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ARTÍCULO

KIDNAPPING AND INVESTMENT: A THEORETICAL MODEL

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Kidnapping, as a criminal activity, negatively affects the costs of firms. In addition, when kidnappers bribe a corrupt government, the government's political reaction for fighting kidnapping will depend on weighing the impact of kidnapping on investment, consumer surplus and the amount of bribe received by the kidnappers. With a high level of corruption, the government's political reaction will depend on the size of the market and the speed of the learning process in the fight against kidnapping. With a low level of corruption, the government always fights against kidnapping.

Keywords: Kidnapping; investment; corruption; bribes; political reaction.
JEL: D43, K14, L13, C02.

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Espinosa Ramirez, R. S. (2024). Secuestro e inversión: un modelo teórico. *Cuadernos de Economía, 43*(92), 413-436.

La actividad delictiva del secuestro afecta negativamente los costos de las empresas. Cuando los secuestradores sobornan a un gobierno corrupto, la reacción política del gobierno para combatir ese crimen dependerá de sopesar el impacto del secuestro sobre la inversión, el excedente del consumidor y el monto del soborno recibido por los secuestradores. Con un alto nivel de corrupción, la reacción política del gobierno para combatir el secuestro dependerá del tamaño del mercado y de la velocidad del proceso de aprendizaje en la lucha contra el secuestro. Con un bajo nivel de corrupción, el gobierno luchará contra el secuestro de manera más regular y efectiva.

Palabras clave: secuestro; inversión; corrupción; sobornos; reacción política.
JEL: D43, K14, L13, C02.

INTRODUCTION

Kidnapping is considered a source of public policy problems for developed and developing economies. These problems encompass political corruption, public insecurity, social distress, and declining investment (Briggs, 2001). In the beginning, kidnapping was eminently a matter of international politics. The kidnapping of a public figure increased public interest in the media, and this worried authorities in all countries as kidnapping was used by political groups whose demands ranged from the release of prisoners to the dissolution of whole states, like Israel. It was a matter of high-level diplomacy (Briggs, 2001).

Currently, kidnapping does not reach the levels of media attention that other crimes like drug trafficking and terrorism do. However, the combination of kidnapping with other criminal activities closer to home has an impact on social perception. Kidnapping is no longer the "romantic" expression of the achievement of political objectives and has become a profitable business that is sustained by a weak and corrupt institutional and legal apparatus. These days, kidnapping is motivated more by profit than by principle.

Kidnapping as a growing industry is basically carried out between individual agents with few direct economic implications for the public budget. It does, however, come with enormous externalities due to its high social impact. The kidnapping business operates around Latin America, more specifically in Colombia, Mexico, and Brazil. A significant worldwide proportion also exists in countries such as the Philippines, South Africa, and some regions of the former Soviet Union (Koseli et al., 2021). In developing countries, kidnapping is an increasingly common criminal activity (Fink & Pingle, 2014), and there are some socioeconomic dimensions as Bello (2022) references. Kidnapping for economic gain has become a growing industry (Stubbert, Pires, & Guerette, 2015). It grew by 179% between 2003 and 2017 according to the United Nations Office on Drugs and Crime data page (UNODC, 2020).

Until the beginning of the year 2000, kidnappers been earning up to $500 million on average per year worldwide, representing the ransoms paid by those kidnapped. (Briggs, 2001). The cost of being kidnapped is far higher than the cost of other criminal activities such as drug trafficking; the estimated total cost of drug abuse exceeds $193 billion a year in the United States (Office of National Drug Control Policy, 2011). The costs of drug trafficking were equivalent to 1.4% of US GDP in 2011. In developing economies, even when the economic cost of kidnapping is not as high as that of other criminal activities, the social cost is important.

This social cost is very high because of the social perception of insecurity that determines negative externalities for economies (CIDAC, 2015). As opposed to the way other criminals act, kidnapper's behaviour has to do with their negotiating skills that adapt to market conditions and the conditions of risk they face due to arrest and imprisonment. In urban Mexico, the probability of arrest is higher than in other countries, therefore kidnappers use more violence in establishing

negotiations. This a very different case from the one presented in rural parts of Colombia. However, as a common denominator, kidnappers seem to be above the law and interact with authorities in a symbiosis of corruption (Briggs, 2001).

Although the direct economic cost of kidnapping is not significantly higher than other criminal activities such as drug trafficking and production, the impact on citizens' perception of insecurity is devastating. For example, according to the Research Centre for Development A.C. (CIDAC) the impact generated in Mexican society in 2014 by an increase of 4 kidnappings per 100,000 inhabitants increased the perception of insecurity by 1%. This magnitude would only occur with other crimes when they showed a much greater social incidence. For example, extortion could only generate this impact on the perception of insecurity if the crime were increased by 20 per 100,000 inhabitants, or the crime of non-violent vehicle theft would need to increase by 365 per 100,000 inhabitants. For CIDAC, kidnapping is the second most important crime with regards to the population's perception of insecurity (CIDAC, 2015).

