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## **Government Corruption and Foreign Direct Investment Under the Threat of Expropriation**

**by**

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## Abstract

Foreign investment is often constrained by two forms of political risk: expropriation and corruption. We examine the role of government corruption in foreign direct investment (FDI) when contracts are not fully transparent and investors face the threat of expropriation. Using a novel dataset on worldwide expropriations of FDI over the 1990–2014 period, we find a positive relationship between the extent of foreign investor protections and the likelihood of expropriation when a country’s government is perceived to be highly corrupt, but not otherwise. We then develop a theory of dynamic FDI contracts under imperfect enforcement and contract opacity in which expropriation is a result of illicit deals made with previous governments. In the model, a host-country government manages the FDI contract on behalf of the public, which does not directly observe government type (honest or corrupt). A corrupt type is able to extract rents by encouraging hidden investments in return for bribes. Opportunities for corrupt deals arise from the distortions in the optimal contract when the threat of expropriation is binding. Moreover, a higher likelihood of the government being corrupt increases the public’s temptation to expropriate FDI, magnifying investor risk. The model predicts that expropriation is more likely to occur when the share of government take is low and following allegations of bribes to public officials, and it suggests an alternative channel through which corruption reduces optimal foreign capital flows.

*JEL classification:* F23, F21, F34

*Bank classification:* International topics; Development economics; Economic models

## Résumé

Deux formes de risque politique, à savoir l’expropriation et la corruption, constituent souvent une entrave à l’investissement étranger. Dans le présent article, nous examinons le rôle de la corruption du gouvernement dans l’investissement direct étranger lorsque les contrats ne sont pas entièrement transparents et que les investisseurs sont confrontés à la menace d’une expropriation. Grâce à un nouvel ensemble de données sur les expropriations liées à l’investissement direct étranger à l’échelle mondiale au cours de la période 1990-2014, nous mettons en évidence un lien positif entre l’étendue des protections accordées aux investisseurs étrangers et la probabilité d’expropriation dans le cas d’un gouvernement perçu comme fortement corrompu, mais cet effet n’est pas observé lorsque le taux de corruption est faible. Nous élaborons ensuite une théorie des contrats dynamiques d’investissement direct étranger faisant l’objet d’une application imparfaite. Par la suite, nous étudions l’opacité des contrats dans le cadre desquels l’expropriation est le résultat d’affaires illicites conclues avec d’anciens gouvernements.

Dans ce modèle, le gouvernement du pays d'accueil gère le contrat d'investissement direct étranger pour le compte de la population qui n'est pas en mesure d'observer directement s'il s'agit d'un gouvernement honnête ou corrompu. Un gouvernement corrompu peut s'adonner à l'extraction de rentes en encourageant des investissements cachés en échange de pots-de-vin. Les occasions d'affaires illicites découlent de distorsions dans le contrat optimal lorsque la menace d'expropriation a une valeur contraignante. De surcroît, plus la probabilité que le gouvernement soit corrompu est élevée, plus la population est incitée à exproprier l'investissement direct étranger, ce qui a pour effet d'accentuer le risque pour les investisseurs. Le modèle prévoit que la probabilité d'expropriation est plus forte lorsque les intérêts du gouvernement sont moindres et que des allégations de pots-de-vin pèsent contre des fonctionnaires. Enfin, le modèle nous porte à croire qu'il existe un autre canal par l'entremise duquel la corruption réduit le flux optimal de capitaux étrangers.

*Classification JEL : F23, F21, F34*

*Classification de la Banque : Questions internationales; Économie du développement; Modèles économiques*

## Non-Technical Summary

Recent efforts to deepen our understanding of barriers to cross-border capital flows to relatively capital-poor developing countries have found that foreign investment is lower in countries with relatively weak institutions and poor governance. Two forms of political risk appear to be especially important in explaining global patterns of foreign direct investment (FDI): government corruption and expropriation. While these two forms of political risk are typically studied in isolation, recent disputes between foreign investors and host-country governments suggest that expropriation risk and corruption are interrelated. Specifically, several recent cancellations of direct investment contracts have been justified by national governments as attempts to reverse unfair or “exploitative” deals signed with investors under a previous government.

This paper examines the link between high-level government corruption, transparency of foreign investment contracts, and the security of foreign investor property rights. Specifically, we consider the incentives for corrupt officials to make secret deals with foreign investors when terms of the contract are not fully transparent to the public, and we study the consequences for expropriation risk and host-country welfare. Using a novel dataset on worldwide expropriations of FDI over 1990–2014, we find that expropriation is more common in industries where host-country governments typically play a direct role in establishing contracts with foreign investors (such as mining and utilities). We also document a positive relationship between the strength of foreign investor protections and the likelihood of expropriation when a country’s government is perceived as being highly corrupt, but not otherwise.

We then develop a theory of dynamic FDI contracts under imperfect enforcement and contract opacity that can help explain these facts. In the model, a host-country government manages the FDI contract on behalf of the public, which does not directly observe government type (either honest or corrupt). A corrupt type is able to extract rents by encouraging hidden investments in return for bribes. Opportunities for corrupt deals arise from the distortions in the optimal foreign investment contract caused by expropriation risk. Moreover, a higher likelihood of the government being corrupt increases the public’s temptation to expropriate FDI, magnifying investor risk. In the model, expropriation occurs as a result of illicit deals made by previous governments that violate the optimal contract. Consistent with the empirical and anecdotal evidence, the theory predicts that expropriation is more likely to occur when the share of government take is low and following allegations of bribes to public officials, and it suggests an alternative channel through which corruption decreases host-country income.

# 1 Introduction

Recent efforts to deepen our understanding of barriers to cross-border capital flows to relatively capital-poor, developing countries have generally found that foreign investment is lower in countries with relatively weak institutions and poor governance (see, for example, Alfaro, Kalemli-Ozcan, and Volosovych, 2008; Faria and Mauro, 2009; Papaioannou, 2009; Ju and Wei, 2010; Méon and Sekkat, 2012; Okada, 2013; Reinhardt, Ricci, and Tressel, 2013). Empirical work that has focused on foreign direct investment (FDI) in particular—the largest and most stable source of capital inflows to developing and emerging markets—has emphasized the importance of two prevalent forms of political risk: government corruption (e.g., Wei, 2000; Asiedu, 2006; Hakkala, Norbäck, and Svaleryd, 2008; Morrissey and Udomkerdmongkol, 2012) and risk of expropriation (Bénassy-Quéré, Coupet, and Mayer, 2007; Busse and Hefeker, 2007; Asiedu, Jin, and Nandwa, 2009).<sup>1</sup> Although these two forms of political risk are typically studied in isolation, an examination of recent disputes between foreign investors and host-country governments suggests that expropriation risk and corruption may be interrelated. In several high-profile cases involving the cancellation of direct investment contracts (including the numerous expropriations in Bolivia, Russia, and Venezuela over the past decade),<sup>2</sup> national governments have justified the takings as an attempt to undo the unfair or “exploitative” deals offered to the investor by previous national or local government leaders. In several cases, accusations of corruption and acceptance of bribes in return for low tax or royalty payments are explicit.<sup>3</sup> This paper examines the link between high-level government corruption, transparency of foreign investment contracts, and the security of foreign investor property rights. Specifically, we consider the incentives for corrupt officials to make clandestine deals with foreign investors when terms of the contract are not fully transparent to the public, and study the consequences for expropriation risk and host-country welfare.

We assemble a unique dataset on expropriations of FDI across all developing countries worldwide over 1990–2014 to study the relationships between the likelihood of expropriation and commonly used measures of foreign investor property rights protection and government corruption. We find that the strength of investor protections is associ-

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<sup>1</sup>The principal roles of corruption and expropriation risk in the allocation of FDI across emerging markets are also underscored in the IMF Capital Markets Consultative Group’s (2003) foreign investor survey. The report emphasizes investor concerns over both forms of risk, noting that investors rank quality of governance second in importance (behind market access) in deciding where to invest.

<sup>2</sup>We adopt a relatively narrow definition of expropriation, which is outlined in detail in Section 2.

<sup>3</sup>For example, prior to nationalizing Bolivia’s petroleum industry in 2005, the president declared:

Many of these contracts signed by various governments are illegal and unconstitutional. It is not possible that our natural resources continue to be looted, exploited illegally, and as the lawyers say, these contracts are legally void and must be adjusted. (Associated Press, December 21, 2005)

Numerous other examples of expropriation of FDI coinciding with investigations into government corruption are discussed in Section 2.

ated with a lower propensity to expropriate in countries with higher corruption, but this association is weak in countries where corruption is low. We then develop a model of expropriation of FDI in the presence of high-level government corruption that is consistent with these findings, providing a novel channel through which corruption distorts foreign investment and reduces host-country welfare.

Our theoretical framework builds on the work of Eaton and Gersovitz (1984), Cole and English (1991), and Thomas and Worrall (1994) in which a host country requires foreign capital to finance an excludable investment opportunity and the government is unable to commit to not seizing the investor's assets. The model environment is closest to Thomas and Worrall (1994), who characterize the optimal, self-enforcing contract between a host-country government and foreign firm when the government type and contracts are fully transparent. In contrast to their work, however, we assume that the public observes whether the contracted transfer payments from the investor to the host country are made but relies upon (possibly misleading) reports from the government in every period concerning the actual value of FDI assets.<sup>4</sup> The government official who manages the contract is assumed to be either honest or dishonest, and the official's type is not directly observable by the public. The honest type always implements the contract that maximizes the *ex ante* expected welfare of the public, does not accept bribes, and expropriates FDI whenever this is beneficial to the public *ex post*. In contrast, the dishonest type only cares about the stream of side payments that can be extracted from the foreign investor by deviating from the optimal contract.

In this environment, the optimal foreign investment contract features gradualism in FDI flows, which minimizes the temptation of the host-country citizens to demand that the government expropriate investor assets and redistribute the gains. Opportunities for dishonest officials to extract side payments through corrupt deals with foreign investors depend crucially on this risk-induced distortion in the optimal investment path. However, there is also a causal link between corruption and expropriation operating in the opposite direction. A higher propensity for corruption in a country, which we model as the likelihood of a politician being a dishonest type, increases the temptation to expropriate. The expectation of corruption magnifies the distortions to investment and payments to the host country under the contract due to expropriation risk, even if no corrupt deals occur *ex ante*. Finally, when we allow for the possibility of exogenous government turnover, corrupt deals increase the likelihood of an expropriation actually occurring. In fact, the contract the public is able to write with an investor is fully self-enforcing in the absence of corruption, and expropriation only occurs if a corrupt deal has taken place.

We find that government corruption constrains the optimal contract in several ways. First, when there are positive start-up costs, corruption constrains the set of contracts

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<sup>4</sup>We also depart from Thomas and Worrall (1994) in that we consider the related, dual problem of characterizing the contract that maximizes host-country welfare, subject to the investor's expected discounted payoffs from date 0 being sufficient to cover the investor's initial start-up costs, as opposed to analyzing the optimal contract that maximizes investor returns. However, this does not impact the equilibrium dynamics of the optimal contract.

in which foreign investors can profitably participate, resulting in a more limited set of projects that are ultimately financed. Second, for any given project that is financed, the potential for corruption decreases contracted investment leading up to the stationary investment stage of the contract (and may even decrease the long-run investment level) while delaying transfers to the host country. Corrupt deals, when they take place, entail foreign investment in excess of the official contract. Therefore, corruption decreases FDI on the extensive margin, but the effect on the intensive margin is ambiguous. However, a higher likelihood of corruption results in lower transfers to the host country and lower welfare.<sup>5</sup> Moreover, an expropriation is more likely to occur before any contracted transfers to the host country are made and when there is evidence of past corruption. These features relating to the timing of expropriation provide a rationale for why governments frequently claim contracts are corrupt, unfair and/or exploitative as a justification for breaking them.<sup>6</sup>

Our work is related to recent literature on the distortionary effects of uncertainty in the form of extortion and/or expropriation by corrupt governments. Phelan (2006) considers the dynamics of investment in an environment where domestic investors update their beliefs about government type (and whether to elect a new government with a lower *ex ante* likelihood of being corrupt) and where the corrupt type optimally chooses when to seize investor assets. He characterizes a Markov perfect equilibrium in which the opportunistic type gradually ratchets up the probability of expropriating in a given period as investment increases and investors become more confident that the government is not corrupt. Bhattacharyya and Hodler (2010) consider random government types (corrupt or honest) in the context of theft of public revenues. They show that higher resource abundance in the absence of executive constraints on the government (i.e., when it is more difficult for investors to overthrow a government that is suspected of past corruption) increases theft by corrupt officials and lowers private investment, resulting in a resource curse. Though neither paper considers foreign investment explicitly, their basic arguments could be carried to this context as well, suggesting potential channels by which corruption discourages FDI, as documented by Wei (2000). However, in both papers government corruption and expropriation (more generically, government theft) are treated as synonymous. Our focus instead is on how corruption and bribes shape the foreign investment contract on the one hand, and the implications for the security of these contracts, FDI flows, and host-country welfare on the other.

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<sup>5</sup>We follow much of the existing literature by focusing on the welfare impact owing to distortions in foreign capital flows. However, expropriation risk may affect the value of the project in a number of other ways, depending on the specific contract setting. Melek (2014) develops a model of non-renewable resource extraction where the anticipation of expropriation will encourage investors to over-extract the resource, and estimates large productivity losses in Venezuela's oil sector leading up to its 1975 nationalization. Baldursson and Von der Fehr (2015) formally examine the case of a renewable resource in the presence of initial contracting costs and show that expropriation risk reduces the value of the project through distortions in the optimal duration of the lease.

<sup>6</sup>For evidence that larger gaps between oil revenue shares in favor of the foreign investor increase the likelihood of expropriation, see Mahdavi (2014).

Relatively little attention has been given to the endogenous determination of expropriation risk and the incentives for corrupt officials to solicit bribes from foreign investors. Two important exceptions are Azzimonti and Sarte (2007) and Koessler and Lambert-Mogiliansky (2014). In each of these models, acts of expropriation are treated as distinct from theft through extortion (i.e., bribes), which enables the authors to consider the effects of bribe-taking on expropriation and vice versa. In Azzimonti and Sarte (2007), the contracting government during the initial investment phase of the FDI project faces a trade-off between demanding payments from the investor in proportion to investment (a tax or a bribe), which distort investment, and the amount of assets that can be expropriated during the production phase, which the government may not be able to appropriate in the event it is replaced by a new government. The authors show that higher political turnover results in a higher level of bribes and a lower level of expropriation. In their model, expropriation occurs with probability one—varying only in the proportion of assets seized—and the value of assets expropriated is negatively related to the extent of bribes acquired during the investment phase. Building on the work of Myerson (1981), Koessler and Lambert-Mogiliansky (2014) model government corruption as an auction between a large number of heterogeneous foreign firms, where bribes paid to the corrupt official are determined by the reservation price the official requires for a promise to not expropriate investor assets. The bribe required may differ from asset values, given the assumptions that the official's private valuation differs across firms and a political constraint limits the number of firms that can be expropriated. The model predicts that the likelihood of expropriation increases with the value of firm assets (and decreases with the value of other firms when the constraint binds), generating a positive association between expropriation risk and the amount of bribes paid by firms.

