South Korea, Pakistan, Thailand, etc.) but crowd out in others (Agosin and Machado 2005).

- Despite the prevalent concern with discrimination against foreign firms in the international business literature, the World Bank Enterprise Survey finds that foreign firms actually face fewer obstacles than domestic firms while doing business, suggesting a collusive relationship between host governments and foreign firms (Batra et al. 2003).

A closer look into the level of corruption across industries also suggests a negative relationship between spillover and bribe. According to the Transparency International (2011)'s Bribe Payer Index, which measures the propensity of firms from industrialized countries bribing abroad, the most corrupt sectors are public works contracts, utilities, real estate, oil and gas, and mining. These sectors are most susceptible to corruption due to a lack of competition and a high level of government involvement. They also tend to be less conducive to spillover due to the winner-take-all structure of the industry (UNCTAD 2001, 138). Indeed, if scarce resources and contracts in real estate or mining can only be won by large foreign firms, then these firms will capture the rent and perpetuate their market power while relegating local contractors to low-value added tasks.

In contrast, the least corrupt sectors are agriculture, light manufacturing, civilian aerospace, IT, and banking and finance. Among these, some are high tech industries (e.g. aerospace, IT) that governments may prioritize to facilitate spillover. Others have low barriers to entry and a divisible production process, both of which are conducive to domestic sourcing (e.g. agriculture, light manufacturing) (Transparency International 2011). Looking across the most and the least corrupt sectors, it seems that there is an inverse relationship between corruption and spillover.

Beyond these broad strokes, the relationship between spillover and corruption emerges in more granularity within the same sector and across countries. For example, despite the stereotype as a high corruption, low spillover sector, the mining industries in Chile, Ghana, and Mozambique have substantial variation of spillover according to the host country's level of corruption. According to the Transparency International (2014)'s Corruption Perception Index, Chile, Ghana, and Mozambique rank 21, 61, and 119 out of 175 countries on control of corruption. Correspondingly, according to surveys of mining firms, Chilean foreign mines "have the greatest proportion of domestic suppliers and carry out more valued-added activities in-country than [foreign mines] in Ghana and particularly more than in Mozambique" (Farole and Winkler 2014, 127). The high level of FDI spillover in Chilean mining may be due to its developed economy and competent base of local suppliers. However, this does not explain the difference between Mozambique and Ghana, two countries with a similar level of GDP per capita.

Importantly, Ghana and Mozambique differ not only in the level of spillover, but also in their policies to cultivate supply chain linkages between foreign and domestic firms. In Ghana, the government worked with the private sector to develop regulations that put real teeth into the local content requirements in the Ghana Minerals and Mining Act (2006). According to these regulations, foreign mining firms are required to develop a five-year local procurement plan, including targets and strategies to develop domestic supplier capacity. These is also clear evidence that the government enforces these rules by striking at the profitability of the firms: when bids are within two percent of prices, the bid with the highest local content shall be selected. In stark contrast, Mozambique shows no commitment to local supplier development either in its Mining Law (2002) or Mining Regulations (Decree no.62/2006) (Farole and Winkler 2014, 137). One may speculate that this stark constrast between Ghana and Mozambique is due to the difference in the level of corruption between them.

This example shows that if a government wants to induce spillover from foreign firms, it can. Even though policies that affect the profitability of the foreign firms, such as local content requirement, are technically not allowed under the national treatment principle of the WTO, there are many loopholes and little enforcement (Hufbauer et al. 2013). Indeed, Ghana itself has been a WTO member since 1995 and a GATT member since 1962. Therefore, the interesting question is not whether the government can extract spillover from FDI, but under what conditions would it want to do so.

3 Roadmap

The proposal proceeds as follows. Section 4 introduces the model, including the actors, their choices, preferences, and constraints. Section 5 discusses four empirical projects, each of which maps to a specific parameter in the theoretical model. Finally, Section 6 describes the tentative time line for the dissertation.

4 Theory

In the following pages, Section 4.1 introduces the model, including the actors, their choices, and the assumptions behind the model. Section 4.2 discusses the official's budget constraint. I argue that, holding a firm's profit constant, the official faces a trade-off between spillover and private benefits since offering either good cuts into the profit of the firm. Section 4.3 and Section 4.4 examine the parameters that change the location and the slope of the budget constraint. Section 4.5 shows how the official's time horizon changes the shape of his indifference curve. Together, the official's budget constraint and indifference curve regarding spillover and private benefits determine his choice over this two-good bundle. Once equipped with this theoretical framework, we can derive testable hypotheses regarding the official's choice in the next part of the project. Finally, Section 4.6 situates my model, showing how it conceptualizes corruption between the official and the foreign firm as *symbiotic* rather than *predatory* as the literature has always assumed.

4.1 Actors and choices

The model has one strategic actor: a government official. This official has control over a certain endowment (e.g. market access, cheap labor) that is attractive to foreign firms.[2] Foreign firms who invest in the official's territory turn this endowment into profit via their productive activities. Firms then share the value added with the official in exchange for access to the endowment.

Firms share the value added with the official in the form of a two-good bundle: 1) technological spillover and, 2) private benefits (to the official). *Technological spillover* is the beneficial effects of foreign firms' technological knowledge on the productivity of domestic firms. The official cares about the technological spillover of FDI because it is a crucial ingredient in improving total factor productivity and generating long-term growth. Growth, in turn, brings electoral or career benefits. *Private benefits* that firms offer to the official can come in many forms, both illegal (e.g. bribe, kickback) and legal (e.g. campaign finance contribution, informal network with foreign firms that leads to contracts for friends and families). I argue that offering either spillover or private benefits cuts into the firm's profit.

[2] I define *foreign firms* as firms with over 50% ownership belonging to private foreign individuals, companies, or organizations. In these firms, we are certain that the foreign owner has the majority stake and is responsible for the firm's choice. This definition is common across business surveys and national laws, allowing us to collect a wide range of data.

Therefore, if the official wants more of one good from the firm it has to take less of the other. In other words, the official faces a trade-off between spillover and private benefits, and the essence of the dissertation is to determine how the official chooses the mix of this two-good bundle.

In this model, firms care about whether the official demands spillover or private benefits, but only because firms have heterogeneous abilities in offering these two goods. For example, if a firm belongs to an industry where production is divisible, it is easier and less expensive for the firm to sub-contract local firms and create spillover. On the other hand, if a firm comes from a country with little corruption, it may be less adept at working with the official. It will have to hire local agents, and thus finds it more expensive to offer the same amount of private benefits than firms that are more familiar with corrupt dealings. I model this firm's preference via two parameters: the "price" of spillover and the "price" of private benefits, which the official has to consider when he demands one of the two goods from the firm. By doing so, my model is able to incorporate firm's preference without introducing it as a strategic actor.

This model has two assumptions. First, offering spillover or private benefits only affects the firm's utility through its bottom line. If we believe that firms are unlikely to have moral (or other non-financial) incentives to bring spillover or to withhold bribe, then this assumption is reasonable.

Second, I assume that the firm is satisfied as long as its retained profit remains above a reservation level. The firm will not invest if and only if the official's demand reduces its profit to below this level. This assumption is supported by the behavioral model of firms, in which firms are profit-satisficing instead of profit-maximizing (Simon 1959). Granted, it is less defensible to build a model with one actor satisficing (the firm) while the other maximizing (the official). Therefore, in Section 5.5, I will model both actors as utility maximizing, using two-sided logit (TSL) model to estimate their preferences. Logan (1996b) has shown that TSL corresponds to the game-theoretic college admissions model, a many-to-one matching problem that is relevant to how countries and FDI firms find their match.