One aspect of this work to consider is the impact of kidnapping on investment. Knowing that the impact of kidnapping on the population's perception of insecurity is high, it could be believed that this perception transcends investment intentions by national and international capital. It would be logical to think that if a climate of insecurity is perceived in the country, the inflow of capital into the country would be reduced. There are several reasons why it can be argued that kidnapping may limit investment. An insecure environment due to the incidence of crime, and particularly high kidnapping rates, discourage the initiative of national or foreign investors (Carboni & Detotto, 2016). Kidnapping can generate a negative impact to people's wealth and can significantly affect the labour market. In addition, trust and social cohesion are very important for investment activities. Kidnapping can erode this social cohesion and investment conditions (Robles, Calderón, & Magaloni, 2013).

There is significant literature relating economic performance in general and the flow of investment concerning the environment of insecurity and violence in a given country. Gaviria (2002) finds that companies located in a country where their administrators perceive a climate of insecurity have lower annual sales. Barro (1991) and Alesina and Perotti (1996) find that countries that are politically unstable due to corruption and violence grow less and receive less investment than politically stable countries. For Lucas (1990), high rates of violence in developing countries explain why capital does not flow from developed to developing countries.

However, there is very limited literature on the impact of kidnapping on investment. Okafor and Ede (2021) found that the higher kidnapping rates lead to greater capital outflow. However, the significant effect of the relationship between the kidnapping rate and capital flight was only sustained in the group of 'fragile'

developing countries. Pshisva and Suarez (2010) analyse how kidnapping affects investment in Colombia. They find that companies invest less when kidnappers target the owners and managers of companies located where the kidnapping takes place. Recently, Gonzalez, Sierra and Mora (2022) found that an increase of 1% in kidnapping cases reduces net investment by 0.4% in some Colombian regions. To our knowledge, aside from this there is no non-dissemination article that speaks of this relationship in a rigorously theoretical way.

In this paper, we develop a theoretical model to explain why policies seeking to eliminate kidnapping have had ambiguous welfare effects in mainly developing countries. In the model, a country receives investment depending on the effort its government makes to reduce the number of kidnappings. However, kidnappers lobby and offer contributions, the impact of which depends on the level of government corruption. The effort of a government's reaction against kidnapping considers the contributions paid by kidnappers, the benefit of incoming firms and the welfare of inhabitants. Analytically we use agency theory to justify and explain the results of anti-kidnapping policies.

The model intends to show how efforts to reduce kidnapping are not necessarily related to investment flows or lobbying by kidnappers. We focus on determining the optimal level of government reaction and how this policy is affected by changes in the corruption parameter, the amount of ransom requested by the kidnappers, and the size of the market. Lobbying is modelled using the political contribution approach. That is, the kidnapper is assumed to make political contributions to the authorities in power, and the amount they contribute is contingent on the policy adopted by the government.

The article is divided into seven sections. In the next section, we describe the basic theoretical model. In section 3, we analyse the comparative statics of the kidnapping problem on economic agents. Section 4 discusses the determination of the optimal policy reaction. In section 5 we show, starting from the optimal level of effort, the impact of changes in corruption, the ransom's magnitude, and the market size on this political reaction. Finally,, our conclusions can be found in section 7.

THE MODEL

We have four actors in our model: local firms, honest people, dishonest people, and the government. The first actor is the firms. A country hosts n identical local firms competing in an oligopolistic industry. These firms produce a homogeneous good x which is entirely consumed in the host country. The marginal cost of each firm is c_x which is taken to be constant, and therefore equal to average variable cost. Of course, we consider a numeraire good in the background which is produced under competitive conditions. It is a factor of production whose price is determined in the competitive sector.

The profit function of each *n* firm is

$$\pi = \left(p_x - c_x \right) x - R\theta \tag{1}$$

where p_x is the price of the good x such that

$$p_x^{'} < 0$$

Each firm has a Cournot perception: it takes the output of other firms as given while maximising its profits. Under Cournot-Nash assumptions from (1) profit maximisation yields the first-order condition

$$\frac{d\pi}{dx} = \left(p_x - c_x \right) + xp_x^{'} = 0$$

and the optimal feasible output is

$$x = -\frac{\left(p_x - c_x \right)}{p_x^{'}} > 0 \tag{2}$$

From (2) to (1) we have

$$\pi = -p_x^{'} x^2 - R\theta \tag{3}$$

where the second-order condition is

$$\frac{d^2\pi}{dx^2} = \left(2p_x^{'} + xp_x^{''} \right) < 0$$

we consider, as does the common literature, that.

$$p_x^{'}, p_x^{''} < 0$$

In (1) we have $R\theta$ as the cost incurred by the firm for the possibility that its owners or executives are kidnapped. In this case, R is the ransom, and θ is the probability of the kidnapper's success. Moreover, kidnapping disturbs the production process with an extra per-unit fixed cost k, which is larger due to the probability of kidnapper success. Kidnapping a firm owner or executives unequivocally negatively affects the production process and it is the reason for this per-unit cost as a kind of precautionary cost.

According to Alesina and Perotti (1996), we can affirm that a high number of kidnappings is linked to low security levels and corruption, and that these characteristics discourage foreign businesses from investing in the producing country. These

authors divide instability into socio-political and executive instability. The first of these refers to socio-political disturbances, namely insecurity in political protests and social insecurity, and the second refers to the frequency with which governments are overthrown.

Government effort against kidnapping is considered a support policy in the fight against this criminal activity, impacting the country's interests. If the government makes a high level of effort in the fight against kidnapping and manages to reduce the number of kidnappings, this government shows greater security as well as collaboration and support for firms. Therefore, the efficiency of firms depends on the effort made by the government to combat kidnapping. In other words, $n=n(\varepsilon)$ where we assume that there is a positive relationship between the number of incoming firms and the enforcement level (ε) such that $n'(\varepsilon) > 0$. The flow of incoming firms increases with an increase in the enforcement level.