The connection between corruption and expropriation risk that we explore is complementary to the mechanisms proposed in these recent theories. Each offers insight into expropriation as a tool for politicians to generate personal financial or political gain. However, several recent expropriation cases analyzed in the next section suggest that the solicitation of bribes and outright expropriation of investor assets are frequently motivated by a conflicting set of objectives. In the model we develop, corruption and expropriation risk are endogenously co-determined, as in Azzimonti and Sarte (2007) and Koessler and Lambert-Mogiliansky (2014); a key difference in our model is that expropriations arise from the conflicting objectives of corrupt officials and the intended beneficiaries from the FDI contracts, the host-country public. Our results have direct implications for the timing of expropriation and suggest that allegations of corrupt deals made between public officials and foreign investors may not simply be a convenient justification for seizing investor assets. They also lend insight into repeated cycles of nationalization and subsequent privatization in countries with poor contract transparency and extensive histories of government corruption such as those documented by Gadano (2010) in the Argentinian oil sector.

The rest of the paper is organized as follows. Section 2 presents empirical evidence for the effect of weak contract enforcement on risk of expropriation when governments

are perceived as being relatively corrupt. These relationships are examined formally in Section 3. Here we introduce contract opacity and exogenous government types (honest or corrupt) into a standard model of FDI under imperfectly enforceable contracts, and characterize the optimal contract when the government type is constant but not observable by the public. This basic framework is then extended in Section 4 to consider the effects of government turnover, where we consider the effects of political risk corruption on the likelihood that expropriation occurs. Section 5 concludes.

## 2 Empirical Facts on Expropriation and Corruption

Political risk has been frequently cited as an important barrier to foreign investment in developing countries, particularly those forms of risk associated with changes in contract terms by governments and the threat of expropriation of investor assets. The prevalence of government corruption in negotiating and managing foreign investor contracts in particular can exacerbate enforcement problems. In her comprehensive analysis of corruption in developing countries, Rose-Ackerman (1999) notes that the demand for bribes by high-level officials in the procurement of contracts may result in investor concerns over whether corrupt officials will “stay bought.” Rose-Ackerman proposes two reasons for this concern. First, corrupt officials may be vulnerable to being replaced by a new government, and the investor may fear that the new regime will not honor the old commitments. Foreign investors forced to pay bribes in the bidding for contracts may expect that future governments (possibly at the behest of the host-country electorate) will demand outright nationalization of investor assets if there is suspicion that the deal was reached under illicit circumstances.<sup>7</sup> Second, the willingness of officials to accept bribes in securing the contract may be viewed as a negative signal that the investor is likely to face extortion and costly changes in contract terms throughout the life of the contract. This tendency for officials to demand further side-payments from investors that were not agreed to during the initial contract phase is a form of what is often referred to as “creeping expropriation.”<sup>8</sup> The risk to investor property rights implied by the first concern is distinct from the second in that the former reflects either the attempt of the host-country governments to rescind corrupt contracts or the time-inconsistency of past deals that offer few current benefits to the country. The latter stems from a lack of contract transparency and the prevalence of government corruption itself.

A number of recently publicized cases of expropriation of FDI lend support to the view that illicit deals between foreign investors and corrupt officials increase contract vulnerability. In the case of Russia, for example, legislation governing production shar-

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<sup>7</sup>See Rose-Ackerman (1999) Chapter 3, pp. 32-35, for a detailed discussion.

<sup>8</sup>The term creeping expropriation has been used more broadly to refer to all adjustments in investor payments that do not involve a transfer of asset ownership or outright cancellation of contracts, including changes in official tax and royalty payments conflicting with the provisions of the original contract. However, Rose-Ackerman’s discussion of changes in contract terms in the context of government corruption focuses on illicit payments.

ing agreements with foreign investors in energy and mining, signed by President Yeltsin in 1993, was never ratified, and the few foreign investment contracts that were concluded under Yeltsin, such as the Sakhalin II agreement with Royal Dutch Shell, did not receive legislative approval. These contracts offered internationally non-standard terms that tended to strongly advantage the foreign investor (Bamberger, 2007). When Shell refused a bid by the state petroleum company to acquire its stake in Sakhalin II in 2005, the government forced Shell to transfer the assets to the state by revoking key operational licences. In Guinea, the government takeover of Brazilian iron mining operations BSGR in 2013 accompanied allegations that the rights were illegally issued by the country's previous dictator in return for bribes. This case culminated in the FBI's involvement in an investigation into bribe payments and an indictment against a French national who worked as an intermediary for BSGR in securing the contested mineral rights.<sup>9</sup> Media reports indicate that the current government is also scrutinizing 18 other contracts signed by foreign mining firms and previous regimes. Similarly, in 2013, the Kyrgyz government decided to review the contract of a Canadian mining affiliate because the 2009 agreement under the former government was deemed to be unconstitutional, resulting in the government acquisition of a 33 per cent stake in the operations (and the subsequent demands for a 67 per cent equity stake).<sup>10</sup>

Allegations of corruption by previous contracting officials are also found in the recent wave of expropriations in Latin America. In Bolivia, several mining and petroleum contracts have been cancelled amidst claims that the contracts cancelled with foreign investors were either exploitative or corrupt.<sup>11</sup> Following the Venezuelan government's 2010 nationalization of a U.S. and Italian-owned chemical and fertilizer subsidiary, a former co-owner is serving a four-year sentence in the United States for having bribed Venezuelan officials.<sup>12</sup> Suspicion of corruption in signing foreign investment contracts also appears to have had broader influence in the decision to nationalize several industries in Venezuela. In a 1999 public speech, Venezuela's Minister of Foreign Affairs—under the newly elected Chavez government—claimed that government corruption over the previous 20 years was responsible for sending an estimated \$100 billion abroad owing to “irregularities” in public works contracts.

While these recent expropriation cases are suggestive of a causal connection between government graft and the security of foreign investor assets, we formally investigate the prevalence of this relationship by assembling data on acts of expropriation of FDI world-

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<sup>9</sup>The French businessman was apprehended in a U.S. airport in April 2013 on charges of making illegal payments to the former Guinean president and transferring these payments into the United States.

<sup>10</sup>The Kyrgyz government also nationalized a Latvian bank in 2010 after it had been accused of money laundering on behalf of relatives of the former president.

<sup>11</sup>These cases include the seizure of a Canadian company's mining concessions in 2012 and a Swiss mining affiliate in 2007 amidst claims that the concessions were fraudulently obtained and that the current government was simply putting things right.

<sup>12</sup>The owners purchased the subsidiary Venoco shortly after the brief coup and imprisonment of the Venezuelan president, in which the company's chief executive member is alleged to have played a lead role.

wide over 1990–2014, and estimate the impact of corruption and the strength of contract enforcement on the likelihood of expropriation. Following Kobrin (1984), we measure an act of expropriation as the forced transfer of FDI assets in a given industry (3-digit SIC category) and in a given year. The data are collected by systematically scanning a wide range of international mainstream media outlets and published investment treaty arbitration claims and checking the details against a number of criteria.<sup>13</sup> To capture the impacts of government corruption and foreign investor protections, we adopt the index measures of corruption and foreign investor contract enforcement published by the PRS Group's International Country Risk Guide (ICRG) and commonly considered in the empirical literature on political risk and foreign investment.<sup>14</sup>

Global expropriations of FDI over 1990–2014 are depicted in Figure 1, broken down by sector. A total of 162 expropriation acts occurred across 44 countries during this period, with a relatively large share of takings in resource-based industries (44 per cent), the bulk of these occurring in mining and petroleum.<sup>15</sup> A substantial proportion of takings has also been in public utilities (11 per cent). The figure shows that expropriation had been on the rise between 1990 and 2010, but since 2011 the frequency of takings has declined. (It should be noted that Venezuela alone accounts for almost 25 per cent of acts during this period, but these dynamic and sectoral patterns look very similar when Venezuela is excluded.)

The broad set of factors accounting for the global dynamic and sectoral expropriation patterns is beyond the scope of the present paper; sectoral characteristics relating to the timing of expropriation are examined in Opp (2012) and Hajzler (2014), whereas national and international politico-economic pressures have been studied in Li (2009); Asiedu, Jin, and Nandwa (2009); Chang, Hevia, and Loayza (2010); Koivumaeki (2015); and Tomz and Wright (2010), among others. (See also Guriev, Kolotilin, and Sonin, 2011; Engel and Fischer, 2010; Mahdavi, 2014 for analysis of political and economic factors related

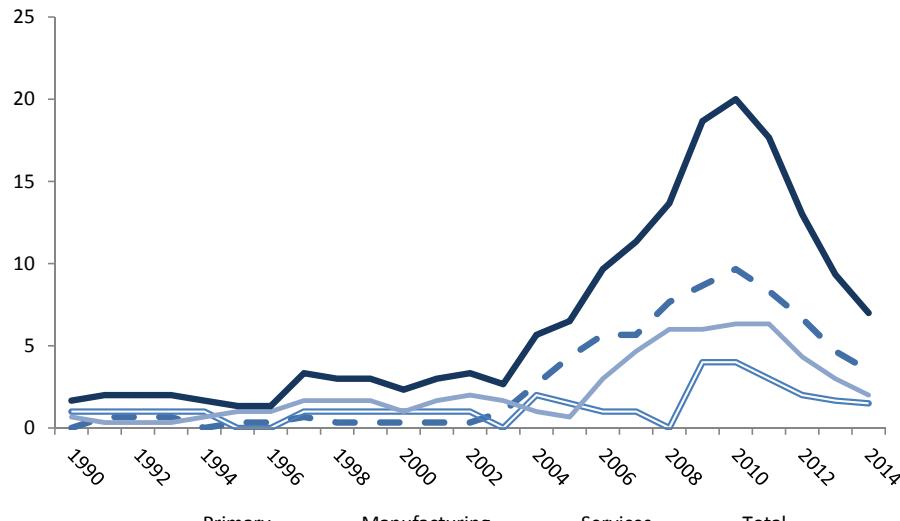
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<sup>13</sup>These data update and extend those assembled by Hajzler (2012) for the 1990–2006 period to cover 2007–2014. Definitions, data collection and coding follow the methodology of Kobrin (1984), who produced the original dataset on expropriations in all developing and emerging markets over the 1960–1979 period. Arguably a more ideal measure of expropriation intensity would be based on the value of assets seized. However, this company information is often confidential or difficult to obtain, whereas the frequency-based measure used here is conducive to obtaining more complete global coverage of all expropriation. Owing to the growing use of investment dispute resolution through international arbitration claims, Hajzler (2012) is able to draw on available investor claim information to compare sectoral and time patterns based on both the reported assets seized and the frequency of acts, and finds that observed patterns are broadly the same. (A detailed discussion of the advantages of this expropriation measure and the comprehensiveness of country coverage can be found in Kobrin, 1984; Hajzler, 2012.)

<sup>14</sup>See, for example, Aguiar, Amador, and Gopinath (2009), Asiedu and Lien (2011), and Li and Resnick (2003) who consider the ICRG's contract enforcement, and Arezki and Brückner (2011), Fratzscher and Imbs (2009), Hakkala, Norbäck, and Svaleryd (2008), Svensson (2005), and Wei (2000) who consider the effects of ICRG's government corruption. A description of each indicator is available on the PRS website: <http://www.prsgroup.com/wp-content/uploads/2012/11/icrgmethodology.pdf>.

<sup>15</sup>Of these, a total of 116 expropriation acts have been documented in our 2007–2014 update. Although there has been a sharp increase in expropriations since 1990, the frequency of takings remains low compared with their peak in the late 1960s and early 1970s. (See Kobrin, 1984, for a comparison.)

Figure 1: Expropriation acts by sector, 1990–2014



Source: Hajzler (2012) and authors' estimates

to the timing of expropriation in mining and petroleum in particular.<sup>16</sup> However, two observations are worth emphasizing here. First, the relative frequency of takings in resource extraction and utilities industries exceeds the industry shares in developing-country GDP. These are also industries where government officials typically have a more active role in allocating concessions and negotiating the terms of foreign investor contracts, and where opportunities for soliciting bribes are expected to be relatively high. Arezki and Brückner (2011) and Arezki and Gylfason (2013), for example, present evidence that the extent of government corruption in a country is positively associated with the level of resource rents, controlling for a host of other determinants of corruption.<sup>17</sup> Second, the time path of expropriations, particularly in natural resource sectors, broadly tracks global fluctuations in mineral and energy prices, as has been previously documented in related literature (Duncan, 2005; Guriev, Kolotilin, and Sonin, 2011; Hajzler, 2012; Mahdavi, 2014).<sup>18</sup> This suggests that expropriation is driven, at least in part, by an opportunistic

<sup>16</sup>Examining global oil sector nationalizations over the past century, Mahdavi (2014) also considers a number of external factors influencing contract enforcement, including reliance on exports (which makes an expropriating country more vulnerable to foreign retaliation) and spillover effects from expropriating neighbors (capturing the notion that the capacity for foreign retaliation is limited, and less likely when many nations expropriate).

<sup>17</sup>O'Higgins (2006, p.242) also observes that theft tends to be easiest in resource extraction because contracts are often less transparent to the public and corrupt deals are more difficult to detect. Ades and Di Tella (1999) argue that corruption in the form of wasteful government spending increases when revenues from resource extraction are also above average.

<sup>18</sup>Higher risk of expropriation associated with the prevalence of sunk costs in resources and mineral price volatility is also discussed in Nellor (1987), Monaldi (2001), Engel and Fischer (2010).

Table 1: Comparison of political risk and FDI in developing economies (1990–2014)

	Expropriating Countries			Non-expropriating Countries		
	Average	Min	Max	Average	Min	Max
Investment risk index	5.36	0.68	11.38	5.21	0.50	10.83
Corruption index	3.65	1.00	6.00	3.67	1.00	5.27
Log FDI stock per capita	5.81	0	9.58	5.21	0	10.83
Log income per capita	8.54	6.13	10.28	8.21	6.14	10.46
Countries	44		92			

Sources: Corruption and Investment Risk are calculated from the PRS Group's ICRG indexes, which are measured on 0-6 and 0-12 point scales, respectively. For clarity, values for (6 - *Corruption Absent*) and (12 - *Investment Profile*) are presented. Inward FDI stocks per capita are expressed in (logged) constant 2005 U.S. dollars and obtained from UNCTAD, while income per capita is in constant PPP dollars from the World Bank.

motive related to the value of investor assets.

Table 1 contains summary statistics relating to income, FDI, and the ICRG country risk scores among developing countries that have expropriated during the sample period and those that have not. Investment risk is calculated from the ICRG Investment Profile index (reported on a 12-point scale), which measures the strength of contract enforcement, the ability to repatriate profits, and the absence of payment delays. The ICRG corruption index aims to mainly capture high-level government corruption, including nepotism in government, “favor-for-favors,” secret party funding, suspiciously close ties between politics and business, and excessive patronage, which aligns well with the type of illicit activity we focus on in this paper.<sup>19</sup> The ICRG measures corruption on a 6-point scale, with higher values indicating lower corruption. For clarity, we recalculate corruption as 6 minus the index value.