4.2 The trade-off between spillover and private benefits

To induce spillover, governments frequently impose on foreign firms conditions such as forming a joint venture or local content requirement. These conditions constrain firms' ability to optimally use their physical and management capital, reducing their profitability. Similarly, when firms are forced to offer private benefits to officials, they suffer from not only a upfront cost but also a uncertainty cost. This uncertainty stems from the frequent lack of transparency and the high degree of informality regarding these private benefits, making the process abstruse to foreign firms. For this reason, offering private benefits to the official increases firms' expenses and thus also reduces profitability. Given that 1) offering either spillover or private benefits cuts into the firm's profit, and that 2) the firm has to maintain a minimum amount of profit (akin to reservation wage) that justifies investing in the country, if a firm offers more private benefits to the official it will have to bring less technological spillover, and vice versa.

One may argue that some foreign firms voluntarily produce spillover—therefore, offering spillover and private benefits is not a trade-off. However, such cases are rare because foreign firms want to keep their technology proprietary and maintain their competitive advantage. Due to scale and sophistication, foreign firms also source from established international suppliers and only buy standard commodity goods from local suppliers at arms-length, which does not generate as much spillover as personal contact (e.g. training, quality assurance assistance, financing assistance). FDI firms voluntarily source from local suppliers only when the availability and the quality of local suppliers are not far from the international standard—however, in these cases there is less need and room for spillover to start with. Another scenario that leads to foreign firms voluntarily producing spillover is when they specifically target the local market. In this case, the qualilty requirement is not too stringent, the quantity not too large, and there is a need for rapid local customization. Unfortunately, in this case, market oriented FDI firms can displace local firms, which may lead to a net reduction in domestic firms' productivity (Mody 2004).

In sum, given that offering either spillover or private benefits cuts into the firm's finite profit, the official can only have more of one good if he gives up some of the other. In other words, there is a trade-off between spillover and private benefits, and the official faces a budget constraint over this two-good bundle.

While FDI does bring other benefits, e.g. jobs and capital, my theory intentionally focuses on the trade-off between technological spillover and private benefits for both substantive and theoretical reasons. Substantively, technological spillover increases a country's total factor productivity (TFP), a key to sustained long-term economic growth in the face of diminishing returns to capital. While the literature has mainly focused on the quantity of FDI a country attracts, development agencies and governments have paid much attention to the quality of FDI, i.e. its technological spillover.

Furthermore, the implication of a spillover-vs-private-benefit trade-off is very different from that of a spillover-vs-capital/job trade-off. In the later case, one can count on the official to shift towards attracting high spillover FDI as his country gradually grows and is in less immediate need of capital and job creation. The growth trajectory of a country is guaranteed to be positive in this scenario, fueled by FDI's capital injection in the earlier stage and sustained by FDI's technological transfer in the later stage. However, if the trade-off that the official considers is between spillover and private benefits as my project theorizes, then one cannot count on the official to take such benevolent action.

Theoretically, since technological spillover is key to growth, my theory about the official choosing the spillover-vs-private-benefits bundle speaks to the age-old research question: "Why are some governments corrupt, some growth-promoting, and yet others are both?" While such question is massive both in its importance and its difficulties, my project approaches FDI's spillover effect as a mid-size problem with several mid-level theories, where the model of an official considering the mix of benefits brought by a FDI project is not too abstract from the real-world investment process to be fictional. With the theory well delineated within the topic of FDI, we can pinpoint the parameters that affect the official's budget constraint and preference over spillover and private benefits as follows.

4.3 Parameter 1: The firm's profit determines the size of the budget constraint

If a firm has more profits, there are more to be shared with the official, no matter whether in the form of spillover or private benefits. The firm's profit is high when the official has a lot of endowment that the firm can access (e.g. China) or when the firm is very productive. In this case, the official's budget constraint shifts to the right. He can choose more of both goods, i.e. promoting growth while enriching himself at the same time (Figure 3). Theoretically, this feature of the model captures the fact that growth and corruption are not mutually exclusive. Empirically, our estimation model must always hold the budget constraint constant by controlling for firms' profit in order to isolate the effect of other factors on the official's choice.

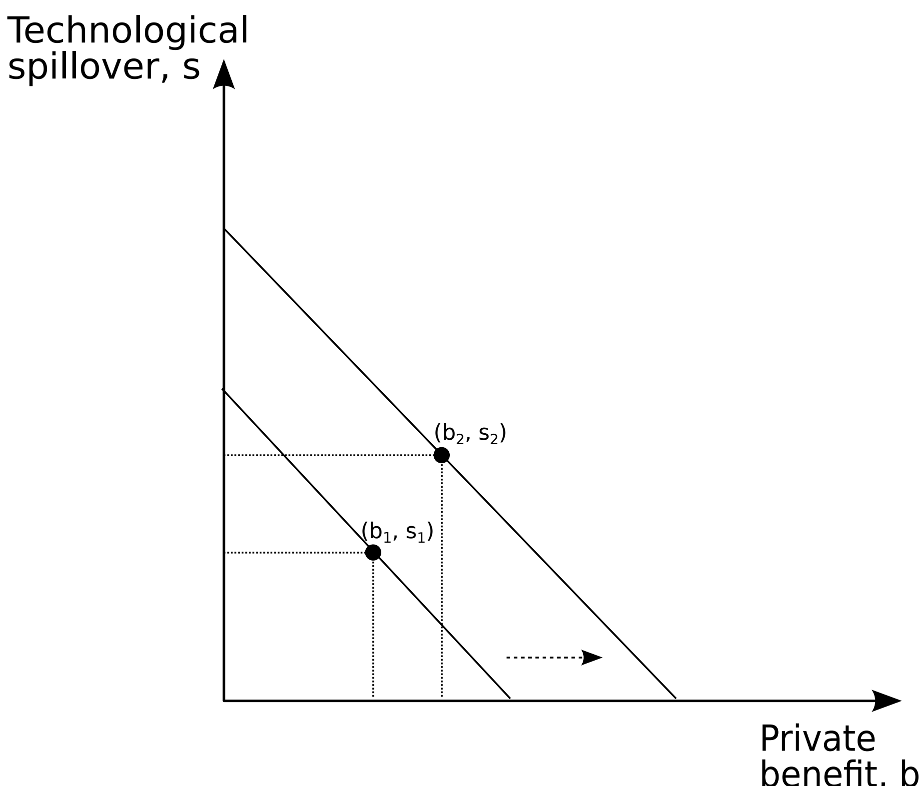


Figure 3: When an official has more endowment, his budget constraint shifts from left to right. He is now able to afford the (b_2, s_2) bundle, with $b_2 > b_1$ and $s_2 > s_1$.

4.4 Parameter 2: The prices of spillover and private benefits determine the intercept and the slope of the budget constraint

Given a fixed amount of the firm's profit to be shared with the official, the two intercepts of the budget constraint are determined by the "price" of the two goods, i.e. how easily the official can obtain technological spillover and private benefits from the foreign firm. If a good becomes harder to extract, the official can afford less of it and the corresponding intercept shifts inward (Figure 4). Alternatively, we can think of the slope of the budget constraint as the relative price of the two goods.