In this sense, the government uses specific policies to reduce the number of kidnappings by determining a level of enforcement in terms of spending. The enforcement level is expressed as the legal, political, and judicial instruments designed to inhibit this criminal activity. In this sense, these instruments imply a financial cost for the government. This enforcement level is only limited at its lower level since it can be zero but not negative, and it can reach a maximum level where kidnapping is eliminated. The enforcement level affects the kidnapper's probability of success. From the above argument, the probability of the kidnapper's success is defined as $\theta = \theta(\varepsilon)$ which decreases such that $\theta'(\varepsilon) < 0$, $\theta(0)=1$ and $\theta(\bar{\varepsilon}) = 0$ as we mentioned previously.

The second and third actors are honest and dishonest people. Each of these people is homogeneous within their type. Honest people are consuming the goods produced by firms. Dishonest people work and earn their income from illegal activities, specifically kidnapping. Therefore, we are considering that dishonest people kidnap business owners and/or managers.

As the second actor, honest people have identical quasi-linear preferences and some exogenous levels of income, $\bar{Y}$. The preferences of the consumers are represented by $u(y,Q) = y+f(Q)$ where y is the consumption of a numeraire good produced under competitive conditions with a price equal to 1. We denote the consumption of the non-numeraire good with Q, such that $Q = nx$, while function f is increasing and strictly concave in Q. Hence, with income $\bar{Y}$ each individual consumes $Q = g(p_x)$ of the non-numeraire good and $y = \bar{Y} - p_x g(p_x)$ of a numeraire good (where p_x is the price of non-numeraire goods). We can then derive the representative honest consumers' indirect utility as

$$I_H = CS_x + \bar{Y} - \varepsilon \tag{4}$$

In (4) we have that ε is a tax cost collected from honest people to finance the enforcement policy. CS_x is the consumer surplus such that $CS_x = f(g(p_x)) - p_x g(px)$, and it is well-known that

$$dCS_x = -p_x^{'} Q dQ \tag{5}$$

In the case of honest people, the model defines a net consumer, and their income is taken to be given. However, a more realistic characterisation would be to recognise that they earn an income from work. If we consider that honest workers receive their income from working for companies, we could assume that the variable cost of companies would be the income of honest people. This, considering that there is only one factor of production in a perfectly competitive market. Therefore, the salary would be equal to the marginal and average costs of companies. Incorporating this income from honest people would not affect the results presented in this article, since it would only increase the magnitude of the impact of public policy on the income of companies and the income of honest people. The cost of companies is deducted from the income of honest people and the result obtained in this article does not change. Due to these points, we can characterize honest people as net consumers, which simplifies the analysis.

The third actor is the dishonest people. As we mentioned before, dishonest people work and obtain their income from illegal activities, specifically in this case from the kidnapping of firms' executives. By assuming that kidnappers behave like monopolists, we can refer to them as 'the kidnapper'. The indirect utility of the kidnapper is given by the expected income

$$I_D = \theta\left(R - c_R\right) + \left(1 - \theta\right)\left(-c_R\right) \tag{6}$$

where R is the ransom, and c_R is the operating cost for kidnapping. This expression establishes that the income of the kidnapper is equal to the profit obtained from the kidnapping (R - c_R) multiplied by the probability of being successful θ, plus the operating cost if they are unsuccessful ($-c_R$) multiplied by the probability (1 - θ).

In the case of dishonest people, Betancourt Cabrera (2013) argues that in Mexico kidnappers are generally characterised young people between 22 and 35 years of age, with low levels of empathy, who are originally and mainly engaged in informal trade. They often turn to kidnapping as a result of drug addiction and come from dysfunctional families. They get involved in the kidnapping business to increase their economic earnings, since it is easy to commission and has a relatively high economic return. Over a period of approximately a year and a half this becomes their exclusive paid activity, as the model displays.

According to INEGI (2022), by 2009 there were 9,014 people imprisoned for this crime in Mexico, and 28,951 by 2022, an increase of more than 300%. On the other hand, the organisation Alto al Secuestro reports that from 2018 to date there are an average of 3.4 kidnappings per day in Mexico. However, this figure is likely higher since it is estimated that for each reported kidnapping there are 5 unreported cases (Alto al Secuestro, 2023). The magnitude of this problem and the high perception of insecurity mentioned above make this criminal activity a

highly relevant problem. Additionally, victims of kidnapping in Mexico can be from different social levels and include recent migrants, although the most wanted continue to be people of known economic solvency (businessmen, industrialists, politicians, merchants, ranchers, artists) and their relatives, according to the proposal of this model.