A comparison of simple means reveals that expropriating countries exhibit slightly lower security of contracts, as captured by the higher average investment risk rating. However, there is little evidence that recently expropriating countries are perceived as being more corrupt on average. Expropriating countries have higher average stocks of FDI, which is perhaps not too surprising given that countries with more FDI have more to potentially expropriate.<sup>20</sup> Interestingly, a comparison of income per capita (in constant international dollars) reveals that expropriating countries are slightly richer on average, which may reflect the higher FDI. However, the differences in means appear rather small given the within-group variation. Moreover, other determinants of expropriation may

<sup>19</sup>Costs associated with corruption at low levels of public service such as special payments and bribes connected with import and export licences, filing taxes, police protection, or loans are factored in to the overall ratings but receive a comparatively small weight.

<sup>20</sup>Data are from UNCTAD and converted to constant dollar terms: <http://unctad.org/en/Pages/DIAE/FDI\%20Statistics/Interactive-database.aspx>.

be correlated with corruption and investment risk, potentially clouding the underlying relationships of interest. To adequately control for these and other determinants of expropriation, we estimate a multivariate statistical model. Importantly, the statistical model allows us to explicitly consider key interactions between foreign investment contract enforcement and corruption that are implied by our theory.

We regress expropriation acts on both political risk measures and a number of controls using a negative binomial model with random effects using data averaged over five-year periods ( $t = \{1990-94, 1995-99, 2000-04, 2005-09, 2010-14\}$ ).<sup>21</sup> Specifically, we estimate

$$Y_{i,t} = \beta_0 + \tau_t + \beta_1 Risk_{i,t} + \beta_2 Corrupt_{i,t} + \beta_3 FDI_{i,t-1} + \beta_4 Risk_{it} \times Corrupt_{i,t} \\ + \gamma \mathbf{X}_{i,t} + \epsilon_{i,t},$$

where  $Y_{it}$  is the number of expropriation acts in country  $i$  and period  $t$ ,  $Risk$  and  $Corrupt$  are the investment risk and government corruption indicators calculated from the ICRG indexes,  $FDI$  is the stock of FDI per capita in constant dollars, and  $\tau_t$  is a time dummy.  $\mathbf{X}$  is a vector of additional controls: log per capita income (measured in purchasing-power parity and capturing a country's relative level of development) and its squared term, a democratic accountability index, and exports as a share of GDP.<sup>22</sup>

We include the interaction between investment risk and corruption because we hypothesize that, while weak enforcement of foreign investor contracts is a necessary contributor to a country's expropriation propensity, the prevalence of corrupt deals is a catalyzing factor. The time dummy controls for exogenous time-varying factors not explicitly modelled, such as global commodity price and asset value movements, as well as global macroeconomic and financial conditions, which potentially influence the temptation to expropriation in all countries. We include lagged FDI stocks in the model because countries with little or no FDI likely have little to expropriate even at high levels of investor risk and corruption. Finally, the level of development and democratic accountability capture a host of other aspects of institutional quality that influence a country's propensity to expropriate, and which may also be correlated with FDI and our political risk measures. Export dependence relates to external contract enforcement; countries more reliant on international trade are more likely to weigh the benefits of expropriation against the threat of damaging diplomatic and trade ties with the governments of the original owners of the expropriated assets.<sup>23</sup>

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<sup>21</sup>We average the data over five-year intervals both because political risk measures evolve gradually over time and because large expropriation events involving the takeover of multiple companies often occur gradually with expropriation acts spanning multiple years.

<sup>22</sup>Data used to measure the control variables are from the World Bank's World Development Indicators, except for Democratic Accountability, which is from the ICRG.

<sup>23</sup>A recent example of the use of trade sanctions in this context is Argentina's expropriation of assets belonging to Spain's largest oil company, Repsol, in 2012. Following the decision, the Spanish government said it would restrict imports of fuel from Argentina, and the European parliament called for the suspension of Argentina's tariff concessions under the generalized system of preferences.

CORRUPTION, FDI AND EXPROPRIATION

Table 2: Effects of corruption on expropriation  
(1990-2014)

Dependent Variable		(1)	(2)	(3)
<i># of Expropriation Acts</i>				
<i>Investment Risk</i>	0.341** (0.103)	-0.570 (0.360)	-0.720+ (0.387)	
<i>Corruption</i>	-0.199 (0.251)	-1.550** (0.549)	-1.760** (0.578)	
<i>FDI Stock (t - 1)</i>	0.351** (0.125)	0.332* (0.130)	0.153 (0.140)	
<i>Corruption</i> × <i>Risk</i>		0.217** (0.082)	0.276** (0.088)	
<i>Democratic</i>			0.038 (0.138)	
<i>Export Share</i>			0.000 (0.014)	
<i>ln(Income)</i>			-0.916 (3.412)	
<i>ln(Income)</i> <sup>2</sup>			0.088 (0.206)	
<i>Constant</i>	-4.873** (1.245)	0.892 (2.434)	3.403 (14.37)	
N	435	435	406	
Countries	89	89	85	
Year Dummies	Yes	Yes	Yes	
$\chi^2$	39.53	43.86	58.55	

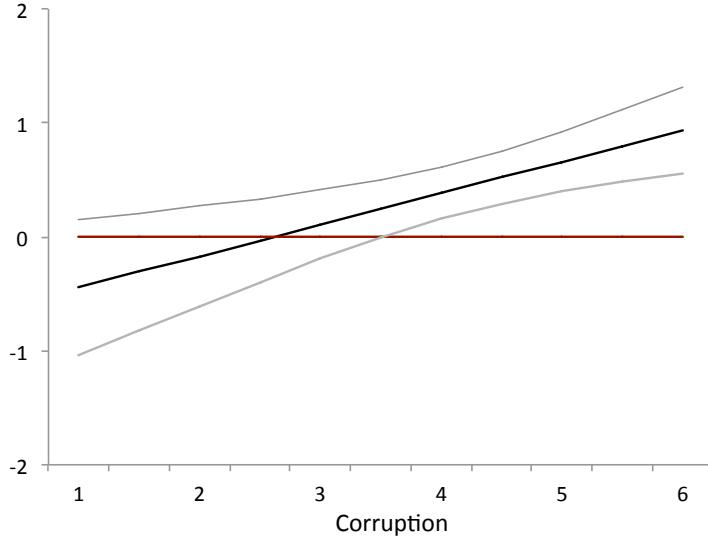
Standard errors in parentheses. \*\* p<0.01, \* p<0.05, + p<0.1

Given that our dependent variable is a count variable, with most countries having fewer than five expropriation acts over our sample period, a negative binomial specification is appropriate. (We also check the robustness of all of our estimates in the presence of country fixed effects and in the context of OLS regressions, and do not find any differences in the signs or statistical significance of the estimates.)<sup>24</sup> We first present the results from a baseline model based on investor risk, corruption, and FDI stocks per capita (without additional controls) and report the model estimates and standard errors in the first

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<sup>24</sup>These results are available from the authors upon request. However, we limit our discussion to the estimates from the negative binomial random-effects model for a number of reasons. For each set of estimates, a Hausman test does not reject the hypothesis that the random effects are uncorrelated with the other regressors. Moreover, in a fixed-effects model with a count-dependent variable, countries characterized by expropriation acts that are constant over time (most often these are countries with zero acts over the entire period) are dropped from the analysis, and estimates based solely on observations with time-varying expropriation patterns are likely to be imprecise. Finally, given that the dependent variable is truncated at zero with a large proportion of zero observations, our data violate the OLS distributional assumptions.

Figure 2: Marginal effects of investment risk on expropriation at different levels of corruption



Black Line:  $\hat{\beta}_1 + \hat{\beta}_4 \text{Corrupt}$  based on Model (3). Gray Lines: 95 per cent confidence intervals.

column of Table 2. These results reaffirm the conclusions drawn from examining Table 1. On their own, investment risk and lagged FDI stocks are positively correlated with expropriation events, but expropriating countries are not, on average, more corrupt. However, the prevalence of corruption potentially amplifies existing weaknesses in investor contract enforcement mechanisms. To test this hypothesis, we re-estimate the model interacting investment risk with corruption, and report the estimates in the second column of the table (Model (2)). The results support this hypothesis: we find a statistically significant positive relationship between corruption and expropriation when interacted with investor risk. Moreover, we find little evidence that investment risk has any effect on expropriation in countries at the lowest level of the corruption scale. In Model (3), we add the additional control variables. The relationships between the political risk variables and the likelihood of expropriation are the same as in Model (2), except that the effect of investment risk becomes negative for countries at the low end of the corruption scale (but it is only marginally significant at the 10 per cent level).

The interaction between investment risk and corruption is summarized in Figure 2, which plots the estimated marginal effects (and associated 95 per cent confidence interval) of investment risk at varying levels of corruption, evaluated at the sample means of the remaining explanatory variables. At levels of corruption below 3.5, which corresponds to the sample mean, the correlation between investor property protection and the likelihood of expropriation is insignificant at conventional levels of confidence. Only for above-average corruption levels, by contrast, is the increase in a country's level of investment

risk positively and significantly related to its propensity to expropriate.

Taken together, the anecdotal and statistical evidence suggests an important role for past transgressions by corrupt officials in accounting for observed expropriation patterns. This finding motivates the theoretical model developed in the next section. It should be noted, however, that these estimated relationships are also consistent with the extortion theory of Koessler and Lambert-Mogiliansky (2014). Both mechanisms are potentially at work in the underlying data, and the insights from this analysis should be viewed as complementary to theirs.

We model the optimal, self-enforcing “official” contract between the investor and the host country where, owing to lack of transparency, contracting parties may secretly violate the official terms of this contract. Consistent with our empirical findings, the model predicts that expropriation occurs as a result of government corruption (i.e., when contract transparency is low and the incidence of illicit deals is sufficiently likely) when the threat of expropriation is binding. The model also predicts that opportunities for corrupt officials to make illicit deals depend positively on the degree of exogenous investment risk. This moves the official contract away from the unconstrained optimum and increases the likelihood of expropriation, reinforcing the positive interaction between investment risk and corruption observed in the data.

### 3 Theoretical Model

#### 3.1 Basic Environment

The basic environment consists of a large number of foreign investors that compete for the exclusive right to operate a single project in a small open economy. The host country is unable to finance the project itself.<sup>25</sup> For simplicity, it is assumed that there is no foreign borrowing, so all capital inflows take the form of FDI.<sup>26</sup> An investor that is successful in its bid for the project incurs an initial start-up cost of  $I_0 > 0$ , and receives the value of output from time  $t = 0$  onward resulting from capital investment  $k_t \geq 0$  made at the beginning of each period, equal to  $pf(k_t)$ , where we assume

$$f'(k_t) > 0, \quad f''(k_t) < 0, \quad f(0) = 0, \quad \text{and} \quad \lim_{k_t \rightarrow 0} f'(k_t) = \infty.$$

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<sup>25</sup>This could be because the host country lacks the required capital or the technological knowledge necessary to carry out the project independent of the foreign investor. Even if technology is the main contribution of the foreign investor, we assume that the host country is sufficiently cash constrained that it is unable to transfer the value of investment upfront as collateral in case the investor’s assets are expropriated.

<sup>26</sup>Albuquerque (2003) considers both FDI and foreign borrowing in an imperfect contract enforcement environment, where the value of borrowed capital can be fully appropriated whenever default occurs but only a fraction of the value of FDI can be appropriated. In our model, if it is relatively costly for the host country to appropriate FDI due to the specificity of knowledge involved, foreign investment is a superior form of capital inflows in the presence of expropriation risk, which provides one justification for abstracting from other types of inflows.

Output is tradable and  $p$  represents the exogenous world price. For simplicity, we assume that capital fully depreciates at the end of each period. Finally, we assume that there exists a  $k^*$  satisfying  $pf'(k^*) = 1$ . In addition to the capital invested in each period, which is specified under a contract with the host-country government, the investor is responsible for making any specified transfers  $\tau_t \geq 0$  to the government at the end of each period.

Investment is risky. In any period, once the investor invests and output is produced, the public may not be able to commit to honoring the terms of the contract. Specifically, the public may demand that the government expropriate the entire value of output and forgo the contracted transfers. Following Aguiar, Amador, and Gopinath (2009); Cole and English (1991); Thomas and Worrall (1994) and others, exogenous variation in the temptation to expropriate is captured by the country's discount factor. This captures the degree to which the host-country governments and/or electorate are forward-looking, as well as institutional determinants of contract enforcement. We also follow this literature by assuming that, if the contract is changed in a way that leaves the investor worse off than under the originally agreed terms (including expropriation), the investors punish the host country by cutting off all future investment.<sup>27</sup>

Taking into consideration its inability to commit to not expropriating, the public chooses the dynamic foreign investment contract that maximizes the discounted expected host-country income generated from the project.<sup>28</sup> Although the full terms of this contract are common knowledge to the investors, government officials, and the public, we assume that capital investments and output from the project are unobserved by the public. Instead, the government in each period sends a message  $m_t \in \mathcal{M} \subset \mathbb{R}^+$  to the public (which may or may not be credible) concerning the level of investment. However, we assume that the public observes when the contracted transfer payments are received (or not received) into the public funds.

The government manages the foreign investment contract, monitoring investments and collecting transfers, and can be one of two types—honest or corrupt—where types differ according to their objective function. While the investor knows the government's type at each date  $t$ , we assume that the public does not. The objective function of the honest type is aligned with that of the public, ensuring that the contract desired by the general public is implemented, does not appropriate any of the transfers under the contract, and always truthfully reports the level of investment each period. The corrupt type, in contrast, only cares about the amount of side payments it can secretly appropriate by deviating from the optimal contract and does not necessarily provide truthful reports on investment. We assume that an incumbent government may be replaced randomly in any given period by a new government of either type and, in addition, that the public may in-

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<sup>27</sup>As discussed in Thomas and Worrall (1994), the model results do not depend qualitatively on this assumption of a maximum punishment trigger-strategy, but simplify the analysis. What is essential in the absence of any direct punishment or enforcement mechanism is that there is a credible threat to not invest for some minimum length of time.

<sup>28</sup>Alternatively, we can view the contract as being chosen by an initial-period elected government according to the public's preferences.

state a new government whenever it is revealed that the incumbent is a corrupt type. If the incumbent government is replaced, it is no longer involved in managing the resource contract and a new government takes over, having the same exogenous probability of being corrupt as the one before it. Note that, because the honest government type only implements the contract chosen by the public and reports the truth, the strategic agents in the model consist of the foreign investor, the public/electorate, and the corrupt government official.