Substantively, the "price" of technological spillover depends on both the nature of the sector as well as the absorptive capacity of the local economy, which I define as the presence of domestic firms that are able to absorb technology from foreign firms.[3] Consider two channels through which technological spillover flows. First, domestic firms enter the supply chain of foreign firms, improving their productivity by imitating the higher production standards or management techniques of foreign firms. For this to happen, it is necessary to have a wealth of domestic firms that are technologically capable to enter the supply chain. The feasibility of such outsourcing is also sector-specific, e.g. whether the production process is divisible into units, or whether the technology has matured enough for subcontracting. Second, local employees working for foreign firms may learn from their experience and bring back knowledge when they move to private firms. For this to happen, domestic firms must also be technically advanced enough to make use of and compete for this high quality labor from the foreign sector.

The "price" of private benefit substantively means how easily the government officials can extract these benefits from the foreign firms. One example of such parameter is the origin of the foreign firm. Firms that come from countries where corruption is more common or accepted would be more adept at providing private benefits to official. In contrast, firms from countries that have signed onto the OECD anti-bribery convention could be more hesitant to bribe given the punishment that they may face from their home governments.

Changing prices of the two goods will move the intercept of the budget constraint and, holding the indifference curve constant, have implications for the mix of two goods that the official chooses.

4.5 Parameter 3: The official's time horizon determines the shape of his indifference curve

The official has a convex indifference curve, implying a decreasing marginal utility to both spillover and private benefits. This assumption is standard and makes intuitive sense. As the official accumulates more private benefits, there are fewer things worth spending on as his consumption is satiated and produces less utility. Similarly, when more spillover happens, the lack of technological upgrading becomes less of a bottleneck to the economy. Thus, voters (or the official's higher-ups) become less concerned with the issue and it brings fewer electoral (or career) benefits.

The shape of the indifference curve denotes the relative weight the official assigns to the two goods, spillover and private benefits. When the curve is steep, the official is willing to trade a lot of spillover for a small increase in private benefits. Vice versa, a flatter curve indicates that the official values spillover more (Figure 5).

Politically, the steepness of the indifference curve depends on the time horizon of the official. This is because technological spillover takes time to materialize and to increase economic growth. In contrast, private benefits bring immediate utility. Therefore, the longer

[3] I define *domestic/private firms* as firms with over 50% ownership belonging to private domestic individuals, companies, or organizations

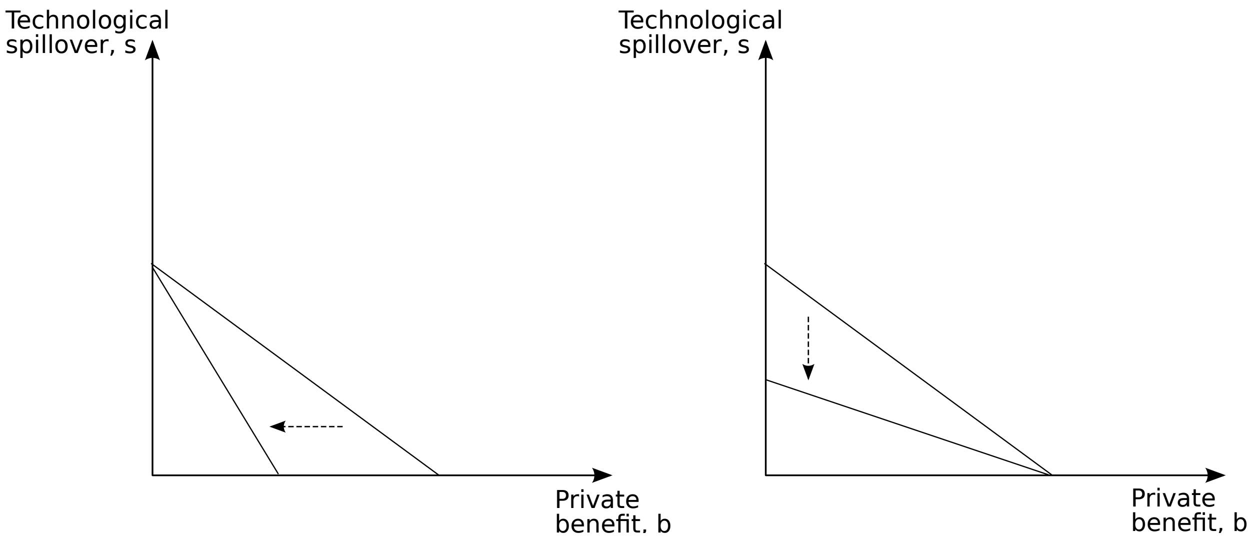


Figure 4: In the left panel, the intercept for private benefits moves from right to left as its price increases. Similarly, in the right panel, as it becomes more difficult to extract spillover from foreign firms, the intercept moves down.

the official's time horizon, the more heavily does he value FDI spillover effect. For example, in Figure 5, the blue indifference curve is flatter and signifies more weight assigned to spillover. In that case, the official chooses a bundle that has more spillover and fewer private benefits (i.e. $s_1 > s_2$ and $b_1 < b_2$). Political factors that influence the official's time horizon may include term limit, the stability of the autocratic regime, or the degree of institutionalization of the party in power.

4.6 Literature on corruption and FDI

Regarding private benefits for the officials, I focus on corruption, i.e. bribe and informal fees, given the ubiquity of the practice in developing markets and wealth of data collected on this issue from cross-national business surveys.

The majority of literature on the relationship between corruption and FDI focuses on showing that a high level of corruption deters FDI (Wei 2000; Hakkala et al. 2008; Al-Sadig 2009). A smaller literature examines the behaviors of foreign firms that choose to invest in a highly corrupt environment. It argues that foreign firms can help reduce corruption in host country via regulatory pressure effect, demonstration effect, and professionalization effect (Kwok and Tadesse 2006); or via competing away the rents of the domestic firms and reducing the supply of bribes (Sandholtz and Gray 2003). In these works, corruption between the host government and the foreign firm has been conceptualized as *predatory*.

My research offers a new perspective, showing how corruption between government officials and foreign firms can be *symbiotic*, with foreign firms getting exclusive access to resources, turning them into profits, and sharing the value added with the officials. Such symbiotic corruption between the government and foreign firm can be the key to explain the puzzle why governments may want to attract a lot of FDI despite the lack of developmental