Finally, the fourth actor is the government. The government's objective function considers the income of honest people and profits of firms as well as the income of the kidnapper, because the government obtains an income from them in the form of a political contribution. The intention of this political contribution (bribe) is to affect the enforcement levels set by the government. Taking into account (3), (4) and (6), the government's objective function is

$$G = \rho c + n\pi + I_H + I_D \tag{7}$$

In (7) the government considers the benefit of firms, honest and dishonest people. The first term is the payment received as a political contribution and the second, third and fourth terms are the producer surplus, income of honest people and income of dishonest people respectively. In (7) ρ is the corruption parameter and c is the political contribution paid by the kidnapper in the form of a bribe. Even when the national government is unlikely to be willing to accept a bribe from the kidnapper, this case fits perfectly in the case of local governments. Additionally, $\rho > 1$ and using equations (3), (4), (6) and (7), government's objective function can also be written as $G = \rho c + (n\pi + I_H + I_D - c)$. Reorganising the equation, we get $G = (\rho - 1)\, c + (n\pi + I_H + I_D)$. Hence, the government attaches a positive weight to contributions provided that $\rho > 1$. In other words, when $\rho = 1$ there is no political relationship between the government and the kidnapper; the weight that the government attaches to social welfare is normalised to one.

As mentioned before, the probability of the kidnapper's success depends on the enforcement level and is defined as $\theta = \theta(\varepsilon)$. This probability affects the result of the model. In this sense, the government establish the optimal enforcement level considering the kidnapper's lobbying and the benefit for firms and honest people. The enforcement level is a policy strategy for the government and is determined by political equilibrium. We shall closely follow Dixit, Grossman and Helpman (1997) in specifying this equilibrium. The firms and honest people do not lobby the government, but the kidnapper makes political contributions to influence the government's decisions.

Political equilibrium is the outcome of a two-stage game. In stage one, the kidnapper chooses their contribution schedule. The government then sets its enforcement level in the second stage. A political equilibrium is given by

i. a political contribution function $c^*(\varepsilon)$, such that it maximises the kidnapper's income given the anticipated political optimisation by the government, and

ii. a variable, ε^*, that maximises the government's objective function given by (7), taking the contribution schedule as given.

As discussed in Dixit et al. (1997), the model can have multiple sub-game equilibria, some of which may be inefficient. These authors develop a refinement that selects truthful equilibria that result in Pareto-efficient outcomes. Bernheim and Whinston (1986) develop a refinement in their menu-auction problem. Following this, first Grossman and Helpman (1994) and later Dixit et al. (1997) develop a refinement (as in Bernheim and Whinston (1986)) for the political contribution approach, which selects Pareto-efficient actions. However, the framework is focused on the specific aspect of the political contribution equilibrium with only one lobby actor; in such a case we closely follow the original Grossman and Helpman (1994) approach in modelling this equilibrium.

Stated formally, let (c° (ε°, $I_D{}^\circ$), ε°) be a truthful equilibrium in which $I_D{}^\circ$ is the equilibrium reserve utility of the kidnapper. Then, (c° (ε°, $I_D{}^\circ$), ε°, $I_D{}^\circ$) is characterised by

$$c\left(\varepsilon, I_D^{\circ}\right) = Max\left(0, \delta\right) \tag{8}$$

$$\varepsilon^{\circ} = Argmax_{\varepsilon}\left\{\rho c\left(\varepsilon, I_D^{\circ}\right) + I_H\left(\varepsilon\right) + I_D^{\circ} + n\pi\left(\varepsilon\right)\right\} \tag{9}$$

where $\delta$is defined as

$$I_D^{\circ} = \left(I_D - \delta\right) \tag{10}$$

Equation (8) characterises the truthful contribution schedule chosen by the kidnapper, where δ can be interpreted as the compensation variation. Hence, equation (8) (together with (10)) states that the truthful contribution function $c(\varepsilon, I_D{}^\circ)$ relative to the constant $I_D{}^\circ$ is set to the level of compensating variations. In other words, under truthful contribution schedules the payment to the government is exactly equal to the change in the kidnapper's income caused by a change in policy ε (see Dixit et al (1997, p.760)). Equation (9) states that the government sets the enforcement level to maximise its objective, given the contribution schedule offered by the kidnapper.

Equations (1) to (10) define the structure of the theoretical model that, as indicated, is established in terms of a maximisation problem where there is a political contribution. In this political equilibrium, the government obtains the same utility that it would obtain if it did not allow any contribution. Therefore, given this argument, in the model presented here, the kidnapper would get all the benefits of bribing. This situation, without a doubt, is harmful to honest citizens.

COMPARATIVE STATICS

After setting the model, we shall obtain the optimal enforcement level against the kidnapper. To model the investment decision, we consider the case of an endogenous number of firms. We assume firms would move into the market as soon as they see positive profits and would otherwise keep out of the market. Therefore, from (3), the investment equilibrium condition is given by

$$\pi = -p_x^{'}x^2 - R\theta = 0 \tag{11}$$

Our interest is to determine the impact of the enforcement level on the number of incoming firms. As we know, a larger enforcement level implies a lower payment to a kidnapper. We can obtain the derivative of the number of firms with respect to enforcement by implicit derivation such as

$$\frac{dn}{d\varepsilon} = -\frac{\partial F / \partial \varepsilon}{\partial F / \partial n} \tag{12}$$

where

$$F = \pi$$

From (11) we have

$$\partial F / \partial \varepsilon = -R\theta'(\varepsilon) > 0$$

$$\partial F / \partial n = -2xp_x^{'}x_n < 0$$

Let us assume that $x_n = \frac{dx}{dn} < 0$ This is a very common assumption in literature and is obvious because a larger number of firms reduces the amount of output produced per firm in the market. More competition means less market share. To simplify, we consider that this is a linear relation such that

$$x_n = -\,x / (n+1)$$

Considering this assumption and using implicit derivation, from (11) and (12) we have that

$$\frac{dn}{d\varepsilon} = \frac{R\theta'(\varepsilon)(n+1)}{2x^2 p_x^{'}} > 0 \tag{13}$$