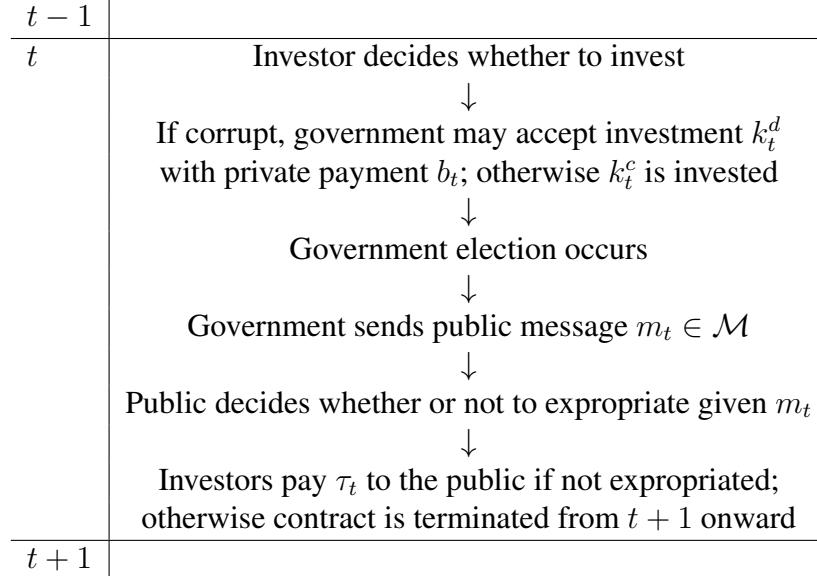
In this environment, government corruption takes the form of receiving side-payments  $b_t > 0$  from the investor, which arise from deviations in investment from the level specified under the optimal contract. We assume that corrupt governments do not have the same incentive as the public to expropriate foreign investment because they are unable to appropriate any part of an expropriated project. (Expropriations are assumed to be highly visible events, constraining the ability of corrupt officials to steal any part of expropriated assets.) Because the investments are not directly observed by the public, violations of the optimal contract yield potential rents to the parties engaged in the corrupt deals. We will show that such rents are increasing in the public's temptation to expropriate (i.e., the extent to which the public discounts the future).

The timing of the model is as follows: Once an initial contract is offered by the government to an investor, the investor obtains an exclusive right to the project and agrees to make a sequence of capital investments, as well as public transfers to the host country, conditional on not being expropriated. At the beginning of each period, the incumbent government may be of either type. A corrupt government may agree to a level of investment  $k_t^d$  that exceeds the contract level  $k_t^c$ . If  $k_t = k_t^d$ , a side payment  $b_t$  is paid by the firm to the government. If, instead, the government is an honest type or if  $k_t^d$  is rejected by the corrupt type,  $k_t = k_t^c$ . Before the production process is complete, an election takes place and the incumbent government is potentially replaced by a new government (its type also unknown to the public). The government (incumbent or new) observes investment and sends a message to the public:  $m_t \in \mathcal{M} \subset \mathbb{R}^+$ . Output is produced, and the public demands that the government either expropriate the full value of output or collect the contracted transfers  $\tau_t$  from the investor and continue to the next period of the contract. This timing within each period is summarized in Figure 3.

### 3.2 Public Returns

A contract is a sequence of investment levels and transfers from the investor in the form of public revenues (conditional on not being expropriated),  $\theta = \{k_t^c, \tau_t\}_{t=0}^\infty$ , given that the firm has incurred the initial start-up cost  $I_0$ . We denote the discounted expected payoff to the host-country public from remaining in a contract with the foreign investor from period  $t$  onward by  $V_t^c$ , and the corresponding contracted discounted profits to the investor as  $W_t^c$ . If expropriation occurs in any period  $t$ , the investor cuts off all future investments, and there is no public gain to seizing only part of the value of assets in that period. Therefore, when expropriation occurs, the entire value of output is seized. The

Figure 3: Model Timing



host-country payoff from expropriating all output that is expected by the public, who do not observe investment directly but form expectations based on the messages they receive, is  $V_t^e(m_t) = E_t[pf(k_t)|m_t]$ . (This value may or may not be equal to the actual value of expropriation, which is known to the government, depending on whether the message  $m_t$  is credible.)

We assume that investors, host-country governments, and the public are risk neutral and discount future returns at the same rate  $\beta \in (0, 1)$ . Suppose for the moment that, under the optimal contract, expropriation occurs whenever deemed beneficial by the public, regardless of the government's type. (We will show that this assumption is consistent with equilibrium strategies of the agents.) The recursive formulation of the public's *ex post* expected payoff under the contract, after having received message  $m_t$  from the government, is

$$V_t(m_t) = \max \{ \tau_t + \beta E_t[V_{t+1}(m_{t+1})|m_t], V_t^e(m_t) \}, \quad (1)$$

where expropriation does not occur provided

$$\tau_t + \beta E_t[V_{t+1}(m_{t+1})|m_t] \geq V_t^e(m_t). \quad (2)$$

We are interested in the optimal contract between the firm and host country that maximizes expected public utility from the beginning of each period  $t$ ,  $V_t^c = E_t[V_t(m_t)]$ , conditional on not having expropriated and terminated the contract in the past. Although an honest-type government implements the contract, the optimal contract must take into account the potential contract violations that may be carried out by a corrupt type.

We can express  $V_t^c$  more compactly by defining the set of government reports  $\mathcal{D}^t(\theta) \subset \mathcal{M}$  (possibly empty) in a given period  $t$  for which the public believes with certainty that

Condition (2) is violated:

$$\mathcal{D}^t(\theta) = \{m_t \in \mathcal{M} \mid \tau_t + \beta E_t[V_{t+1}(m_{t+1})|m_t] < V_t^e(m_t)\}.$$

We use  $\rho_t(\theta)$  to denote the public's belief at the beginning of period  $t$  about the likelihood that they will receive a report  $m_t \in \mathcal{D}^t(\theta)$ . Thus, the *ex ante* expected payoff in period  $t$  to the public from the contract  $\theta$ , given that expropriation has not occurred in any previous period, can be defined recursively as

$$V_t^c = \sup_{\theta} (1 - \rho_t)(\tau_t + \beta V_{t+1}^c) + \rho_t E_t[V_t^e(m_t)|m_t \in \mathcal{D}^t], \quad (3)$$

where the notation signifying the dependence of  $\rho_t$  and  $\mathcal{D}^t$  on  $\theta$  has been suppressed for brevity. We are interested in the characteristics of an official (or "honest") contract that maximizes (3) that is feasible and satisfies the participation constraint of the investor, subject to the probability of expropriation given  $\rho_t$ . The official contract is feasible if

$$\tau_t \geq 0 \quad (4)$$

and

$$pf(k_t^c) - \tau_t \geq 0 \quad (5)$$

for all  $t$ . The firm is willing to participate in the official contract, provided it offers expected discounted profits at least equal to the initial start-up cost  $I_0$ .

According to the following lemma, under such a contract there would be no expropriation whenever the public receives a report that the contracted amount is invested. This implies that, if  $\theta$  is an optimal contract,  $k_t^c \notin \mathcal{D}^t(\theta)$  for any  $t$ .

**Lemma 3.1.** *Under the optimal contract  $\{k_t^c, \tau_t\}_{t=0}^\infty$ , in any  $t$  such that  $m_t = k_t^c$ , Condition (2) is satisfied.*

*Proof.* Consider the case where  $k_t = k_t^c$ . By definition, an honest type always ensures the contracted amount of investment and reports investment truthfully. Suppose that, having received the report  $m_t = k_t^c$ , expropriation was optimal under the contract. Then, for some report  $m_t \neq k_t^c$ , expropriation is not optimal; otherwise the investor would not be willing to invest in period  $t$ . Since  $k_t^c$  is invested, such a report must originate from a corrupt type, implying that the investor would only ever be willing to invest  $k_t = k_t^c$  under a corrupt regime. But then  $k_t^c$  would not be optimal under the contract.  $\square$

The next section outlines the expected returns of the foreign investor engaged in an official contract with the public when the investor may also engage in corrupt contracts that are not directly observable. Consistency conditions for the recursive formulation of the contract (or "promise-keeping" constraints) are then established in sections 3.4 and 4, which characterize the optimal contract when the government type is constant and when there is stochastic type renewal, respectively.

### 3.3 Investor Returns and Corrupt Contracts

In characterizing the optimal contract, it is useful to begin by considering the optimal responses of the firm under a corrupt regime to a given contract  $\theta$ . Discounted investor profits can be expressed recursively as

$$W_t = \sup_{\{k_t, b_t\}_{t=0}^{\infty}} -k_t - b_t + (1 - \rho_t)(pf(k_t) - \tau_t + \beta E_t W_{t+1}).$$

If the government is an honest type in period  $t$ , the investor and government are committed to the transfers and investment levels set out in the contract. If the government is a corrupt type, however, it may be profitable for the investor and government to violate the contract terms by investing  $k_t^d > k_t^c$  if  $k_t^c$  is below the unconstrained efficient level  $k^*$ . We define total rents from investing  $k_t^d$  given  $k_t^c$  as the difference in expected profits that can be shared between the investor and corrupt government by not honoring  $k_t^c$  (but still making the contracted transfers to the public):

$$R(k_t|k_t^c) = (1 - \rho_t)pf(k_t) - pf(k_t^c) - (k_t - k_t^c) - \rho_t \beta E_t W_{t+1}. \quad (6)$$

The following lemma establishes that, whenever under a corrupt regime the investor's optimal response to a contract is to invest the contracted amount, there is no expropriation risk and  $R(k_t|k_t^c) = 0$ . This implies that any violation of the contract terms must offer strictly positive rents.

**Lemma 3.2.**  $R(k_t|k_t^c) = b_t = \rho_t = 0$  whenever  $k_t = k_t^c$  is an optimal response to a contract  $\theta$ .

*Proof.* If, given the official contract, the optimal response under a corrupt regime is to invest the contracted amount  $k_t^c$ , the public would always expect  $k_t = k_t^c$ . From Lemma 3.1, expropriation therefore cannot occur in period  $t$ , implying  $\rho_t = 0$ . Therefore  $R(k_t^c|k_t^c) = 0$  and  $b_t = 0$ .  $\square$

Next, consider a potential profitable violation of the official contract such that  $\rho_t$  is independent of  $k_t$  for any level strictly above  $k_t^c$ . (In Sections 3.4 and 4, this will be the relevant case to consider.) Clearly, if  $k_t^c \geq k^*$ ,  $R(k_t|k_t^c) < 0$  whenever  $k_t > k_t^c$ , there is no incentive to violate the contract. Then, if  $k_t^c < k^*$ , given that violation of the contract is profitable, optimal investment  $k_t^d$  maximizes period-by-period rents:

$$(1 - \rho_t)pf'(\tilde{k}_t) = 1. \quad (7)$$

If  $R(\tilde{k}_t|k_t^c) > 0$ , then  $k_t^d = \tilde{k}_t > k_t^c$ ; otherwise  $k_t^d = k_t^c$ . This results in a sequence  $\{k_t^d\}_{t=0}^{\infty}$  for a given contract and a given sequence  $\{\rho_t\}_{t=0}^{\infty}$  representing realized investment in every period that an expropriation has not previously occurred. The side payments  $\{b_t\}_{t=0}^{\infty}$  reflect the division of these rents between the corrupt government and the investor. In the ensuing analysis, any division of rents (if they are positive), including the Nash bargaining solution, is allowed provided  $b_t > 0$ .

The optimal contract maximizes public utility, taking as given this optimal response of the investor under corrupt regimes. We first consider the optimal contract in the simplest possible environment with no political turnover and constant government types. In this environment, government reports about the level of investment are not informative and, if a non-trivial contract exists, it is self-enforcing. We then extend the analysis to include political turnover with stochastic type renewal and show that expropriation can occur in equilibrium as a result of corrupt contract violations.

### 3.4 Optimal Contract With Constant Government Type

We consider the optimal contract in an environment with no political turnover, where the type of government is constant throughout the contract but initially unknown to the public. We restrict our attention to the interesting case where the unconstrained efficient level of investment in all periods is unattainable owing to the public's temptation to expropriate. We proceed by characterizing the optimal contract under the assumption that the government, regardless of its type and the actual investment level, always reports  $m_t = k_t^c$ , rendering the messages uninformative, and then demonstrate that, in fact,  $m_t = k_t^c$  for all  $t$  is an equilibrium. This, along with Lemma 3.1, implies that expropriation never occurs under a constant government type. We find that the dynamics of the optimal contract are qualitatively similar to the optimal contract studied by Thomas and Worrall (1994). However, we also find that the mere possibility of corrupt contracts results in lower contracted investments, particularly at the early stages of the contract, and a lower discounted stream of transfers to the public.

Suppose that the government is a corrupt type with probability  $\delta$  and an honest type with probability  $1 - \delta$ . Assuming that  $m_t = k_t^c$  for any level of actual investment, then

$$\bar{V}_t^e = V_t^e(k_t^c) = \delta p f(k_t^d) + (1 - \delta) p f(k_t^c),$$

where  $k_t^d$  is defined in Section 3.3 and is fully anticipated by the public, given  $k_t^c$ . The following lemma establishes the amount of capital that is invested when the government type is corrupt,  $k_t^d$ , as well as the implied constraints on the optimal contract taking  $k_t^d$  as given.

**Lemma 3.3.** *If government types are constant,  $\rho_t = 0$  for all  $t$  and a corrupt government chooses  $k_t = k_t^d = k^*$  given any  $k_t^c$ . Moreover, the optimal contract satisfies*

$$\tau_t + \beta V_{t+1}^c \geq \delta p f(k^*) + (1 - \delta) p f(k_t^c) \quad (8)$$

for all  $t$ , taking  $k_t^d = k^*$  as given.

*Proof.* Consider a period under the contract where  $k_t^c < k^*$  and suppose that  $k_t^d = \tilde{k}_t > k_t^c$ , where  $\tilde{k}_t$  is implicitly defined by (7) given  $\rho_t$ . Since both government types report  $m_t = k_t^c$ , Condition (2) is satisfied, implying that  $\rho_t = 0$  and hence  $k_t^d = k^*$ . Then

$k_t^c$  is constrained to satisfy (8), where the left hand equals  $\bar{V}_t^e$  and  $V_{t+1}^c$  is simply the continuation value of the contract given  $m_t = k_t^c \notin \mathcal{D}^t$  (see Lemma 3.1).  $\square$

With  $\rho_t = 0$  and  $k_t^d = k^*$  for all corrupt types taken as given by the public, Lemma 3.3 implies that the optimal contract solves

$$V_t^c = \sup_{\theta} \quad \tau_t + \beta V_{t+1}^c,$$

subject to Condition (8) as well as feasibility conditions, the investor's participation constraint, and a promise-keeping constraint. The latter enables us to solve the dynamic problem using the recursive definitions given above while treating the continuation profits of the investor under the contract,  $W_{t+1}^c$ , as a state variable, where

$$W_t^c = \sum_{s=t}^{\infty} \beta^{s-t} (pf(k_s^c) - k_s^c - \tau_s) = pf(k_t^c) - k_t^c - \tau_t + \beta W_{t+1}^c.$$

That is, in addition to specifying investment and transfers, the contract can be considered a promise in time  $t$  of discounted future profits,  $W_{t+1}^c$ , such that

$$pf(k_t^c) - k_t^c - \tau_t + \beta W_{t+1}^c \geq W_t^c. \quad (9)$$

Finally, an investor is willing to participate in the contract under an honest government regime from any period  $t$  onward provided

$$W_{t+1}^c \geq 0 \quad (10)$$

and given initial condition

$$W_0^c \geq I_0. \quad (11)$$

Features of this dynamic programming problem are very similar to the problem considered in Thomas and Worrall (1994). In particular, owing to the dependence of the constraint set on the optimum value function itself, and because the concavity of  $f(\cdot)$  on the right hand side of (8) implies the constraint set is not convex, standard contraction mapping arguments cannot be used to establish a unique fixed point for the value function  $V_t^c = V^c(W_t)$ . However, the authors describe an iterative mapping procedure starting from the first-best Pareto frontier that converges to the optimum value function. Lemma 3.4 applies their result in the present context.