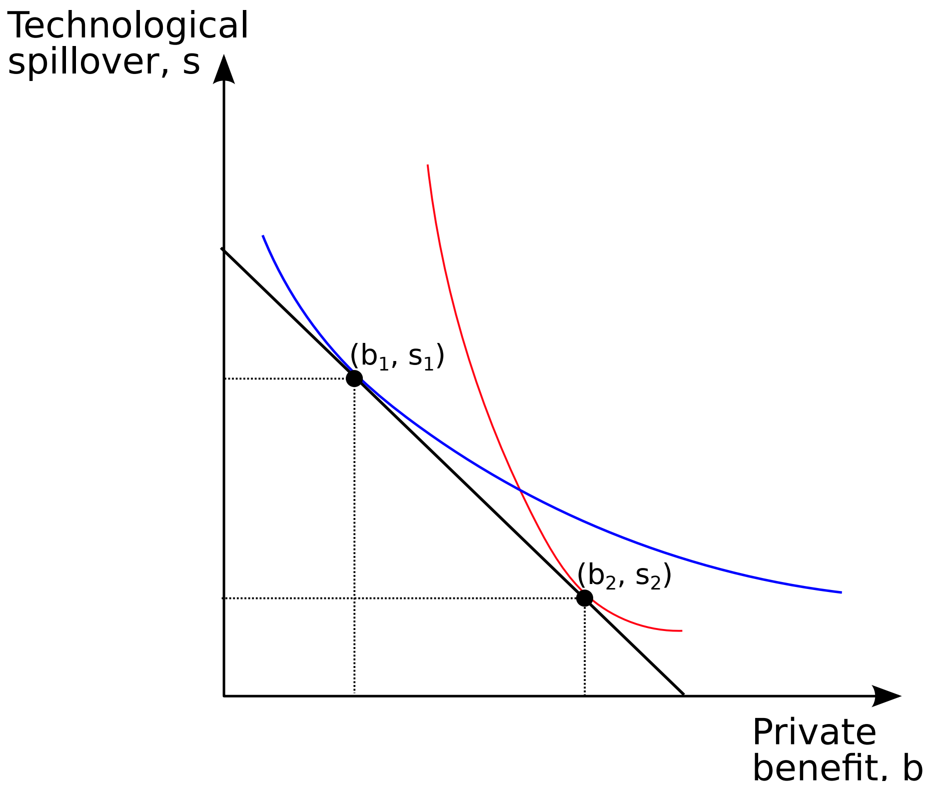


Figure 5: The blue indifference curve shows that the longer the official's time horizon, the flatter his indifference curve, and he will choose more spillover and fewer private benefits.

impact. (Corrupt) institutions matter, but not only to *how much* FDI a country can attract as the literature has studied, but also *which kind*.

5 Research Design

First, Section 5.1 demonstrates how to measure FDI spillover, the key outcome variable of the project. Then, the next three subsections test the effect of three key parameters in the theoretical model. We want to see how each of these parameters affect the mix of spillover and private benefits that the official chooses. Section 5.2 examines the first parameter—the "price" of spillover—arguing that the official extracts more spillover and fewer bribes from firms that have a high potential for spillover. Section 5.3 examines the second parameter—the "price" of private benefit—arguing that the OECD Anti bribery convention raises the cost of bribing for firms from member countries. Therefore, the official will extract fewer bribes and more spillover from these firms. Section 5.4 examines the third parameter—the official's time horizon. I argue that if the official has a short time horizon (e.g. a Vietnamese provincial official facing term limit), he will extract more bribes and less spillover from firms.

Finally, Section 5.5 uses the two-sided logit (TSL) model to extend the main theoretical model in Section 4 by including both the official and the firm as strategic actors. I also generalize the time horizon argument to a cross-national setting and test whether a government's longer time horizon leads to a higher preference for spillover.

5.1 Measuring the main dependent variable: spillover effect

Measuring spillover indirectly

Similar to the endogenization of technological change in growth theory, many researchers have investigated how technology spillover from FDI happens instead of assuming its inevitability (Romer 1994). Several channels have been proposed, some of which suggest an indirect measure of technology spillover.

These channels are:

- imitation: private firms may reverse engineer a production or management technique (Wang and Blomstrom 1992), which is facilitated by backward linkage between local and foreign firms (Javorcik 2004). This motivates my first measure of spillover effect: % of private firms that participate in contracts with foreign firms.
- export demonstration: foreign firms are more knowledgeable about exporting, which involves high fixed cost to set up a distribution and transport infrastructure, or learning about foreign taste and regulatory environment. Domestic firms can learn this "export know-how" from foreign firms (Aitken et al. 1997). This motivates my second measure of spillover effect: % of domestic firms that export.

Measuring spillover directly

As standard in the economic literature that studies whether there is a spillover effect for FDI, we can also measure spillover directly. This is done in two steps.

- First, measure the level of technology or productivity of a firm.

  Level of technology: R&D spending

  Level of productivity (Van Beveren 2012): Consider the familiar Cobb-Douglas production function:

  $$Y = AL^{\alpha}K^{\beta} \tag{1}$$

  where Y is value added, A is total-factor productivity (TFP), L is labor, and K is capital.[4] y, L, and K are observable, while A is not. Log transform both sides of the equation, we attain a linear form:

  $$y = a + \alpha l + \beta k \tag{2}$$

  where the lowercase variables are the log-form of the uppercase variables (e.g. $y = \log(Y)$ and so on). Equation 2 can then be estimated with OLS:

[4] This is a structural equation and thus does not have an error term.

$$y_i = \beta_0 + \beta_1 l_i + \beta_2 k_i + \epsilon_i \tag{3}$$

where β_0 is the average TFP of all firms and ϵ is the firm-specific deviation from that mean. From the estimated coefficients of Equation 3, we can estimate firm-level TFP as follows:

$$a_i = \hat{\beta}_0 + \hat{\epsilon}_i \tag{4}$$

$$A = \exp^{\hat{\beta}_0 + \hat{\epsilon}_i} \tag{5}$$

- Having estimated firm-level TFP (or technology), we then regress TFP (or technology) on the presence of FDI in a country / sector. FDI presence can be measured as:
  - the proportion of output in a country (sector) that comes from foreign firms in that sector. This measure focuses on the horizontal, or intra-sectoral, linkage of FDI.
  - the proportion of input and output of a sector that comes from and to foreign firms (as measured in the input-output table). This measure focuses on the vertical, or inter-sectoral, linkage of FDI.

5.2 Project 1: "Price" of spillover—industry variation in potential for spillover

As implied in Section 4.4, when the "price" of spillover is high (i.e. it is difficult to obtain spillover due to the host country's absorptive capacity or sector-specific characteristics), the official would choose a bundle that has more private benefits than spillover (Figure 6).

Here I focus on industry-specific characteristics that either facilitate or hinder spillover.[5] Having a divisible production process, manufacturing firms tend to engage more local suppliers and generate more spillover than firms in the primary and tertiary sectors. In addition, within each sector there is a wide variation across industries to be exploited as well. For example, within manufacturing, food processing can have a high level of spillover due to the sourcing of raw materials and packaging. On the other hand, it is harder for foreign firms to work with local suppliers in textile and automotive due the high level of technical sophistication. Similarly, in the service sector, finance, trading, tourism and utilities are generally not divisible into discrete stages to sub-contract. Yet other service industries such as retailing and construction have more opportunities for input suppliers (UNCTAD 2001, 138).

This leads us to the following hypothesis:

[5] Absorptive capacity, or the ability of private firms to learn from their interaction with foreign firms, is also a very important factor in determining spillover. However, given the time-varying nature of absorptive capacity, not to mention the fact that official and domestic firms can strategically invest to improve absorptive capacity, it is much harder to have a research design studying absorptive capacity that claims exogeneity.