We prove that an increase in the enforcement level increases the number of incoming firms due to the reduction in the cost of kidnapping. On the other hand, from (12) and (13) we have

$$\frac{dx}{d\varepsilon} = -\frac{R\theta'(\varepsilon)}{p_x^{'} 2x} < 0 \tag{14}$$

The increase in the enforcement level reduces the optimal output of each firm because there is an increase in competition and a reduction in the market share for each producer. Before obtaining the optimal enforcement level let us consider some comparative static. From (11) and (14) we get

$$\frac{d\pi}{d\varepsilon} = 0 \tag{15}$$

The free movement of firms moving into/out of local markets keeps the benefit of each firm constant. An increase in enforcement increases the number of incoming firms, reducing the benefit of the firms. However, this increase in enforcement levels reduces ransoms and increases the benefit of firms. To obtain the effect of the enforcement policy on producer surplus we take (11), (13) and (15) such that

$$\frac{d(n\pi)}{d\varepsilon} = 0 \tag{16}$$

Considering the investment equilibrium condition, the producer surplus is fixed because of the free entry and exit of firms. On the other hand, to get the impact of enforcement levels on consumer surplus, from (5), (13) and (14) we get

$$\frac{dCS_x}{d\varepsilon} = -\frac{nR\theta'(\varepsilon)}{2} > 0 \tag{17}$$

With an increase in the enforcement level, the payment for ransom decreases. This decreasing kidnapping cost increases the total output produced for the market and reduces the price of goods. In brief, an increase in the enforcement level increases the consumer and producer surplus.

Following the comparative static analysis, we consider the impact of the enforcement level on the indirect utility of honest people. From (4) and (17) we have

$$\frac{dI_H}{d\varepsilon} = -\frac{nR\theta'(\varepsilon)}{2} - 1 \tag{18}$$

With an increase in the enforcement level, honest people benefit from an increase in the consumer surplus, but harm is due to the payment needed for maintaining this policy. The impact of an enforcement level depends on the size of the

consumer surplus benefit. On the other hand, the impact of an increase in enforcement levels on the indirect utility of the kidnapper is given by (6) as

$$\frac{dI_D}{d\varepsilon} = R\theta'(\varepsilon) < 0 \tag{19}$$

which is unequivocally negative. An increase in the enforcement level reduces the benefit for the kidnapper as there is a reduction in their probability of success.

Once we have set the comparative static, we have the backbone for our analysis. Next, we must define the optimal enforcement level of the government considering the benefit for honest people and firms, and the benefits obtained by governments from the bribe offered by the kidnapper.

GOVERNMENT´S OPTIMAL POLITICAL REACTION

In this section, we will obtain the optimal political reaction to kidnapping. From the comparative statics, we can determine the optimal political reaction considering that the government considers the welfare of its nationals, the benefit of the investment, and the political contribution offered by the kidnapper.

Defining an optimal political reaction rather than just an optimal policy is not trivial. There are two reasons: Firstly, it is highly expected that the government set policies against any criminal activity, but in this case, the government may omit its responsibility using political arguments. Secondly, an optimal policy exercised by a legal authority assumes a set of actions within a valid legal context. In this case, we must speak of optimal reactions that lighten the implicit burden of certain illegality in an optimisation process that considers moving from within a legal context. Therefore, we must talk about optimal reactions that ultimately operate under the same optimisation criteria.

To obtain the optimal government reaction, we obtain the first-order conditions of the optimisation problem given in (7). From (13)-(19) we get:

$$G_\varepsilon = R\theta'(\varepsilon)\left[\rho - (n/2)\right] - 1 \tag{20}$$

From (20), we have that when there is a sufficiently high level of corruption ($\rho \gg 1$), then the first-order condition is negative, and the optimal policy reaction is not to have an anti-kidnapping policy ($\varepsilon^* = 0$). Although it is well known that countries or regions with a high level of corruption always exercise some type of fight against kidnapping, this result projects the net perceptions of the population concerning government action in the face of kidnapping as criminal activity.

Due to the corruption of government agents, who receive bribes from kidnappers, there is always a suspicion that the fight against kidnapping is a farce. In this case,

the positive effect of an anti-kidnapping policy on consumer surplus would be inhibited by the gains made by the government from the political contribution or bribe made by the kidnappers, minus the possible loss of producer surplus, as this fight attracts major competitors in the market.

On the other hand, with a low level of corruption ($\rho \to 1$), the first-order condition is ambiguous. The value of the first-order condition when the level of corruption is small depends on the number of firms originally located in the country. However, the number of firms is endogenously determined, and we should determine the conditions in which the number of firms may be small or large.