**Lemma 3.4.** *There exists a sequence  $\{L^n P^*\}_{n=0}^{\infty}$  defined by operator  $L : \mathcal{P} \rightarrow \mathcal{P}$ , where  $\mathcal{P}$  is the space of continuous, bounded, and concave functions on  $[0, \bar{W}]$  and  $\bar{W} = (pf(k^*) - k^*)/(1 - \beta)$  that converges pointwise to the optimum value function  $V^c(W)$ .*

*Proof.* See the Mathematical Appendix.  $\square$

Using multipliers  $\mu_t$ ,  $\varphi_t$ ,  $\phi_t$ ,  $\lambda_t$ , and  $\beta\zeta_t$  on constraints (4), (5), and (8)–(10), the

first-order conditions corresponding to the dynamic programming problem are

$$\tau_t : 1 - \varphi_t + \mu_t + \phi_t - \lambda_t = 0 \quad (12)$$

$$k_t^c : (\varphi_t + \lambda_t - \phi_t(1 - \delta))pf'(k_t^c) - \lambda_t = 0. \quad (13)$$

Moreover, fully differentiating with respect to  $V_{t+1}^c$  and  $W_{t+1}^c$ , we can summarize the Pareto frontier  $V^c(W_t^c)$ :

$$\frac{\partial V_{t+1}^c}{\partial W_{t+1}^c} = -\frac{\lambda_t + \zeta_t}{1 + \phi_t}. \quad (14)$$

Finally, we have the envelope condition

$$\frac{\partial V_t^c}{\partial W_t^c} = -\lambda_t. \quad (15)$$

Taken together, equations (14) and (15) summarize the dynamics of the contract as well as expected future payoffs for both the public and the investor. Before turning to the dynamics of the optimal contract, the following lemmas establish that the conditions above describe a global optimum and lay out some other features of the optimal contract that help simplify the analysis.

**Lemma 3.5.**  *$V^c(W_t^c)$  is concave, with strict concavity when  $V^c(W_t^c)$  does not correspond with the first-best Pareto frontier. Moreover,  $\partial V_t^c / \partial W_t^c \leq -1$ , and (5) never binds.*

*Proof.* See the Mathematical Appendix. □

Lemma 3.5 implies that  $\lambda_t \geq 1$  and  $\varphi_t = 0$  for all  $t$ . The following lemma implies that  $\phi_t > 0$  if and only if  $k_t^c$  is less than the unconstrained efficient level.

**Lemma 3.6.** *For any period  $t$  in which  $k_t^c < k^*$ , the optimal contract satisfies (8) with strict equality:  $\tau_t + \beta V_{t+1}^c = \bar{V}_t^e$ .*

*Proof.* Suppose, toward a contradiction, that for some period  $t$  we have both  $k_t^c < k^*$  and  $\tau_t + \beta V_{t+1}^c > \bar{V}_t^e$ . The latter implies that  $\phi_t = 0$  from complementary slackness and, since  $\varphi_t = 0$  and  $\lambda_t > 0$  from Lemma 3.5, (13) becomes  $pf'(k_t^c) = 1$ , which would imply  $k_t^c = k^*$ . □

The next proposition establishes that the dynamics of the optimal contract, which features a back-loading of transfers from the investor to the host country, and a gradual increase in contracted investment levels over time (which may or may not reach the unconstrained efficient level):

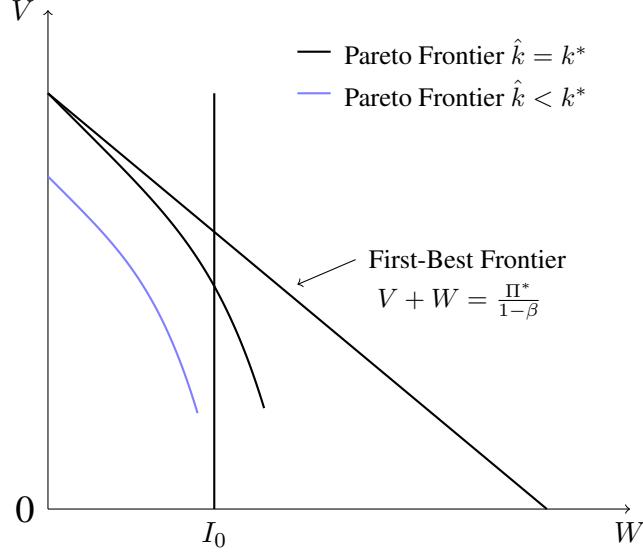
**Proposition 3.7.** *Under the optimal contract,  $k_t^c$  is increasing over time and  $\tau_t = 0$  until  $k_t^c$  reaches stationary value  $\hat{k} \leq k^*$ , after which transfers to the host country are positive.*

*Proof.* See the Mathematical Appendix. □

Assuming a contract characterized by the unconstrained efficient level of investment in all periods cannot be achieved, the optimal contract is structured to deliver the investor's minimum expected payoff from the project,  $W_0 = I_0$ , as quickly as possible without violating the expropriation constraint. This involves postponing transfers to the host country until  $I_0$  is recovered through investor profits. If, instead, the contract featured a positive transfer on some earlier date, lowering this transfer today (keeping the contracted investment stream constant) could be offset with an equal (discounted) increase in future transfers. This would satisfy today's expropriation constraint, allowing current period investment to remain the same. It would also satisfy promise-keeping, since a reduction in the investor's taxes today is offset by an equal (discounted) increase in future taxes (as all agents discount transfers at the same rate). Note that this otherwise neutral change in the timing of transfers relaxes the host-country expropriation constraint in every period up to the time that the offsetting transfer increases are received. But then higher investment is possible in every one of these future periods such that the expropriation constraint binds. Increasing investment in each of these periods also implies higher discounted transfers and host-country welfare (given the promise it has kept to the investor), and therefore higher investment today. Contracted investment, in turn, is set at the maximum level permissible in each period without inducing expropriation, given the scheduled transfers from the investor to the host country. Because these transfers do not appear until some date  $t^* - 1$ , the discounted payoff to the public arising from the contract at every date  $t < t^*$ ,  $V_t^c$ , increases at the rate  $\beta^{-1}$ . Since the expected value of output (given public beliefs) under the contract must not exceed the discounted expected value of transfers under the contract, the no-expropriation constraint defines the bounds on the rate at which contracted investment can increase.

Figure 4 illustrates the Pareto frontier when (i) the efficient level of investment along the first-best frontier is eventually reached ( $\hat{k} = k^*$ ), and (ii) the efficient level of investment cannot be supported as a stationary contract ( $\hat{k} < k^*$ ). In turn, the relative position of the Pareto Frontier depends on, in addition to the production technology, values of  $\beta$  and  $\delta$ . (These relationships are described below.) Because the optimal contract (if one exists) must offer a discounted payoff over the life of the contract at least equal to the investor's sunk investment, the position along the frontier where  $W_0 = I_0$  determines the discounted payoff to the host country, which reflects the levels of investment along the transition to the stationary contract as well as the duration of this transition. When  $I_0$  is large, a longer period of zero transfers is required for the investor to recoup the initial investment. All else equal, prolonging transfers lowers the discounted payoff to the host country, making it more tempting to expropriate for a given level of investment. As a result, contracted investment levels along the transition to the stationary contract are also lower, which further reduces the discounted payoff received by the host country.

In the event the government is an honest type, actual investment follows the constrained optimal investment path, and the host-country public receives the entire discounted value of transfers under the contract, less  $I_0$ . If, instead, the government is dishonest, the expected income from the project received by the public does not change, but

Figure 4: Existence of Contracts given  $I_0$ 

the realized investment path differs, with  $k_t = k^*$  for all  $t$ . This results in economic rents equal to the shaded region in Figure 5, which are shared between the foreign investor and the corrupt official.

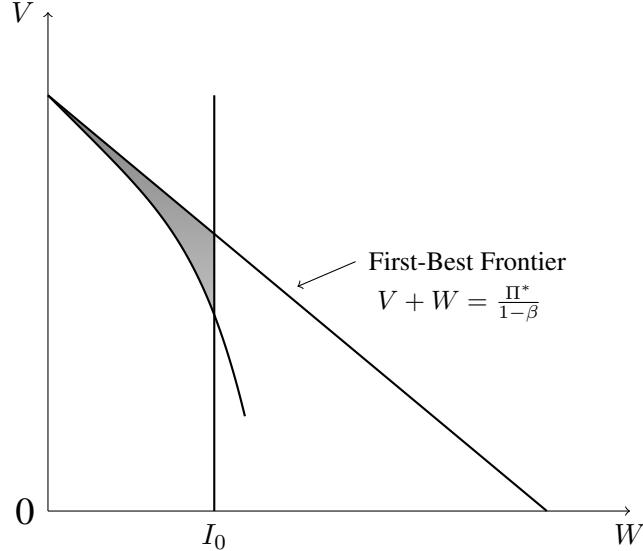
Whether or not a non-trivial optimal contract exists offering the investor  $I_0$  and positive expected return to the host country depends on parameters  $I_0$ ,  $\beta$ , and  $\delta$ . Proposition 3.7 demonstrates that a non-trivial optimal contract, if it exists, must converge to a stationary contract period with constant  $k_t^c = \hat{k} \leq k^*$ . Therefore the existence of a stationary contract period supporting  $\hat{k} > 0$  is a necessary, though not sufficient, condition for the existence of an optimal contract. Proposition 3.8 establishes necessary and sufficient conditions for a *stationary contract* period, which depends on parameters  $\beta$  and  $\delta$ . Having established the conditions for the existence of a stationary contract, we are able to identify necessary and sufficient conditions for an optimal contract with the features of Proposition 3.7, conditional on the existence of a stationary contract.

**Proposition 3.8.** *Given  $\delta \geq 0$  and  $I_0 > 0$ , there exists a continuous relationship  $\underline{\beta}(\delta)$  such that for any  $\beta \geq \underline{\beta}(\delta)$  a stationary contract exists but not otherwise. Moreover,  $\underline{\beta}(\delta)$  is strictly increasing in  $\delta$ , is bounded below at  $\underline{\beta}(0) = 0$ , and bounded above at  $\underline{\beta}(1) = \bar{\beta}$ , where  $\bar{\beta} \in (0, 1)$  is the threshold level of  $\beta$  such that  $\hat{k} = k^*$  if and only if  $\beta \geq \bar{\beta}$ .*

*Proof.* See the Mathematical Appendix. □

According to Proposition 3.8, a non-trivial optimal contract, if it exists, eventually attains the efficient level of investment for any probability that the government is a corrupt type if the rate of discounting is sufficiently low. Additionally, if the probability that

Figure 5: Potential rents from corruption

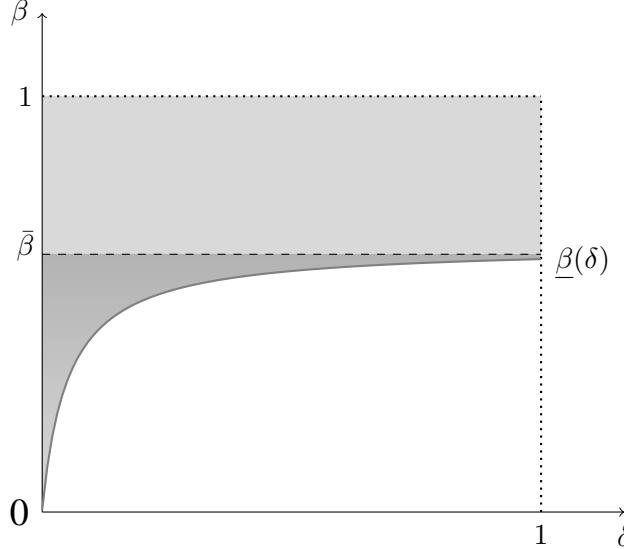


the government is a corrupt type is zero, our assumptions on  $f(\cdot)$  imply that a stationary contract exists for any discount factor. For higher levels of impatience and higher corruption levels, there is a monotonic trade-off between patience and the corruption level that describes the set of possible contracts: as corruption becomes more likely, a higher level of patience is required in order to support any stationary contract. Intuitively, as the rate of discount rises above a certain threshold, there is an increasing wedge between the level of contracted investment that can be supported in the stationary period of the contract and the efficient level, where the contracted stationary investment level is bounded by the expropriation constraint. Then, as the level of corruption rises, the public believes it is more likely that actual investment (under a corrupt type) is the efficient level, and this necessitates an even lower contracted investment level in order to satisfy the expropriation constraint. However, not all levels of investment can be supported in the stationary period of the contract. Even when the host country receives all profits from the contract, when impatience and/or the likelihood of a corrupt contract are sufficiently high, there is no contracted level of investment low enough to mitigate the temptation to expropriate.

The trade-off between the likelihood of a corrupt type and the discount factor,  $\beta(\delta)$ , is illustrated in Figure 6. In the shaded region above  $\underline{\beta}(\delta)$ , a stationary contract can be supported in equilibrium. For  $\beta \geq \bar{\beta}$  (the lightly shaded region), a stationary contract always exists, independent of the level of corruption. As agents become more impatient, however, a stationary contract exists if and only if the likelihood of corruption is sufficiently low (indicated here by the more darkly shaded region).

Given the existence of a stationary contract, there exists a non-trivial optimal contract that offers both the host country and the investor *some* positive return from date 0.

Figure 6: Existence of a stationary contract



However, since the investor requires at least promised payoff  $I_0$  in order to participate in the contract, the set of optimal contracts given  $I_0$  is only a subset of possible stationary contracts. We now examine how this subset of possible contracts is related to parameters  $\beta$  and  $\delta$  through  $I_0$ .