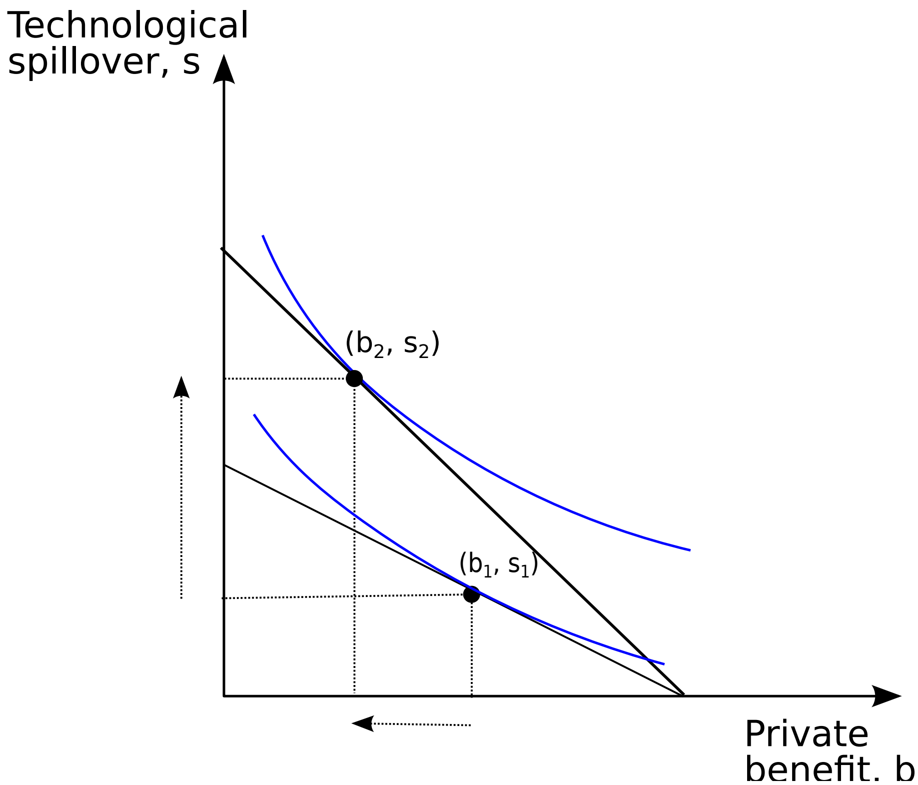


Figure 6: As the "price" of spillover decreases, the official can get a larger amount of spillover given the same budget (i.e. the y-intercept of the budget constraint shifts up). Comparing the bundle (b_1, s_1) and (b_2, s_2), we see that the new bundle has more spillover and fewer bribes.

Hypothesis 1. *Government officials will pursue fewer bribes from firms in industries where it is easier to generate spillover.*

While such variation across industries is conceptually clear, measurement is thorny given the many factors that can affect the potential for spillover. In addition, there is an endogeneity problem as the potential for spillover may itself be affected by the level of corruption in that industry. For example, an industry plagued by collusive relationship between the official and foreign firms does not offer an enabling environment that allows private firms to develop their absorptive capacity. The endogeneity problem is compounded if the official strategically decides whether to invest and improve absorptive capacity, in which case it is not even clear what is the direction of the bias.

To address both of these measurement and endogeneity issues, I will use the variation in technological spillover across industries in the US as the instrumental variable. The assumption is that the level of technological spillover in a US industry only correlates with the level of bribe in another country's industry through the latent factor that is the industry-specific potential for spillover. The instrument is constructed from US' industries due to the high quality of economic data. Alternatively, for each country, I can use data from a comparable country in the same region or the same developmental stage to construct the instrument.

To measure corruption, presence of FDI, and other firm-level controls, I utilize the World Bank's Enterprise Survey (ES), which includes a wealth of firm-level data across 125 countries, spanning various topics from investment, labor, to business-government relation (World Bank 2015). The Enterprise Survey uses stratified random sampling (using three strata: firm size, business sector, and region) in order to ensure representativeness. The survey data comes from face-to-face interviews with upper management and is anonymized to ensure confidentiality at all times.[6] This dataset has a wealth of firm-level data that helps us operationalize key concepts as detailed below.

Operationalization of variables:

- FDI spillover: See **??**. The level of FDI by sectors is available via the Enterprises Survey dataset.[7]
- Corruption: can be measured in two ways. 1) Firms' perception about corruption as an obstacle. This measure is frequently used but is not accurate since firms' perception of corruption depends not only on the level of corruption but also the characteristics of firms. 2) Hard measure of prevalence and depth of bribes, e.g. "Was an informal payment expected or request (when applying for a license)?", "How much do establishments like this one give in informal payments?"

5.3 Project 2: "Price" of private benefit—cost of bribing for foreign firms

As discussed in Section 4.4, when the "price" of private benefits is high (i.e. it is costly for the firm to offer the official private benefits), the official would choose a bundle that has fewer private benefits.

This theoretical claim generates many testable predictions, each involves a factor that affects the cost of bribing for firms. For example, foreign firms that come from a corrupt home country may have more experience with bribing and thus would incur less information cost if they bribe.

I argue that the OECD Anti-Bribery Convention (ABC) makes it expensive for firms from member countries to bribe. In December 1997, all members of OECD and an additional five non-members, accounting for nearly 61% of world trade, signed the ABC. The ABC criminalizes the bribery of foreign public officials and upholds its principles with a peer-monitoring system, in which member countries visit and review one another's legislation and implementation. According to legal experts, these reports are often quite harsh and effective in shaming countries into improving their practices (Tyler 2011). Therefore, member countries have diligently tightened their legal framework and prosecuted offenders. For a firm that bribes abroad, the ABC raises the cost of bribe by increasing both the probability and the consequence of getting caught.

[6] For more on the methodology of the Enterprise Survey, visit http://www.enterprisesurveys.org/methodology

[7] It would be better if there is UNCTAD data for FDI by sector, since the Enterprize Survey is not designed to account for all FDI inflow. Without weights, it is difficult to accurately get the population of foreign firms from the ES' sample of foreign firms.

Important for my design, in December 2009 the OECD's Working Group on Bribery (WGB) announced that following Phase 1 and 2 (Evaluation and Assessment) there would be a Phase 3 (Enforcement). The goal of Phase 3 is to continually monitor countries' anti-bribery practices and to exhort inactive enforcers. Noticeably, Phase 3 also removes a previous exception that allowed firms to make "small facilitation payment" (Strauss 2013). Researchers argue that following the announcement of Phase 3, member countries have ramped up enforcement to avoid a negative review. Therefore, firms from member countries have reduced their bribery abroad (Malesky and Jensen 2015).

In sum, I hypothesize that

Hypothesis 2. *After the Phase 3 (Enforcement) of OECD's Anti-Bribery Convention, firms from member countries have more spillover and fewer bribes than firms from non-member countries.*

In addition,

Hypothesis 3. *After the Phase 3 (Enforcement) of OECD's Anti-Bribery Convention, firms from member countries with stronger enforcement have more spillover and fewer bribes than firms from member countries with weaker enforcement.*

To test the effect of the ABC, I use the case of Vietnam, which is an ideal empirical setting for several reasons. First, Vietnam attracts FDI from a wide range of countries, including both member and non-member countries of the ABC. Second, given that FDI to Vietnam only accounts for a small fraction of ABC countries' total foreign investment, it is plausible that Vietnam is not a major factor driving the initiation of Phase 3. Therefore, the announcement of Phase 3 serves as an exogenous shock to the cost of bribery for firms from ABC member countries. With these firms being reluctant to offer bribes, we expect officials to become uninterested in extracting private benefits from them. Post 2009, firms from ABC member countries would be attractive only for their developmental impact, and we should observe them having more spillover effect.

Using ABC Phase 3 in 2009 as an exogenous shock, we have a difference-in-difference design. First, we estimate the difference in spillover between ABC and non-ABC firms, pre-2009. We then find the same difference in spillover post-2009. Subtracting these two differences, we can estimate the effect of corruption on the level of spillover.[8] To operationalize the strength of enforcement among member countries, I use Heimann (2013)'s assessment of the OECD ABC progress.