If we consider a linear demand $p = a - bQ$, and $Q = nx$, we can rewrite (2) as

$$x = \frac{\left(a - c_x\right)}{b\left(n+1\right)} = \frac{s_x}{\left(n+1\right)} > 0. \tag{21}$$

Here, s_x is the well-known market share. From (11), we explicitly get the number of firms such that

$$n = \frac{s_x}{\sqrt{A_1}} - 1 \geq 1 \tag{22}$$

where

$$A_1 = \frac{R\theta}{b} > 0$$

Therefore, from (20) and (22) with a low level of corruption ($\rho \to 1$), and a sufficiently small market share such that ($n \leq 2$), the first order condition is unequivocally negative, and the optimal political reaction is not to have an anti-kidnapping policy. On the other hand, when the market share is sufficiently large ($s_x \gg 0$), and consequently the number of firms is sufficiently larger as well ($n \gg 1$), then the first-order condition is positive. In this second case, the government's political reaction is to fight against kidnapping. Formally, we can say,

Proposition 1 *With a sufficiently large corruption level, the optimal government reaction to kidnapping is zero. On the other hand, when the level of corruption is sufficiently small, the optimal government reaction to kidnapping is positive when the market share is large enough, and zero when the market share is small enough.*

PROOF From equation (20), in the first case, with a sufficiently large corruption level ($\rho \gg 1$) we have that $\rho \gg \left(n/2\right)$ and (20) would be unequivocally negative, so the optimal government reaction is zero. In the second case, with a sufficiently small corruption level ($\rho \to 1$), the term inside the square bracket can be rewritten as [$1 - (n/2)$], so when $n \leq 2$ it is clear that (20) is negative and the optimal government reaction is zero. When $n \gg 1$ the first term on the right-hand side of (20)

would be positive and larger than the negative second term, therefore the optimal government reaction is positive.

Intuitively speaking, in the first case, a high level of corruption overstates the impact of the political contribution on the government's objective function, despite the damage to the utility of honest people and the reduction in the number of firms that could enter the market. The benefit received by the government from the kidnappers discourages firms from entering the market and therefore reduces the benefit in consumer surplus.

In the second case, when the level of corruption is low, or at least when the perception of corruption is low, the optimal government reaction depends on the size of the market. When the market size is small, only a few firms enter the market, and the consumption benefit is negligible. The cost of financing a policy against kidnapping is too high, and the government's best reaction is not to pay attention to the crime. However, when the market size is large enough, the number of firms in the market is large, and the consumer surplus benefit is larger than the cost of financing a policy against kidnapping. The optimal reaction of the government is to set a policy against this criminal activity.

On the other hand, both results depend on the government's objective function being concave. In other words, the government seeks to determine the optimal level of effort that will give it the highest level of benefit possible, considering that there is a limited level of effort. This is because its policy only impacts the kidnapper's probability of success, and in this case, the effort cannot be less than zero, nor greater than a level where the probability of the kidnapper's success is zero ($0 \geq \varepsilon^{*} \geq \bar{\varepsilon}$). From (20) we obtain the second-order condition as:

$$G_{\varepsilon\varepsilon} = R\left[\theta''(\varepsilon)(\rho - n/2) + \frac{\theta'(\varepsilon)^2(n+1)}{4\theta}\right] \tag{23}$$

For this condition to be negative, it not only relates to the level of existing corruption and the size of the market share, but above all the second derivative of the probability of success of the kidnapper with respect to the level of government effort ($\theta''(\varepsilon)$). This second derivative is not trivial in our case, since in it there is an element of analysis that allows us to better intuit around the problem raised here.

The second derivative shows us the dynamics of the kidnapper's probability of success in the face of a variation in the level of effort made by the government. We already know that with a higher level of effort, the kidnapper's probability of success decreases. However, this fall can decrease or increase according to the government's learning process in the fight against kidnapping and the learning process of the kidnapper in being successful in their criminal activity.

When the second derivative is negative ($\theta''(\varepsilon) < 0$) with a small effort made by the government, the kidnapper's probability of success decreases by a small

proportion, but as the effort gets larger and larger, the kidnapper's probability of success decreases by an ever greater amount. In this case, we can infer that the action of the government permeates slowly at the beginning and faster later in the face of the action of the kidnapper, and this would imply that the government has a learning process against kidnapping that is slower at the beginning and faster later.

In this case, when the government has this increasing learning process, the second-order derivative (23) is negative only if the corruption parameter is sufficiently large. If we seek to fulfil the condition of concavity of the government's objective function, then from (23) we can say that the optimal reaction will be to establish the laxest possible policy against kidnapping ($\varepsilon^* = 0$).

When the second derivative is positive ($\theta''(\varepsilon) > 0$) with a small effort made by the government, the kidnapper's probability of success decreases by a large proportion, but as the effort gets larger, the kidnapper's probability of success decreases by an ever-smaller proportion. In this case, we can infer that government action permeates quickly at first and slowly later. Government action is efficient at first but inefficient later. This would imply that the government's learning process is faster at the beginning and slower later.

In this case, where the government has a smaller learning curve than the kidnapper, the second-order condition (23) would be negative if there was a sufficiently small level of corruption ($\rho \rightarrow 1$) and many firms ($n \gg 1$). However, under these conditions, we would get a positive enforcement level ($\varepsilon^* > 0$) according to (20), and the probability of success of the kidnapper would be small. So, from the previously mentioned conditions and the positive enforcement level, the second term inside the square brackets in (23) is positive and large, so the second-order condition is ambiguous, and we can omit this option. Therefore, the only optimal government reaction is not to fight against kidnapping. If we seek to fulfil the concavity condition of the government's objective function, then from (20) we can say that the optimal reaction is to establish the laxest possible policy against kidnapping ($\varepsilon^* = 0$).