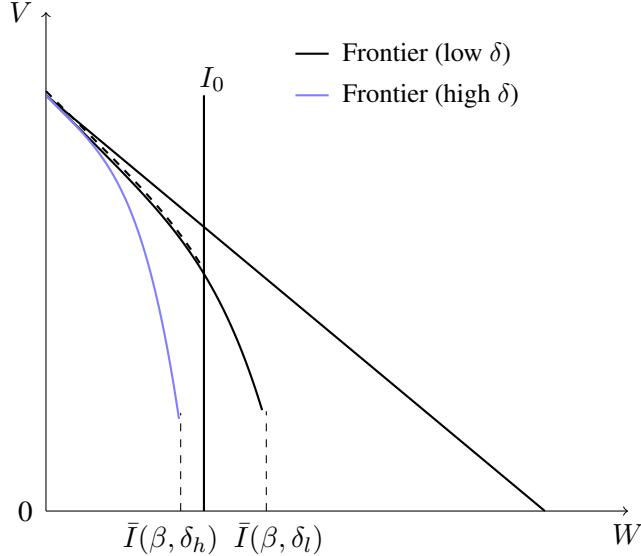
**Proposition 3.9.** *If a non-trivial stationary contract exists given  $\beta$  and  $\delta$ , then there is a corresponding threshold  $\bar{I}(\beta, \delta)$  increasing in  $\beta$  and decreasing in  $\delta$  such that a non-trivial optimal contract exists from date 0 if and only if  $I_0 \leq \bar{I}(\beta, \delta)$ . Moreover, if  $I_0 \leq \bar{I}(\beta, \delta)$  then, for any date  $t$  in which  $k_t^c < k^*$ ,  $k_t^c$  is strictly decreasing in  $\delta$ .*

*Proof.* See the Mathematical Appendix. □

Proposition 3.9 implies that anticipated corruption lowers overall investment and host-country welfare under the optimal contract in two ways. First, for any optimal contract that can be supported under  $\delta$ ,  $\beta$ , and  $I_0$ , *contracted* investment in every period along the transition to the stationary period of the contract is strictly lower as  $\delta$  is increased and, unless the efficient frontier is reached, investment also remains low in the stationary period. Second, the set of initial start-up costs  $I_0$  for which an optimal contract exists is smaller for larger values of  $\delta$ . That is, for sufficiently high  $\delta$ , only projects featuring arbitrarily low initial start-up costs  $I_0$  will be undertaken by foreign investors. Extending this intuition to an environment with a large number of simultaneous projects characterized by different start-up costs, this implies an extensive margin for foreign investment that decreases as the possibility of corruption increases.

Figure 7 illustrates the impact of corruption on the Pareto frontier and the set of permissible contracts given  $I_0$ . As the probability of a corrupt type  $\delta$  increases, the frontier

Figure 7: Corruption and the Pareto Frontier



shifts downward, but without influencing the stationary contract, in the case that it can be reached, and is therefore pivoted at  $\hat{k}$ . Given  $I_0$ , this implies that an optimal contract, if it exists, will offer the host country lower initial utility  $V_0$ , which reflects both lower investment levels along the transition to the stationary contract and a prolonged transition with zero transfers. The figure also shows that, if  $\delta$  is sufficiently high, then an optimal contract may not exist given  $I_0$ , even though an optimal contract would have existed at lower levels of corruption.

It is worth noting that, although realized foreign investment for a given project under a corrupt government is unchanged as the likelihood of corruption increases, our results imply that the expected value of investment and output decrease as the expectation of corruption increases. Nevertheless, public returns from the project depend only on reported investments over the length of the contract. Therefore, in addition to potential reductions in host-country welfare owing to lower investment on the extensive margin, host-country welfare is reduced by lower investment on this intensive margin of any particular contract. Interestingly, a higher probability of corruption will, conditional on the project being financed, increase the rents obtained through corrupt deals whenever they occur (as illustrated by Figure 5).

We close the analysis of this section by arguing that, if the government is a corrupt type, there is no incentive to report anything other than  $m_t = k_t^c$ . If the honest type always implements  $k_t = k_t^c$  and reports truthfully, then any report  $m_t \neq k_t^c$  reveals to the public that the government is a corrupt type. The public, knowing that  $k_t = k^*$ , would therefore

require that the contract satisfy

$$\tau_t + \beta V_{t+1}^c \geq pf(k_t^*)$$

for all  $t$  following such a report in order to not expropriate. Otherwise, the firm would not invest. However, along the transition to the stationary contract period before the efficient frontier can be reached, this condition cannot be satisfied. (Otherwise it would always be possible to attain the efficient level of investment and the expropriation constraint never binds.) On the other hand, once the efficient frontier is reached (if at all), there is no longer any incentive for the investor to write a corrupt contract,  $k_t^c = k_t^d = k^*$  is known by the public, and the above condition is already satisfied under the optimal contract. Therefore  $m_t = k_t^c$  in equilibrium, regardless of government type.

## 4 Optimal Contract With Political Turnover

We now consider the optimal contract in the presence of exogenous government turnover. Specifically, we assume that in any period an incumbent government can be replaced by a new government in one of two ways. First, the public can decide to replace a government based on beliefs about the government type, taking into account the implications of type on the expected public returns from the contract, as in Bhattacharyya and Hodler (2010). Second, the incumbent may be replaced randomly in any period independent of public beliefs and the optimal contract. This captures the idea that governments are sometimes replaced by the electorate based on factors outside of the model. As in Phelan (2006), this results in stochastic government type renewal, and public beliefs about the government type are conditioned on the actions taken by the government.<sup>29</sup>

In this environment, equilibrium outcomes will be influenced by the ability of the government to send credible messages to the public. Specifically, although a corrupt type will have no incentive to report anything other than  $m_t = k_t^c$ , as in the case without government turnover considered in Section 3.4, the public will receive report  $m_t = k_t^d$  whenever a corrupt type is replaced by an honest type. When  $k_t^d \neq k_t^c$  and a corrupt type always reports  $m_t = k_t^c$  in equilibrium, the fact that an honest type always reports truthfully and a corrupt type always reports  $m_t = k_t^c$  implies that the message  $m_t = k_t^d$  is credible. Knowing that  $k_t = k_t^d$  when  $m_t = k_t^d$  the public will, under certain conditions, find it optimal to expropriate in equilibrium.

Denote the probability that a government is randomly replaced in any given period by  $\sigma$ . (With probability  $1 - \sigma$ , the incumbent government remains in power.) Assume for the moment that a corrupt incumbent government always reports  $m_t = k_t^c$ , so that it never reveals its type. Then, conditional on the incumbent being a corrupt type, the probability that the public will receive a report  $m_t = k_t^d$  is the probability that it is replaced by an

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<sup>29</sup>As will become clear, information concerning government type will be transmitted to the public only in the case of exogenous turnover in this set-up, and the ability of the public to overthrow a corrupt government plays only an indirect role in influencing equilibrium outcomes.

honest type,  $\sigma(1 - \delta)$ . In the analysis that follows, we are interested in the probability the public places on receiving a report  $m_t = k_t^d$  in any period for the first time over the course of the contract. Since the posterior belief that the government is a corrupt type having only received message  $m_t = k_t^c$  up to the current period  $t$  is  $\delta$ , the public believes that report  $m_t = k_t^d$  will be received for the first time with probability  $\sigma\delta(1 - \delta)$ . The following propositions establish that this also equals the probability that expropriation occurs in equilibrium:

**Proposition 4.1.** *When there is stochastic political turnover, the probability of expropriation occurring in any period  $t$  such that  $k_t^d \neq k_t^c$  is  $\bar{\rho} = \sigma\delta(1 - \delta)$ .*

*Proof.* See the Mathematical Appendix. □

In other words, whenever a corrupt contract  $k_t^d \neq k_t^c$  is profitable,  $k_t^d$  solves  $pf'(k_t) = (1 - \bar{\rho})^{-1}$ , and expropriation occurs with probability  $\bar{\rho} = \sigma\delta(1 - \delta)$ . The contracted level of investment  $k_t^c$ , in turn, must satisfy

$$\tau_t + \beta E_t[V_{t+1}^c] \geq E_t[V_t^e(k_t^c)] = \delta p f(k_t^d) + (1 - \delta)p f(k_t^c). \quad (16)$$

The corresponding dynamic programming problem maximizes (3) subject to (4), (5), (9)–(10), and (16), taking the probability of expropriation  $\bar{\rho} = \sigma\delta(1 - \delta)$  and the corresponding level of investment under the corrupt contract,  $k_t^d < k^*$ , as given.

The main features of the optimal contract are very similar to the contract without government turnover in Section 3.4. However, expropriation may occur in equilibrium, and the likelihood of expropriation is determined by the likelihood of government turnover and the prevalence of corruption. Features of the optimal contract are summarized in the following proposition:

**Proposition 4.2.** *Under the optimal contract,  $k_t^c$  is increasing over time,  $\tau_t = 0$ , and the probability of expropriation is  $\bar{\rho}$  until  $k_t^c$  reaches stationary value  $\hat{k} \leq k^*$ , after which transfers to the host country are positive, and expropriation occurs with positive probability if and only if  $\hat{k} < k^*$ .*

*Proof.* See the Mathematical Appendix. □

The intuition for the dynamics of the optimal contract is the same as in Section 3.4. The only substantive difference is a positive probability of expropriation under the optimal contract. By assumption, the first-best frontier is unattainable in the very first period and  $k_t^c < k^*$  over some initial phase of the contract. Because agents are unable to condition the contract on incidents of corruption, the possibility of an honest government replacing a corrupt one implies that, with positive probability,  $k_t = k^*$  is revealed to the public with certainty. When  $k_t^c < k^*$ , this must violate the expropriation constraint. Therefore government turnover increases the likelihood of expropriation, but only if there is positive corruption ( $\delta > 0$ ).

Given  $\sigma$ , however, the effect of corruption on the likelihood of expropriation reaches a maximum  $\delta = 0.5$ . (As  $\delta$  rises above or below this threshold, it is less likely that government turnover will result in a change in government type, which is necessary in the model for generating reports that induce expropriation.) That is, the prevalence of government graft increases the probability of expropriation whenever the expropriation constraint binds up to a certain threshold, but this effect is reduced as corruption becomes ubiquitous. Nevertheless, higher corruption decreases both FDI under the official contract and host-country welfare over the entire range of  $\delta$ .

To close the characterization of the equilibrium contract, we verify that these equilibrium strategies are consistent with  $m_t \neq k_t^c$  being reported only if an honest type has succeeded a corrupt type (at a point in the contract that does not correspond to the first-best Pareto frontier). As in the case of no government turnover considered in Section 3.4, a corrupt type has no incentive to report  $m_t \neq k_t^c$  as an incumbent, which would reveal that it is not an honest type. (Otherwise  $k_t^c$  would have been both invested and reported.) The reason is that, under a corrupt government, actual investment is  $k_t^d = k^*$ , and type revelation would result in a violation of the expropriation constraint whenever  $k_t^c < k^*$  and the termination of the contract with the foreign investor for all future dates. But since this outcome does not increase the corrupt government's expected future payoff (and strictly decreases its payoff when future contracted investments are below the unconstrained efficient level), a corrupt incumbent would never choose to report  $m_t \neq k_t^c$ . Given that an honest incumbent also always reports  $m_t = k_t^c$  (as the incumbent it ensures this is what is invested), only a succeeding government reports anything other than  $k_t^c$ . A newly elected honest government reports  $m_t = k_t^d \neq k_t^c$  only if it replaces a corrupt type and  $k_t^c < k^*$ , and reports  $m_t = k_t^c$  otherwise. Therefore, the message  $k_t = k_t^d$  must increase the probability that public beliefs place on  $k_t > k_t^c$ . As a result, expropriation would occur after report  $m_t = k_t^d = k^*$  independent of government type. But this makes the corrupt type strictly worse off compared to always reporting  $m_t = k_t^c$ , in which case the public believes that  $k_t = k_t^c$  with probability  $\delta$  and expropriation does not occur. Therefore  $m_t = k_t^d$  credibly reveals that  $k_t = k_t^d$ .

## 5 Conclusions

Although it has been widely conjectured that corruption is harmful for development, the empirical evidence linking corruption and long-run growth has been controversial (see, for example, Mauro, 1995; Mo, 2001; Svensson, 2005). This has motivated research that is more acutely focused on the specific channels through which corruption influences investment and productivity. Given the perceived importance of foreign capital and technology for developing-country growth, there has been increasing interest in the impact of corruption on FDI (Wei, 2000; Azzimonti and Sarte, 2007; Bhattacharyya and Hodler, 2010; Delgado, McCloud, and Kumbhakar, 2014; Koessler and Lambert-Mogiliansky, 2014). We contribute to this literature on two fronts. First, in examining expropriations of

FDI across developing countries over 1990–2014, we provide previously undocumented evidence for the relationship between government corruption and outright confiscation of foreign investor assets: weak investor protection increases the likelihood of expropriation when the government is perceived as sufficiently corrupt. This evidence suggests that, in addition to the direct disincentives to invest owing to uncertainty in the payment of costly bribes, a potential repercussion from corruption is a magnification of expropriation risk. Second, by introducing a lack of contract transparency in a standard model of FDI with imperfect contract enforcement, we show how expropriation and corrupt deals with foreign investors arise endogenously and constrain foreign investment.

The theoretical environment we consider departs from much of the existing literature on corruption and expropriation by treating expropriation and theft from corruption as being motivated by different objectives; furtive deals with foreign investors produce unobserved rents for corrupt officials, whereas outright expropriations are highly visible events that transfer returns from the investment project from the investor to the public. The key insight from our analysis is that higher anticipated corruption—captured by the likelihood that a government is dishonest—decreases FDI under the optimal contract along two margins. On the intensive margin, higher corruption increases the public’s expectation that the value of foreign assets is above what is specified under the official contract, increasing the temptation to expropriate for every contracted sequence of investments. This lowers contracted investment at each date conditional on the project being financed. Second, as corruption increases, successively larger projects (i.e., projects involving larger initial start-up costs) can no longer be supported by an optimal contract owing to the higher risk. Moreover, a binding expropriation constraint under the contract is necessary in our model for opportunities for corrupt deals to arise, and higher expropriation risk results in corruption. This endogenous relationship between corruption and expropriation implies a channel through which corruption reduces the host-country benefits from FDI not previously considered in the literature. Finally, consistent with media reports on several recent expropriation events, our model predicts that expropriation is more likely to occur when the share of government take from the project is reportedly low and outgoing governments are accused of making corrupt deals with investors. These findings suggest that improvements in the security of investor property rights and host-country welfare can be achieved by increasing transparency in the deals struck between government officials and foreign investors, and by imposing greater penalties on officials culpable of soliciting bribe payments.