This project also takes advantage of the list experiment by Malesky et al. (2015) to measure the level of bribery. Indeed, asking directly about firms' experience with corruption is unlikely to get an accurate answer due to sensitivity bias (Coutts and Jann 2011). Researchers, including the ES team, often address this problem by framing the question about the experience with corruption of "firms like yours." However, with this technique, firms may

[8] An alternative design looks at the difference between ABC and non-ABC firms that *enter* Vietnam pre- and post-2009. This design will have fewer firms in the sample but could be more appropriate if we think that the spillover-bribe bundle is negotiated at the time firms enter Vietnam and is hard to change later, even with the ABC coming into effect. If so, the change in level of spillover and bribe is caused by the change in the official's selection of firms instead of the adjustment in behaviors of existing firms after 2009.

not read between the lines and actually answer about the experience of others (Ahart and Sackett 2004). The unmatched count technique circumvents these issues by not forcing firms to incriminate themselves with corruption. Therefore, our estimate of the level of corruption would be unbiased.

5.4 Project 3—time horizon of officials

As discussed in Section 4.5, an official with a longer time horizon would choose a bundle with more spillover, whereas an official with a shorter time horizon would choose a bundle with more private benefits.

To get a handle on the time horizon of the official, we need to know the options provided to the official within the country's political economic system. Such is a difficult question to study with a cross-national design due to endogeneity issues, stemming from unobservable and unmeasurable differences across political systems. Therefore, at this step, I focus on the case of Vietnam for three reasons. First, Vietnam has large number of provinces (63) with different levels of FDI inflow. Second, provincial executive offices are not open to elections but controlled by the central government, thus removing campaign contribution from the list of private benefits that can be offered to the official. Third, revolving-door jobs are also non-existent in the country. Therefore, my focus on bribe and informal fees as the main source of private benefits is justified.

5.4.1 The effect of time horizon on the choice of Vietnamese provincial officials

The relative weight assigned to spillover versus bribe by the Vietnamese provincial officials is determined by the principal-agent relationship between Vietnam's central and the provincial governments. On the one hand, the central government (i.e. the principal) cares more about the spillover effect of FDI and uses promotion to reward local officials that attract high-spillover FDI. On the other hand, local officials (i.e. the agent) have more opportunities to engage in corruption with foreign firms, and should they decide that the private benefit of corruption is greater than that of promotion, they will prioritize foreign firms that bring bribes over those that have high spillover effects.

The reason behind such difference in the preference of central and local governments is the fact that FDI projects are approved and managed at the provincial level. While the central law may be uniform in the book, its implementation varies widely across sub-national units in Vietnam (Meyer and Nguyen 2005).[9] Therefore, provincial governments hold valuable services for sale to foreign firms. In contrast, the central government is not in charge of approving FDI projects (except a few with national importance) and thus less likely to benefit from corruption than provincial leaders.

In addition, the central government is much more concerned with overall economic growth, which is central to the longevity of the regime (Malesky 2008). It wants to attract high spillover FDI and uses promotion to reward local officials that accomplish this goal. On the other hand, each provincial leader is incentivized to free-ride on the developmental effort of other provinces and of the central to keep the entire regime stable. Therefore, local

[9] Vietnam's sub-national variation in implementation generalizes well to other cases, such as China (Thun 2006)

officials value the spillover effect of FDI only insofar as the opportunities for promotion that it brings.

Fortunately for the central government, the principal-agent problem in this context is partially solved because monitoring is not too difficult. Indeed, the central government can observe the economic performance of the provinces and use personnel management to punish and reward provincial officials (Sheng 2007; Li and Zhou 2005).[10] Therefore, the principal-agent problem is only severe when provincial officials are not interested in further promotion to the central government, i.e. when the local official's time horizon is short. This suggests that there will be a variation in the level of FDI's spillover effect across provinces according to provincial officials' interest in promotion. In the research design, I use fuzzy regression discontinuity (RD) exploiting the mandated retirement age of Vietnamese officials, arguing that those in their last term have shorter time horizon and less interest in promotion.[11]

By looking at the variation in the career interest of provincial officials, my theory contributes a fresh angle to the current literature on the relationship between decentralization and corruption. So far, scholars have only postulated a one-way relationship: either decentralization increases bribery (Fan et al. 2009) or reduces it (Guerra et al. 2009). In my model, how decentralization affects corruption is conditional on the local officials' interest in the promotions offered by the central government as carrots.

Three key assumptions in the theory above deserve further examination:

1. Why wouldn't Vietnam's central government worry that technological spillover would lead to a developed private sector, and consequently to social change that ultimately undermines its rule?

   First, there is a large scholarship showing that authoritarian regimes are very adept at using institutions to manage regime outsiders in general and business in particular (Gandhi and Przeworski 2006; Gandhi 2008; Wright 2008a; Le 2015). Second, if the legitimacy of the regime rests on delivering growth, then the short-term risk of a downturn and the resulting instability features much more prominently than the long-term concern with social changes. Third, it is possible to foster economic growth while restricting political freedom (e.g. Singapore). Indeed, growth can make a regime, both democratic and authoritarian, more stable, and creates room for political control (Przeworski et al. 1997).

2. Why don't provincial leaders seek rent from the domestic sector?

   First, Vietnam's private sector was very small when FDI was first allowed into Vietnam. The size and the profitability of the average domestic firm is still smaller than those of foreign firms today. Therefore, there are both fewer rents and more coordination problems if provincial officials want to seek rents from domestic firms. Second, ironically, if officials want to grow the private sector for future rent-seeking, they must promote an

[10]Shih et al. (2012) recently argue that economic performance does not matter to cadre promotion. However, they investigate all members of the Chinese Central Committee, including the central party apparatus, the army, and the central economic bureaucracy. These actors are not the important decision-makers in our theory.

[11]The design is *fuzzy* RD because the shortening of time horizon does not happen so abruptly as after a specific date. Instead, it happens in a time window after the official enters their last term before retirement.

enabling business environment that are free from rent-seeking. In contrast, engaging in corruption with large and existing FDI firms is much more convenient. Essentially, corrupt provincial officials have shifted the cost of building a thriving domestic sectors to the home countries of FDI firms and now extract rents from the high productivity and profitability of these firms.

In sum, I hypothesize that

Hypothesis 4. *In provinces whose leaders are in their last term before the mandated retirement age, there are less spillover and more bribes from the foreign firms.*

In addition to the fuzzy RD design using term limit, this project also attempts to measure the preference of the official directly with a survey conjoint analysis instead of relying on the observed level of bribe and spillover. Indeed, it is difficult to fully examine the official's utility function with only observational data because what he truly wants may not be fulfilled due to external and unobservable factors. Furthermore, what an official wants from a FDI firm is often hard to tease out completely. A big FDI firm is an attractive source of bribe, but it also brings job and technology. Indeed, perhaps this high correlation is precisely why it is so easy for officials to extract bribe from FDI under the guise of promoting economic development.

To truly get at the utility calculation of provincial officials, I plan to conduct a survey experiment using conjoint analysis to ask provincial officials about their preference between two hypothetical FDI firms (Hainmueller et al. 2014). The characteristics of these firms will be randomly varied across several dimensions: size of labor force, capital, technology age, and most importantly, need for land, which proxy for corruption opportunities.

5.4.2 Why choose land as a proxy for corruption?

To discern provincial officials' preference for bribe vs spillover, one must vary the hypothetical FDI project along a characteristic that can only be attractive to officials because of its potential for corruption. In this regard, the amount of land a project requires is the best proxy for corruption. Since land is an increasingly scarce and expensive resource in Vietnam, acquiring land from current tenants and farmers is a difficult, sometimes violent, process. Therefore, there is neither good developmental nor political reason for local officials to prefer a project that needs a large amount of land.