Intuitively speaking, the concavity condition forces us to consider high corruption, which is pertinent in the case of many developing economies. This implies that there is also a high sensitivity to political contributions. In this way, when the government has an initially slow learning process in the fight against kidnapping, the cost of learning will go against the benefit that it could obtain as contributions or bribes. With a high level of corruption, the benefit of political contribution exceeds the possible benefit in terms of investment and consumption. In addition, the slow initial learning of the government in the fight against kidnapping makes implementing an anti-kidnapping policy costly. Therefore, the government would have the laxest political reaction possible.

IIn the second case, when the second derivative is positive ($\theta''(\varepsilon) > 0$), even when the concavity condition is not met, we must consider low corruption, which implies

that there is also a low sensitivity to political contributions. This would encourage the government to have the strictest political reaction due to the convexity of the function, meaning a corner solution. This is intuitively obvious. The low corruption level and the fast initial learning of the government in the fight against kidnapping make it clear that the government has a strong incentive to fight against kidnapping. However, it is not realistic in the context of developing countries characterised by high levels of corruption.

CHANGES IN THE GOVERNMENT´S OPTIMAL REACTION

Once we have determined the optimal reaction level, based on the first-order condition (20), we analyse the impact of variations in corruption levels, the ransom amount, and the size of the market. These variables are the ones that, according to (20), can affect the optimal reaction level. To obtain the variation of the optimal effort in the face of a variation of the level of corruption, we take the implicit derivative of (20) such that:

$$\frac{d\varepsilon}{d\rho} = -\frac{G_{\varepsilon\rho}}{G_{\varepsilon\varepsilon}} \tag{24}$$

where $G_{\varepsilon\rho} = R\theta'(\varepsilon) < 0$. Combining this result with the usual assumption of concavity of government objective function in ε, ($G_{\varepsilon\varepsilon} < 0$) we have

When there is lobbying by the kidnapper in the form of a political contribution or bribery, an increase in the level of corruption reduces the optimal level of effort in fighting kidnapping. Formally we can say,

Proposition 2 *When there is lobbying by the kidnapper in the form of a political contribution or bribery, an increase in the level of corruption reduces the optimal level of effort in fighting kidnapping.*

Intuitively we have that an increase in the parameter of corruption increases the impact of the political contribution on the objective function of the government. In this way, the increase in the level of corruption gives greater weight to the bribe offered by the kidnapper as it is more widely accepted. In this case, there is a reduction in the optimal reaction, encouraging this illicit activity. The benefit of a higher probability of success for the kidnapper translates into greater political input and a reduction in the amount of taxes collected to fight kidnapping. These gains exceed the losses from the reduction in the number of firms and hence the reduction in consumer surplus.

Of course, due to the concavity of the function, the optimal enforcement level is zero. It seems obvious to say that the result does not make sense because the enforcement cannot be negative. However, we are talking about the optimal reaction of the government, and with an increase in the corruption parameter, we

cannot rule out the possibility of a negative enforcement level, which would mean criminal support for the kidnapper. Politically unthinkable, but possible in very corrupt contexts.

Let us now consider an exogenous change in ransom requested by the kidnapper, and how it affects the optimal reaction. In such a case, we model this change as an increase in the parameter *R*; from the implicit derivative of (20), we obtain:

$$\frac{d\varepsilon}{dR} = -\frac{G_{\varepsilon R}}{G_{\varepsilon\varepsilon}} \tag{25}$$

where

$$G_{\varepsilon R} = \theta'(\varepsilon)\left[\rho - n/2\right] \tag{26}$$

Under the concavity requirement of the objective function, the corruption parameter should be large, so (26) is expected to be negative. From (26), and combining this result with the usual assumption of concavity of the government's objective function in ε, ($G_{\varepsilon\varepsilon} < 0$) we have

$$\frac{d\varepsilon}{dR} < 0$$

Even when an increase in ransom reduces firms' incentives to enter the market, the political contribution also increases. We can formally say,

Proposition 3 *When there is lobbying by the kidnapper in the form of a political contribution or bribery, an increase in the ransom amount reduces the optimal level of effort in fighting the kidnapping.*

This is why the government has no incentives to pursue an anti-kidnapping policies, rather to do the opposite. As in the previous case, under concavity conditions, the optimal government reaction is not to fight against kidnapping, but an increase in corruption may even incentivise supporting kidnappers.

Finally, we consider the impact of an increase in the size of the market on the optimal government reaction. To obtain the variation of the optimal effort in the face of a variation in the level of corruption, we take (22) and the implicit derivative of (20) such that:

$$\frac{d\varepsilon}{ds_x} = -\frac{G_{\varepsilon s_x}}{G_{\varepsilon\varepsilon}} \tag{27}$$

where

$$G_{\varepsilon s_x} = -\frac{R\theta'(\varepsilon)}{2A_1^2} > 0 \tag{28}$$

From (28), and combining this result with the usual assumption of concavity of the government's objective function in ε, ($G_{\varepsilon\varepsilon} < 0$) we have

$$\frac{d\varepsilon}{ds_x} > 0$$

An increase in the market share makes the investment more profitable and new firms come into the market, increasing production and consumer surplus. Formally we can say,

Proposition 3 *When there is lobbying by the kidnapper in the form of a political contribution or bribery, an increase in the market share increases the optimal level of effort in fighting kidnapping.*

The optimal government reaction is to increase the enforcement level against kidnapping to benefit from consumer and producer surplus despite the cost of such a policy. Market incentives promote anti-crime policies because the benefits are granted by consumer and producer surplus even when the policy is expensive to apply.