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# Appendices

## A Mathematical Appendix

### A.A Proof of Lemma 3.4

Consider a decreasing, concave function  $P \in \mathcal{P}$  and define operator  $L$  by the following modified, non-convex dynamic program:

$$LP(W) = \sup_{\{\tau, k, W'\}} \tau + \beta P(W'),$$

subject to

$$\mu : \tau \geq 0 \tag{17}$$

$$\varphi : pf(k) - \tau \geq 0 \tag{18}$$

$$\phi : \tau + \beta P(W') \geq \delta pf(k_t^*) + (1 - \delta)pf(k) \tag{19}$$

$$\lambda : pf(k) - k - \tau + \beta W' \geq W \tag{20}$$

$$\beta\zeta : W' \geq 0. \tag{21}$$

Moreover, define  $P^*$  as the unconstrained, first-best Pareto frontier for the problem without constraint (19). Defining  $\Pi(k) = pf(k) - k$ , along the first-best frontier, investment equals  $k^*$ ,  $\Pi^* = \Pi(k^*)$ , and  $\{\tau_s^*\}_{s=t}^\infty$  is any sequence of transfers that satisfies the remaining constraints. Given

$$W_t^* = \sum_{s=t}^{\infty} \beta^{s-t} (\Pi^* - \tau_s^*),$$

the first-best Pareto frontier is

$$P^*(W_t^*) = \sum_{s=t}^{\infty} \beta^{s-t} \tau_s^* = \sum_{s=t}^{\infty} \beta^{s-t} \Pi^* - W_t^* = \frac{\Pi^*}{1 - \beta} - W_t^*,$$

with  $P^*(\bar{W}) = 0$ . Given the definition of  $W_t^*$ , it is straightforward to verify that

$$\sup_{\{\tau_s^*\}_{s=t}^\infty} \tau_s^* + \beta P^*([W_{t+1}^*]) = P^*(W_t^*).$$

Therefore the solution to the maximization problem without constraint (19) satisfies  $k = k^*$  and  $\tau - \beta W' = \Pi^* - W$ , yielding a maximum value  $\Pi^*/(1 - \beta) - W = P^*(W)$ . It follows that, taking  $LP(W)$  with constraint (19), starting from the first-best frontier,  $P(W') = P^*(W)$  for any  $W \in [0, \bar{W}]$ ,  $LP^*(W) \leq P^*(W)$ .

The remainder of the proof follows the induction argument of Thomas and Worrall (1994) showing that, starting from  $P^*(W)$ , the sequence  $\{L^n P^*(W)\}_{n=0}^\infty$ , where  $L^n$  is

the  $n^{th}$  application of  $L$ , converges pointwise to  $V^c(W)$ . Assume  $L^n P^* \leq L^{n-1} P^*$ . Comparing  $L(L^n P^*)$  and  $L(L^{n-1} P^*)$ , constraint (19) implies that the constraint set for the latter case is at least as large as the former, given  $L^n P^* \leq L^{n-1} P^*$ . Therefore  $L^{n+1} P^* = L(L^n P^*) \leq L(L^{n-1} P^*) = L^n P^*$ , implying  $L^n P^*$  is a decreasing sequence over a compact set converging to  $V^0$ . For any initial  $W \in [0, \bar{W}]$ , consider the sequence of variables chosen at each application of  $L$ ,  $\{\tau^n, k^n, W^n\}_{n=1}^\infty$ . (19) implies  $\tau^n + \beta L^{n-1} P^*(W^n) \geq \bar{V}^e(k^n) \geq 0$  and so  $L^n P^*(W^{n+1}) \geq 0$  for each  $n$ , so in the limit  $V^0(W^n) \geq 0$ . Since  $V^0(W)$  satisfies (17)–(21) and offers the host country expected return  $V^0(W)$ ,  $LV^0(W) \geq V^0(W)$ . However,  $L^{n-1} P^* \geq L^n P^* \geq \dots \geq V^0$  and hence  $L^n P^* \geq LV^0$ , and taking the limit  $n \rightarrow \infty$ ,  $V^0(W) \geq LV^0(W)$ . Therefore  $V^0(W) = LV^0(W)$  is a fixed point of  $L$  starting from  $P^*$ . Since  $P^* \geq V$ ,  $L^n P^* \geq L^n V^c = V^c$ . In the limit we have  $V^0 \geq V^c$ . By the definition of  $V^c$ ,  $V^0 = V^c$ .  $\square$

## A.B Proof of Lemma 3.5

Assume  $P$  is a continuous, concave, and bounded function, and take any  $W^1, W^2 \in [0, \bar{W}]$  with corresponding contracts  $\{\tau^1, k^1, W^1\}$  and  $\{\tau^2, k^2, W^2\}$ . Next consider  $W^\alpha = \alpha W^1 + (1 - \alpha) W^2$  for  $\alpha \in (0, 1)$  with associated contract

$$\begin{aligned} k^\alpha &= \alpha k^1 + (1 - \alpha) k^2 \\ W'^\alpha &= \alpha W'^1 + (1 - \alpha) W'^2 \\ \tau^\alpha &= \alpha \tau^1 + (1 - \alpha) \tau^2 + (1 - \delta) [pf(k^\alpha) - (\alpha pf(k^1) + (1 - \alpha) pf(k^2))]. \end{aligned}$$

Note that this contract satisfies (17)–(21), and that  $\tau^\alpha \geq \alpha \tau^1 + (1 - \alpha) \tau^2$  with equality if and only if  $k^1 = k^2$ , because  $f(\cdot)$  is strictly concave. Because  $P$  is concave:

$$\begin{aligned} LP(W^\alpha) &= \sup_\theta \tau + \beta P(W'^\alpha) \\ &\geq \tau^\alpha + \beta P(W'^\alpha) \\ &\geq \alpha \tau^1 + (1 - \alpha) \tau^2 + \beta P(W'^\alpha) \\ &\geq \alpha \tau^1 + (1 - \alpha) \tau^2 + \beta [\alpha P(W'^1) + (1 - \alpha) P(W'^2)] \\ &= \alpha LP(W^1) + (1 - \alpha) LP(W^2). \end{aligned}$$

Thus  $LP(W)$  is concave. Consider two cases: (i)  $P(W'^1)$  and  $P(W'^2)$  correspond with the first-best Pareto frontier, and (ii) at least one of  $P(W'^1)$  and  $P(W'^2)$  lies below the first-best frontier. Because the first-best frontier is linear in  $W$ ,  $P(W'^\alpha)$  also corresponds with this frontier for any convex combination  $W'^\alpha$ . (See the proof of Lemma 3.4.) This implies that, in case (i),  $k^1 = k^2 = k^*$  and  $k^\alpha = k^*$ , and therefore  $\tau^\alpha = \alpha \tau^1 + (1 - \alpha) \tau^2$ . Because  $\sup_\theta \tau + \beta P(W') = P(W')$ , where  $P^*(W')$  is the first-best frontier,  $L$  maps weakly concave functions into weakly concave functions provided  $P(W') = P^*(W)$ .

In case (ii), at least one of  $P(W'^1)$  and  $P(W'^2)$  is below the Pareto frontier, implying at least one of  $k^1, k^2$  is less than  $k^*$ , hence  $\tau^\alpha > \alpha\tau^1 + (1 - \alpha)\tau^2$ . This implies  $LP(W^\alpha) > P(W'^\alpha)$ , and therefore  $L$  maps weakly concave functions into strictly concave functions when  $P(W')$  does not correspond with the first-best frontier. Since  $V^c$  is the pointwise limit of  $L^n P$  from Lemma 3.4,  $V^c(W)$  is itself concave, with strict concavity when  $V^c(W)$  does not correspond with the first-best frontier.

Next, to see why  $\partial V_t^c / \partial W_t^c \leq -1$  for all  $t$ , suppose to the contrary that  $-\partial V_t^c / \partial W_t^c = \lambda_t < 1$  for some  $t = \tilde{t}$ . By concavity of  $V^c$ , if this is true anywhere, it is certainly true at the minimum value  $W_t^c = 0$ . Then condition (12) implies that

$$\varphi_{\tilde{t}} = (1 - \lambda_{\tilde{t}}) + \mu_{\tilde{t}} + \phi_{\tilde{t}} > 0,$$

and by complementary slackness  $\tau_{\tilde{t}} = pf(k_{\tilde{t}}^c)$  ( $\mu_{\tilde{t}} = 0$ ) and the investor's profits are negative in period  $\tilde{t}$ . Constraint (9) then implies  $W_{\tilde{t}+1}^c \geq W_{\tilde{t}}^c \geq 0$  (the first inequality is strict whenever  $k_{\tilde{t}}^c > 0$ ). If  $k_{\tilde{t}}^c = 0$ , then  $\tau_{\tilde{t}} = pf(k_{\tilde{t}}^c) = 0$  and therefore  $W_{\tilde{t}+1}^c = W_{\tilde{t}}^c = 0$ . But if a non-trivial contract featuring positive investment in finite time exists from period 0 onward, promising the investor discounted expected return at least equal to  $I_0 \geq 0$  while satisfying (8) and offering the host country  $\tau_0 + \beta E_t[V_1^c] > 0$ , then it is also feasible to deliver a strictly positive expected return to the host country from any period  $\tilde{t}$  onward given promise  $W_{\tilde{t}}^c = 0$  that would require positive investment on some future date. This implies that, if  $\varphi_{\tilde{t}} > 0$ ,  $\tau_{\tilde{t}} = pf(k_{\tilde{t}}^c) > 0$  and hence  $W_{\tilde{t}+1}^c > W_{\tilde{t}}^c = 0$ . Complementary slackness then implies  $\zeta_{\tilde{t}} = 0$ , and  $\lambda_{\tilde{t}+1} = (\lambda_{\tilde{t}} + \zeta_{\tilde{t}})/(1 + \phi_{\tilde{t}}) = \lambda_{\tilde{t}}/(1 + \phi_{\tilde{t}}) \leq \lambda_{\tilde{t}} < 1$ . Repeating the argument for period  $\tilde{t} + 1$ , it immediately follows that  $\lambda_{\tilde{t}+n+1} \leq \lambda_{\tilde{t}+n} \leq 1$  for all  $n > 0$ . But then  $\tau_t = pf(k_t^c)$  for all  $t \geq \tilde{t}$ , which violates the condition  $W_{\tilde{t}}^c \geq 0$ . Therefore it must be the case that  $\lambda_t \geq 1$  for all  $t$ .

Finally, because  $\lambda_t \geq 1$  for all  $t$ , whenever  $\varphi_t > 0$  we must also have  $\phi_t > 0$  (since  $\mu_t = 0$ ). Since  $\varphi_t > 0$  implies  $\tau_t = pf(k_t^c)$ , (8) becomes

$$V_{t+1}^c \geq \frac{\delta}{\beta} (pf(k^*) - pf(k_t^c)),$$

and if  $\phi_t > 0$ , this constraint binds. But if  $\delta > 0$ , this cannot bind because it is possible to increase  $k_t^c$  and hence also increase  $\tau_t$  while holding  $W_{t+1}^c$  constant without violating (9). If  $\delta = 0$ , then the constraint reduces to  $V_{t+1}^c \geq 0$ , which never binds under the condition  $\tau_t \geq 0$ . Therefore  $\varphi_t = 0$  and (5) never binds.  $\square$

### A.C Proof of Proposition 3.7

From Lemma 3.5,  $\varphi_t = 0$  and  $\lambda_t = 1 + \mu_t + \phi_t$  and  $pf'(k_t^c) = \lambda_t / (\lambda_t - \phi_t(1 - \delta))$  for all  $t$ . Moreover, Equations (14) and (15) imply

$$\lambda_{t+1} = \frac{\lambda_t + \zeta_t}{1 + \phi_t}.$$

Consider a stationary contract in which investment is constant,  $k_t = \hat{k} \leq k^*$ , and where  $\lambda_t = \lambda_{t+1} = \hat{\lambda}$ , so that  $(1 + \hat{\phi})\hat{\lambda} = \hat{\lambda} + \hat{\zeta}$ . If  $\hat{\phi} > 0$ , then  $\hat{\zeta} > 0$  and thus  $W_{t+1}^c = 0$  binds for all  $t$ . In this case, (8) binds ( $\hat{k} \leq k^*$ ) and (9) binds for  $W_t^c = W_{t+1}^c = 0$ . This implies the stationary contract  $\hat{k}$  with  $\tau_t = \hat{\tau}$  solves

$$\sum_{t=s}^{\infty} \beta^{t-s} \hat{\tau} = \frac{\hat{\tau}}{1 - \beta} = \delta pf(k^*) + (1 - \delta)pf(\hat{k})$$

and

$$pf(\hat{k}) - \hat{k} = \hat{\tau},$$

which implies  $\hat{k}$  the solution to

$$\hat{k} = \beta pf(\hat{k}) - \delta(1 - \beta)[pf(k^*) - pf(\hat{k})]$$

for  $0 < \hat{k} \leq k^*$ . Note that, for sufficiently high values of  $\delta$ , there does not exist  $\hat{k} > 0$  that solves this equality, in which case a non-trivial stationary contract does not exist. (Conditions for existence are considered in Propositions 3.8 and 3.9.) Also note that only if  $\hat{\phi} = 0$  and hence  $\hat{k} = k^*$  (Lemma 3.6) is it the case that  $\hat{\zeta} = 0$  ( $\hat{\lambda} = 1$ ) and  $W_{t+1}^c \geq 0$  never binds in the stationary contract. This corresponds to a contract on the first-best Pareto frontier, where  $V$  attains its maximum value, and  $\tau_t$  and  $W_{t+1}^c$  are not uniquely determined in any period.

Assuming for the moment that a non-trivial stationary contract exists ( $\hat{k} > 0$ ), the optimal contract converges to this stationary contract period. This follows from  $\lambda_{t+1} \leq \lambda_t$  for all  $t$ . To see why, suppose instead that  $\lambda_{t+1} > \lambda_t$  for some  $t$ . Then  $(1 + \phi_t)\lambda_t < \lambda_t + \zeta_t$ , which implies  $\zeta_t > 0$  and hence  $W_{t+1}^c$  binds. This would imply  $W_t^c \geq W_{t+1}^c = 0$  and, by the concavity of  $V^c$ ,  $\partial V_{t+1}^c / \partial W_{t+1}^c \geq \partial V_t^c / \partial W_t^c$ . But then by the envelope theorem we have  $\lambda_{t+1} \leq \lambda_t$ , a contradiction. Therefore  $\lambda_{t+1} \leq \lambda_t$ , and since  $\lambda_t \geq 1$  for all  $t$ ,  $\lambda_t$  must converge to some value  $\hat{\lambda} \geq 1$ . Assume for the moment that convergence occurs in finite time in some period  $t^*$ . Then either  $\lambda_t = \hat{\lambda} = 1$  for all  $t \geq t^*$ , implying  $\hat{\zeta} = \hat{\phi} = 0$  and  $W_t^c \geq 0$  for  $t \geq t^*$  (Case 1), or  $\hat{\lambda} > 1$ , implying  $\zeta_t = \hat{\zeta} > 0$ ,  $\phi_t = \hat{\phi} > 0$ , and  $W_t^c = 0$  for all  $t \geq t^*$  (Case 2). Case 1 corresponds to the efficient stationary contract, where  $k_t = \hat{k} = k^*$  for all  $t$  and the first-best Pareto frontier is reached, whereas in Case 2  $\hat{k} \geq k^*$ . Since  $W_0 \geq I_0$  and  $I_0 > 0$  by assumption, we know  $\lambda_1 = \lambda_0$  and therefore  $t^* = 0$  if and only if the first-best frontier can be immediately reached in the initial period of the

contract. Otherwise  $t^* > 0$  and there is a positive transition period toward the stationary contract where either  $\zeta_t = 0$  and  $W_t^c > W_{t+1}^c \geq 0$  for all  $t < t^*$ , or else  $t = t^* - 1$ ,  $\zeta_t > 0$  and  $W_t^c > W_{t+1}^c = 0$  (but  $\zeta_t = 0$  for  $t < t^* - 1$ ). In both cases,  $\lambda_{t+1} < \lambda_t$  for all  $t < t^*$ . We now argue that, if a non-trivial optimal contract exists,  $t^*$  is reached in finite time and under this contract  $\tau_t = 0$  until period  $t^* - 1$ .