In contrast, other characteristics of a FDI project can be preferred by officials for many different reasons. For example, a well capitalized project may signify a large pot of money to dip in, but it may also be attractive for the labor productivity enhancing effect of its capital. Similarly, a FDI firm with a large labor force may need to curry favor with officials to suppress their workers, but it may also be appealing for the jobs it creates. Unlike those factors, land is unambiguously an indication of corruption opportunities. With a high level of *monopoly* and *discretion*, local officials are able to sell land access, something that investors are eager to buy.

1) Monopolistic control over land supply: At the start of Vietnam's liberalization, Land Law 1993 stipulates that any exchange of land between land users and investors must go through the local government. Investors had to negotiate with all levels of local governments

(i.e. commune, district, and province level people's committees) to acquire land—a complex process that encouraged investors to use informal procedures and fees to expedite. Importantly, the price of land was solely determined by the local government, which was usually 10-30% of the market price. Therefore, officials were able to extract bribes with both their gate-keeping and price-setting powers over land.

Subsequent land law reforms (2003 and 2013) attempted to bring the land acquisition process closer to a market approach and lessen the monopolistic control of the local government over land. For example, Land Law 2003 specifies two methods for investors to acquire lands: voluntary and compulsory. Under compulsory land acquisition (akin to eminent domain), local governments retain the power to acquire land with compensation then allocate to approved investors. Under the newly-introduced voluntary land acquisition, investors negotiate with and buy from land users in a private market transaction. Despite the option of buying lands from private users, in practice most investment projects tellingly opted for compulsory land acquisition by the state. With the local government's coercive power and legal ability to set compensation value on their side, investors find compulsory land acquisition both faster and cheaper, and thus worth paying for.

Similarly, despite many calls for removing the state's control over land, Land Law 2013 disappointed with its insistence on "people's ownership" of land instead of adopting a fully private ownership system. Furthermore, the law preserves the state's right to acquire land for the vaguely defined "socioeconomic development" and "national interest," which expansively includes the development of industrial zones.

2) Discretionary allocation of land to selected investors: Opportunities for corruption also arise from two discretionary powers of the local governments. First, land acquired by the government is allocated directly to approved investors instead of through public auction, an option allowed by law but rarely practiced by local governments. Second, in many cases, local officials even modify the existing land use plans according to the suggestions of investors, making available land that was previously not zoned for business development. Without any standard guideline for investor approval, this process relies heavily on personal contacts and is prone to bribery and kickback.

An important symptom of this corrupt practice is the lack of transparency in the land allocation process and decision. Key information, such as the criteria of project approval, the shortlist of investors, the profile of the selected projects and investors, and the (dictated) price of land, are kept among selected investors and a few state officials involved. Even a straightforward compliance with transparency regulation, i.e. the public posting of investment site maps, is not fulfilled. In a 2010 study, DEPOCEN researchers could only access the investment site maps in 2 of the 12 visited provinces (Anderson and Davidsen 2011).[12]

5.4.3 Conjoint analysis design

> Two FDI projects want to enter your province. Please carefully read the following description of the projects. Then, please indicate which project you prefer.

[12] But Land law 2013 does remove the direct allocation of land to approved project, instead try to increase the number of land auctions. Does this have an effect?

	Project 1 (Du an 1)	Project 2 (Du an 1)
Industry		
Labor force		
Capital		
Land		
Technology age		

If you have to choose, which project do you prefer to grant investment license?
Project 1 / Project 2

The five dimensions will be given random values as follows.

- Industry: textile, electronics, automobile, consumer product
- Labor force: 5, 50, 100, 200, 500 employees
- Capital:
- Land:
- Technology age:

If desired, it is possible to:

- adjust the design so that implausible hypotheticals will not appear (i.e. there should not be a high-tech company with very small capital).
- randomize the ordering of the characteristics between respondents to test for the ordering effect (i.e. knowing a firm's industry first changes how the respondent thinks about the other characteristics)

I am mainly interested in the "average marginal component effect" (AMCE) of *land*, which is the marginal effect of *land* on the likelihood of a project being preferred, averaged over the distribution of all the other components. This allows us to back-out what provincial officials truly want from a FDI project.

5.5 Two-sided logit (TSL) model

As discussed in Section 4.1, here I will extend my model to consider a strategic firm using the TSL model. Designed to study the job market, the TSL is "a two-sided approach [that] explicitly [combines] models of employers' and workers' preferences . . . with data on the characteristics or resources that each side values in the other" (Logan 1996a, 117). In this section, I show how to frame the FDI investment location in the TSL framework, where the firm chooses the official based on his endowment and the official chooses the firm based on its ability to deliver spillover and private benefits. Extending my model in Section 4.1, the TSL allows the firm to be profit-maximizing instead of profit-satisficing. Furthermore, both sides are also strategic, taking into account not only their own preferences but also offers from the other sides (Logan 1996b).

The data is a random sample of firms and the countries that they invest in, including relevant firm-level and country-level covariates. The research design is to categorize those countries' officials according to the length of their time horizon. Then, for each category, I use the TSL to estimate the preference of the official for spillover versus private benefits. The hypothesis is that officials with a longer time horizon prefer spillover.

In the following pages, Section 5.5.1 specifies the actors' utility functions. Section 5.5.2 discusses how the TSL model is derived from these utility functions and how it can be estimated. Finally, Section 5.5.3 elaborates on the hypotheses regarding the effect of time horizon and how to operationalize them for testing.

5.5.1 The actors' utility functions

Using the notation from Logan (1998), we consider the utility function of the two actors, the official and the firm. Since there is only one official for a country in the model, in this section I will refer to country j and official j interchangeably. For the official j, the utility of having firm i investing in his country is:

$$U_j(i) = \beta_j x_i + m_j + \epsilon_{1ij} \tag{6}$$

(7)

while the utility of not having firm i investing is:

$$U_j(\neg i) = b_j + \epsilon_{0ij} \tag{8}$$

where

$$\begin{aligned} \beta_j &= \text{a vector of official } j\text{'s preference for relevant characteristics of firms} \\ x_i &= \text{a vector of firm } i\text{'s measured values on those characteristics} \\ b_j &= \text{the baseline utility of official } j \text{ without any firm investing} \\ \epsilon_{1ij}, \epsilon_{0ij} &= \text{unobserved components that influence official } j\text{'s utility} \end{aligned}$$

The official j will evaluate each firm and then make an offer to firm i to invest if $U_j(i) > U_j(\neg i)$. In our model, the relevant firm characteristics (i.e. x_i) that the official will consider are: the potential for spillover, private benefits, jobs, and capital. The corresponding β's represent the official's preference for these characteristics. We are mainly interested in the β's for spillover and private benefits.

On the other side, for firm i, the utility of investing in country j is:

$$V_i(j) = \alpha_i w_{ij} + v_{ij} \tag{9}$$

where

$$\alpha_i = \text{a vector of firm } i\text{'s preference for relevant characteristics of countries}$$
$$w_{ij} = \text{a vector of country } j \text{ measured values on those characteristics}$$
$$v_{ij} = \text{unobserved component that influences firm } i\text{'s utility}$$

Firm i evaluates all the countries that make an offer and chooses the one that brings the highest utility. In our model, the relevant country characteristics are: labor quality, infrastructure, and market size.