Consider any period  $t < t^*$  along the transition to the stationary contract such that  $W_t^c > W_{t+1}^c$ . Substituting  $\lambda_t = 1 + \mu_t + \phi_t$  into the above expression for  $\lambda_{t+1}$ , we have  $\lambda_{t+1} = (1 + \phi_t + \mu_t + \zeta_t)/(1 + \phi_t)$ . Because  $\lambda_{t+1} < \lambda_t$  when  $t < t^*$ , one of the following sets of conditions must hold:

- (i)  $\mu_t = 0$ ,  $\zeta_t = 0$ , and  $\lambda_{t+1} = \hat{\lambda} = 1$ ;
- (ii)  $\mu_t = 0$ ,  $\zeta_t > 0$  ( $t = t^* - 1$ ), and  $\lambda_{t+1} = \hat{\lambda} > 1$ ;
- (iii)  $\mu_t > 0$  and  $\lambda_{t+1} > \hat{\lambda}$ .

In cases (i) and (ii), the stationary contract is reached in period  $t + 1$  (hence  $t = t^* - 1$ ). For all other  $t < t^*$ ,  $\mu_t > 0$ , implying that  $\tau_t \geq 0$  strictly binds. The optimal contract therefore features zero transfers to the host country until the period just before the stationary contract is reached. Because  $\beta \in (0, 1)$ ,  $V_0 > 0$  (if a non-trivial contract exists) and  $\tau_t = 0$  for  $t < t^* - 1$  imply  $t^*$  must be finite.

Finally, given  $\lambda_t$  is strictly decreasing and  $\phi_t > 0$  for all  $t < t^*$ , concavity of  $V^c(W_t)$  implies  $W_t$  is decreasing and  $V_t$  is increasing with  $t < t^*$ . Therefore  $V_{t+1}^c - V_t^c > 0$  along the transition to the stationary contract and, given  $\tau_t = \tau_{t-1} = 0$  and (8) strictly binds at  $t$  and  $t - 1$ , this implies

$$\beta(V_{t+1}^c - V_t^c) = (1 - \delta)(pf(k_t^c) - pf(k_{t-1}^c)) > 0.$$

Therefore  $k_t^c > k_{t-1}^c$  whenever  $t < t^*$ . □

## A.D Proof of Proposition 3.8

An optimal contract converging to stationary investment  $\hat{k}$  must satisfy Condition (8) for all  $t \geq t^*$ :

$$V^{max}(\beta) \geq \delta pf(k^*) + (1 - \delta)pf(\hat{k}),$$

where

$$V^{max}(\beta) = \sum_{s=t^*}^{\infty} \beta^{s-t^*} \tau_s = \sum_{s=t^*}^{\infty} \beta^{s-t^*} (pf(\hat{k}) - \hat{k}) = \frac{pf(\hat{k}) - \hat{k}}{1 - \beta}.$$

It is useful to begin by defining  $\beta(\delta)$  as the minimum value of  $\beta$  that supports any particular stationary investment level  $\hat{k}$ , given  $\delta$ :

$$\beta(\hat{k}) = \frac{\hat{k} + \delta(pf(k^*) - pf(\hat{k}))}{pf(\hat{k}) + \delta(pf(k^*) - pf(\hat{k}))},$$

as well as the minimum value of  $\beta$  that supports  $\hat{k} = k^*$ ,  $\bar{\beta} = k^*/pf(k^*)$ . We are interested in the relationship  $\underline{\beta}(\delta)$  that defines the value of  $\beta$  below which there is no  $\bar{k} > 0$  that can be supported as a stationary contract, given  $\delta$ . This can be expressed as

$$\underline{\beta}(\delta) = \inf_{\hat{k} \in [0, k^*]} \beta(\hat{k}).$$

Denoting  $\hat{k}^{min}(\delta) = \arg \min_{\hat{k}} \beta(\delta)$ , evaluating the derivative of  $\beta(\delta)$  with respect to  $\hat{k}$  reveals that  $\hat{k}^{min}(\delta)$  satisfies

$$pf'(\hat{k}) = \frac{((\delta pf(k^*) + (1 - \delta)pf(\hat{k}))}{(\delta pf(k^*) + (1 - \delta)\hat{k})}.$$

Note that, at  $\delta = 0$ ,  $\hat{k}^{min}(\delta) = 0$  solves  $pf'(\hat{k})\hat{k} = pf(\hat{k})$ , implying that  $\underline{\beta}(0) = 0$ . Moreover, as  $\delta \rightarrow 0$ ,  $\hat{k}^{min}(\delta)$  approaches zero. If  $\delta = 1$ ,  $\hat{k}^{min}(\delta) = k^*$  solves  $pf'(\hat{k}) = 1$ , and therefore  $\underline{\beta}(1) = \bar{\beta}$ .

For  $\delta > 0$ ,  $\hat{k}^{min}(\delta) > 0$ . We show that  $\underline{\beta}(\delta)$  is strictly increasing on  $\delta \in [0, 1]$ , converging asymptotically to  $\bar{\beta}$  as  $\delta$  approaches 1 from below. Moreover  $k^*$  can be supported as a stationary contract (if one exists) if and only if  $\beta \geq \bar{\beta}$ .

Because  $\beta(\delta)$  and  $\hat{k}^{min}(\delta)$  are continuous and differentiable in  $\delta$ , by the envelope theorem we can determine the slope of  $\underline{\beta}(\delta)$  by the slope of  $\beta(\delta)$  evaluated at  $\hat{k} = \hat{k}^{min}(\delta)$ :

$$\frac{\partial \underline{\beta}(\delta)}{\partial \delta} = \left. \frac{\partial \beta(\hat{k})}{\partial \delta} \right|_{\hat{k}=\hat{k}^{min}(\delta)} = \frac{(pf(k^*) - pf(\hat{k}^{min}(\delta)))(pf(\hat{k}^{min}(\delta)) - \hat{k}^{min}(\delta))}{(\delta pf(k^*) + (1 - \delta)pf(\hat{k}^{min}(\delta)))} \geq 0.$$

We know from the above that  $\hat{k}^{min}(\delta) \rightarrow 0$  when  $\delta \rightarrow 0$ . This also implies that  $\partial \underline{\beta}(\delta)/\partial \delta \rightarrow \infty$  as  $\delta \rightarrow 0$ . Moreover, when  $\delta = 1$ ,  $\hat{k}^{min}(\delta) = k^*$  and therefore  $\partial \underline{\beta}(\delta)/\partial \delta = 0$ . Finally, for  $\delta > 0$  and  $\hat{k}^{min}(\delta) < k^*$ ,  $\partial \underline{\beta}(\delta)/\partial \delta > 0$ . Therefore  $\underline{\beta}(0) = 0$ ,  $\underline{\beta}(1) = \bar{\beta}$ ,  $\underline{\beta}(\delta)$  is strictly increasing on  $\delta \in [0, 1]$ , and converges asymptotically to  $\bar{\beta}$  as  $\delta$  approaches 1.  $\square$

## A.E Proof of Proposition 3.9

Given that the Pareto frontier  $V^c(W^c)$  is concave and strictly decreasing in  $W^c$  (Lemma 3.5), define  $W^{max}$  as the maximum value of  $W^c$  such that  $V^{min} = V^c(W^{max})$  is the minimum initial promised utility to the host country under an optimal contract. (Evidently  $V^{min} > 0$  under a non-trivial contract, solving condition (8) with equality given  $k_0^c > 0$ .) The optimal contract, if one exists, must offer the investor a return  $W_0 \geq I_0$ , and therefore  $W^{max}$  represents the threshold level for  $I_0$  above which a non-trivial optimal contract does not exist. As  $V^c(W^c)$  depends on  $\beta$  and  $\delta$ , so does  $W^{max}$ . Define  $\bar{I}(\beta, \delta)$  to be this threshold for start-up costs  $I_0$ , given  $\beta$  and  $\delta$ .

Under the optimal contract such that (8) binds in the transition to the stationary contract period,  $\tau_0 = 0$ . Condition (9) at period  $t = 0$  can therefore be rewritten as  $W_0^c = pf(k_0^c) - k_o^c + \beta W_1^c$ , while (8) becomes

$$V_0^c = \beta V_1^c = \beta V^c(W_1^c) \geq \delta pf(k^*) - (1 - \delta)pf(k_0^c).$$

Given  $W_0^c$  and  $V^c(W^c)$ , the optimal contract when (8) binds is summarized by the pair  $\{k_0^c, W_1^c\}$  that solves these two conditions. Therefore, the maximum value for  $W_0^c$  given  $V^c(W^c)$  is the solution to

$$\begin{aligned} \max_{k_0^c, W_1^c} \quad & W_0^c = pf(k_0^c) - k_0^c + \beta W_1^c \\ \text{subject to} \quad & \beta V^c(W_1^c) - \delta pf(k^*) - (1 - \delta)pf(k_0^c) = 0. \end{aligned}$$

Note that the expression for  $W_0^c$  is concave and the constraint is convex given that  $V^c(W^c)$  is concave. According to the envelope condition, we have

$$\begin{aligned} \frac{\partial W_0^c}{\partial \delta} &= W_1^c + \gamma V^c(W_1^c) > 0 \\ \frac{\partial W_0^c}{\partial \beta} &= -\gamma(pf(k^*) - pf(k_0^c)) < 0, \end{aligned}$$

where  $\gamma \geq 0$  is the multiplier on the constraint, and the derivatives are evaluated at the optimized solution  $\{k_0^c, W_1^c\}$ . Recognizing that  $W_0^c$  evaluated at the solution equals  $\bar{I}(\beta, \delta)$ , these conditions show that  $\bar{I}(\beta, \delta)$  is strictly increasing in  $\beta$  and strictly decreasing in  $\delta$  whenever (8) strictly binds ( $k_0^c < k^*$ ).

To see that  $k_t^c$  is strictly decreasing in  $\delta$  whenever  $k_t^c < k^*$  consider  $\delta'' > \delta'$ , note that by the envelope condition,  $\partial V_t / \partial W_t = -\phi_t(pf(k^*) - pf(k_t^c)) < 0$  for all  $t$  in which (8) binds. This implies that the Pareto frontier  $V''(W)$  corresponding to  $\delta''$  lies strictly below the frontier  $V'(W)$  at  $\delta'$  wherever  $V'(W)$  is below the first-best Pareto frontier. Hence, for any period  $t$  of the contract, beginning in period 0, before the first-best frontier is reached (if at all), we have

$$V''(W_{t+1}'') < V'(W_{t+1}'),$$

where  $W_{t+1}'$  and  $W_{t+1}''$  correspond to the optimal contract under  $\delta'$  and  $\delta''$ . But this also implies that  $W_{t+1}'' > W_{t+1}'$  and, by the promise-keeping constraint, we know that  $k_t'' < k_t'$ . If this were not the case, then given  $V_t = \beta V^c(W_{t+1}') = \delta pf(k^*) + (1 - \delta)pf(k_t')$ , and  $\delta'' > \delta'$ ,  $k_t'' \geq k_t'$  would imply  $V''(W_{t+1}'') > V'(W_{t+1}')$ .  $\square$

## A.F Proof of Proposition 4.1

If following the first report  $m_t = k_t^d$  the public does not choose to expropriate under the contract, investors, knowing that expropriation will not occur and  $\rho_t = 0$  when  $k_t^d \neq k_t^c$ ,

choose  $k_t^d = k^*$ . This then implies that the contract satisfies

$$\tau_t + \beta E_t[V_{t+1}(m_{t+1})|k_t^d] \geq pf(k^*).$$

But if the optimal contract satisfies this condition, then  $k_t^c = k^*$  is optimal at time  $t$ , since it offers higher investment without increasing the risk of expropriation. Therefore, if expropriation does not occur, it must be the case that  $k_t^d = k_t^c$ . However, unless  $k_t^c = k^*$ , this is not an equilibrium. Therefore, under a corrupt regime, the probability of expropriation is  $\rho_t = \bar{\rho} = \sigma\delta(1 - \delta)$  for all  $t$  such that  $k_t^c < k^*$  and  $k_t^d$  solves  $pf'(k_t) = (1 - \bar{\rho})^{-1}$ .  $\square$

## A.G Proof of Proposition 4.2

Assigning multipliers  $\varphi_t, \mu_t, \lambda_t, \beta\zeta_t$  and  $\phi_t$  to constraints (4), (5), (9)–(10), and (16) and recalling that  $\varphi_t = 0$ , the corresponding first-order conditions to the dynamic program are

$$\lambda_t = (1 - \bar{\rho}) + \mu_t + \phi_t \quad (22)$$

$$pf'(k_t^c) = \frac{\lambda_t}{\lambda_t - (1 - \delta)\phi_t} \quad (23)$$

$$\frac{\partial V_{t+1}^c}{\partial W_{t+1}^c} = -\frac{\lambda_t + \zeta_t}{(1 - \bar{\rho}) + \phi_t}, \quad (24)$$

as well as the envelope condition

$$\frac{\partial V_t^c}{\partial W_t^c} = -\lambda_t.$$

Substituting  $\lambda_t = 1 - \bar{\rho} + \mu_t + \phi_t$  into Condition (24) yields

$$-\frac{\partial V_{t+1}^c}{\partial W_{t+1}^c} = 1 + \frac{\mu_t + \zeta_t}{1 - \bar{\rho} + \phi_t} \geq 1.$$

Provided  $\zeta_t > 0$  and the investor is still promised positive future utility,  $\lambda_{t+1} > 1$  and  $\mu_t > 0$ . Therefore transfers are zero until either the efficient frontier is reached (at which point the timing of transfers is no longer uniquely determined) or the investor has completely recovered  $I_0$  and  $W_{t+1}^c = 0$ . Moreover, as long as  $\lambda_{t+1} < \lambda_t$  and the contract is converging to a stationary contract  $\lambda_t = \lambda_{t+1} = \hat{\lambda}$ , it must be the case that  $\phi_t > 1 - \bar{\rho}$ , which implies  $k_t^c < k^*$ . Moreover,  $k_t^c$  is strictly increasing over time along the transition to the stationary contract following an argument analogous to Proposition 3.7.

In the stationary contract period,  $\lambda_t = \lambda_{t+1} = \hat{\lambda}$  and  $\hat{\lambda}(\hat{\phi} - \bar{\rho}) = \hat{\zeta}$ . Since in the stationary contract  $\hat{\mu} = 0$  and  $\hat{\lambda} \geq 1$ ,  $\hat{\phi} \geq \bar{\rho}$ . If  $\hat{\phi} > \bar{\rho}$ , then  $\hat{\zeta} \geq (\hat{\phi} - \bar{\rho})$  and  $W_t \geq 0$  must bind. Only if  $\hat{\phi} = \bar{\rho} = 0$  and the efficient frontier is reached is it the case that  $\hat{\zeta} = 0$  and this non-negativity constraint never binds in the stationary contract period.  $\square$