5.5.2 Estimate the actors' preference

Our data contains a random sample of firms and the countries in which they invest. We want to find the parameters that maximize the likelihood of this observed data. This likelihood is:

$$L = \prod_{i,j:\text{i is matched with j}} Pr(A_{ij})$$

where $Pr(A_{ij})$ is the probability of a specific match between firm i and country j. $Pr(A_{ij})$ can be calculated as follows:

$$\begin{aligned}
&Pr(A_{ij}) && (10)\\
&= \sum_{k=1}^{R} Pr(A_{ij}|S_{ik})Pr(S_{ik}) && (11)\\
&= \sum_{k=1}^{R} Pr(A_{ij}|S_{ik}) \prod_{m \in O_k} Pr(o_{im} = 1) \prod_{n \in \bar{O}_k} Pr(o_{in} = 0) && (12)\\
&= \sum_{k:j \in O_k} \frac{\exp(\alpha w_{ij})}{\sum_{h \in O_k} \exp(\alpha w_{ih})} \prod_{m \in O_k, m>0} \frac{\exp(\beta x_i)}{1 + \exp(\beta x_i)} && (13)\\
&\times \prod_{n \in \bar{O}_k, n>0} \frac{1}{1 + \exp(\beta x_i)} && (14)
\end{aligned}$$

Here, the term $Pr(o_{ij} = 1)$ represents the probability that country j makes an offer to firm i, through which the official's preference enters our estimation. On the other side, $Pr(A_{ij})|S_{ik}$ is the probability that firm i will accept the offer from official j, given the offering set O_k. The firm's preference is reflected in our estimation through this term, $Pr(A_{ij})|S_{ik}$.[13]

It is important to note that the offering set O_k contains *all* offers that firm i receives, only one of which is the observed match between firm i and country j. The intuition is that if we observe the full set of offers that all officials make to all firms, then by looking at the

[13]The appendix shows how these terms are derived.

final match we can see how firms and officials reject inferior offers and thus deduce their preferences.

However, since the observed data only contains the final match, there is no information about the offers that firm i receives but rejects, leading to the problem of incomplete data. To maximize the likelihood with incomplete data, we use the Expectation-Maximization (EM) algorithm, which runs as follows. First, we assume some arbitrary values for the parameters representing the actors' preferences. Second, given these preferences, we fill in the missing data, i.e. the offers that we do not observe. After this step, we now have the full set of offers and can estimate the actors' preferences again. These two steps constitute one iteration of the EM algorithm, which we repeat many times.

Under certain regularity conditions, met by the TSL, the EM algorithm is proven to increase the likelihood after each iteration (Logan 1998, 152). We stop the algorithm when the likelihood no longer increases and keep the final set of parameter estimates.

Depending on the starting values of the parameters, the EM algorithm may get stuck on a local maximum of the likelihood. Therefore, we will try multiple starting values and choose the one that leads to the highest likelihood.

5.5.3 Hypothesis and Operationalization

As before, I hypothesize that an official with a longer time horizon would prefer spillover over private benefits. First, I exploit the variation in time horizon among democratic governments, operationalized as the level of institutionalization of the party in power. Highly institutionalized parties are long-lasting and encompass multiple generations of politicians. Since the young generation of politicians have their entire career attached to the party label, they have a long time horizon and consider the long-term effect of the government's policy. Therefore, they are likely to pressure or bribe their senior colleagues, i.e. those with short time horizon, into choosing FDI based on its spillover effect. In contrast, weakly institutionalized parties tend to be short-lived, unable to attract young politicians, and thus have a short time horizon.[14] Therefore, I hypothesize that:

Hypothesis 5. *Democratic governments ruled by highly institutionalized parties prefer FDI with spillover more than those ruled by weakly institutionalized parties.*

I operationalize party institutionalization with the age of party, as measured by the Database of Political Institutions (Keefer 2002). In a presidential system, I consider the president's party to the party in power.

Second, I exploit the variation in time horizon among autocratic governments, operationalized as the probability of staying in power. Unlike democracies, autocracies only have infrequent, if not violent, removal of leaders, leaving little chance for the political losers to regain office. Therefore, once the probability of staying in power becomes small, the leader's time horizon is severely shortened. I hypothesize that:

Hypothesis 6. *Autocratic regimes with higher probabilities of staying in power prefer FDI with high spillover.*

[14] Making a similar argument, Blake (2013) shows that highly institutionalized parties sign less rigid bilateral investment treaties because they want to maintain flexibility in case conditions change during their long future reign.

I measure the probability of staying in power as the predicted probability of regime survival in a duration model, similar to Wright (2008b).

Finally, to estimate the TSL model, we need data on the observed match between firms and countries / provinces, as well as their characteristics. I will use two datasets: 1) The Bureau of Economic Analysis' database of US Direct Investment Abroad (USDIA), and 2) Vietnam's Enterprize Census.

6 Time Line

The prospectus currently has four projects, anticipating that at least one would not be completed and I will quickly move on to the others. I list the tentative time line below with an uncertainty estimate.

6.1 Two-sided logit model

- Obtain the PCI data. **done**
- Obtain the Bureau of Economic Analysis' (BEA) database of US FDI (**contacted Duke librarian and the BEA**). It solely depends on whether the BEA gives graduate student on-site access to the data (high uncertainty). **January 2016**
- Implement the EM algorithm for TSL model (high uncertainty, given that I'll code this up myself and EM models always have the possibility of not converging). **December 2016**

6.2 Diff-in-Diff using OECD Anti-bribery convention

- Obtain PCI data before and after the OECD ABC phase 3 enforcement. **done**
- Calculate spillover effect using Enterprise Census data (medium uncertainty, given that I have not worked extensively with this dataset and that it needs a lot of merging to calculate vertical, i.e. inter-industry, spillover). **February 2016**
- Analyze the data (low uncertainty, given the diff-in-diff design). Finish the chapter. **April 2016**

6.3 Survey experiment in Vietnam

Given the nature of elite surveys, this project has the most uncertainty overall.

- Contact local researchers to gauge the project's feasibility. **February 2016**
- Travel to Vietnam to interview officials and implement the survey. **May – August 2016**
- Analyze (low uncertainty, given the experimental design and available R package for conjoint analysis). Finish the chapter. **October 2016**

6.4 Instrumental variable

- Obtain World Bank Enterprise Survey data. **done**
- Obtain the BEA's data on FDI into the US. contacted Duke librarian and the BEA. This project depends on whether the BEA gives me on-site access to the confidential, firm-level data (high uncertainty). **January 2016**
- Create the instrumental variable by measuring spillover effect by sector for FDI in the US. **February 2017**
- Analyze and finish the chapter. **April 2017**

A Appendix: Two-sided logit

If we assume that the ϵ_{0ij} have independent, standard Gumbel distributions, the probability that official j will make an offer to firm i is:[15]

$$Pr(o_{ij} = 1) = \frac{\exp(\beta_j x_i)}{1 + \exp(\beta_j x_i)} \tag{15}$$

where o_ij is a dummy variable indicating an offer is made.

On the other side, the probability that firm i invest in the country j, given a set of offers O_k is:

$$Pr(A_{ij}|O_k) = \begin{cases} \frac{\exp(\alpha_i w_{ij})}{\sum\limits_{h \in O_k} \exp(\alpha_i w_{ih})}, j \in O_k \\ 0, j \notin O_k \end{cases} \tag{16}$$

This is a polytomous conditional logit model in the discrete choice literature.

[15]Modeling the error term as a Gumbel random variable rather than a normal random variable greatly simplifies the closed-form likelihood while not changing the result substantially (Maddala 1986).

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