HARMONISATION POLICY

From the point of view of principal-agency theory, where the government (Principal) delegates the responsibility of putting their purposes and ends into action to the dishonest agent to maximize their utility functions, the utility of honest people and the benefit for firms are part of the government benefit scheme. Therefore, it could be argued that they are "inserted" agents within the objective function of the government. Therefore, from the modelling point of view, it is valid to define agents as inserted within the objective function of the government because they are part of it.

On the other hand, the dishonest agent interacts with the government because of corruption. Although principal-agent theory considers that the principal maintains a certain functional distance from the agents, in our case this independence is limited by corruption, which is the link between the dishonest agent and the government.

The interaction between the government and dishonest people is what affects the balance. Therefore, it would be necessary to analyse the conditions of this interaction that would enable the objectives of all actors to coincide. One way to alienate everyone's objectives would be for the kidnapper's profits to be shared with honest agents, just as was done with drug trafficking in the 1980s in Mexico and Colombia. Considering the neutrality of producer surplus, sharing the benefits with honest people would offset their drop in consumer surplus, and the absence of an anti-kidnapping policy would be the optimal reaction. This result is only possible when there is no external pressure that affects this result. An example of the result of external pressure is the case of the American government's certification policy on drug trafficking issues which affected internal policy decisions.

Another option would be to compensate the dishonest for the loss of income by encouraging their incorporation into the honest labour market and making the cost of kidnapping more expensive using extreme legal measures. Thus, establishing a policy against kidnapping would be desirable.

CONCLUSIONS

In this article, we have modelled the stylised fact of why some of the policies used in developing countries to inhibit kidnapping have had ambiguous effects on the goal of eradicating kidnapping. To do this, we have constructed a model in which a country receives private investment as a function of its government's efforts to reduce kidnapping. In this country, kidnappers offer political contributions or bribes, the impact of which depends on the level of government corruption.

The government reacts by setting the level of effort in the fight against kidnapping by considering the contributions paid in the form of bribes, the profit of firms, and the welfare of inhabitants. As a result, government corruption, the payment of political contributions, and the ambiguous impact of these policies on the producer surplus can discourage any government-promoted fight against kidnapping, regardless of the benefit that can be derived from the consumer surplus.

Among our main findings, we have seen that a greater effort in the fight against kidnapping could increase the number of firms entering the economy due to a decrease in the cost of security. However, this has two opposite effects: On the one hand, a larger number of firms increases the total output of the economy, improving consumer surplus. On the other hand, the increase in the number of firms reduces the optimal output of each producer due to increased competition.

In this sense, producer surplus is ambiguous since, on the one hand, with a reduced number of firms, an anti-sequestration policy improves producer surplus by reducing the cost of security more than the loss of monopoly power. On the other hand, when the number of firms is relatively larger, an anti-kidnapping policy decreases producer surplus due to the loss to incoming competition, irrespective of the benefit of reduced cost of security.

An anti-kidnapping policy decreases the kidnapper's profit and will have a positive effect on the profit of honest people through consumer surplus, provided that the cost of financing the policy is not too high. Otherwise, the implementation of a costly anti-kidnapping policy will negatively affect the profits of honest people.

The determination of the optimal reaction will depend on two parameters: the level of corruption and the size of the market. The former determines the sensitivity of the political contribution that is central to the government's decision, and the latter determines the level of producer and consumer surplus.

In addition to these conditions, we understand that the government's learning process against kidnapping is important because when this learning is slow, the fight

against kidnapping is discouraged if the level of government corruption is high. On the other hand, when this learning is initially fast, and the market for goods is large, then there are incentives for fighting kidnapping if corruption is not very widespread.

The determining variable is the level of corruption, as it determines the sensitivity of political contributions. In the context of developing countries, it is well known that this high level of corruption is a common reality. Therefore, we can say that when the level of corruption is high, certainly the specific weight of the contribution is significant, and the optimal reaction will be to establish the laxest policy in the fight against kidnapping. This is the main result of this theoretical work.

Moreover, kidnapping is an atomised criminal activity. The fight against kidnapping is complicated because the modus operandi is simple, basic and can be carried out by large or small groups of criminals. It can be executed very quickly and solved without the intervention of governments or authorities. Establishing an anti-kidnapping policy is very costly because it is difficult to fight small criminal groups and unexpected behaviour. There are no expected targets as is the case with robbery; anyone, anytime could be the chosen target, regardless of their social or economic status.

When corruption levels are low, kidnapping is not a realistic option in developing countries. The impact of political contributions would be minimal, and the government would probably opt for a more active anti-kidnapping policy. If, in addition, the market is large enough, governments would have incentives to establish an active anti-kidnapping policy to increase consumer and producer surplus.

From the above, we can establish that the variance of the optimal reaction to changes in corruption is negative since an increase in corruption magnifies the impact of the political contribution and reduces the incentives for fighting kidnapping. However, if the optimal reaction is zero, it is expected that there will be no policy change as zero is the minimum possible level. However, collusion between the government and kidnappers seems to be an increasingly common reality in countries with high levels of corruption. One could speak of government support for criminal groups, and while this may be morally undesirable, the existence of a negative level of enforcement may be possible. An increase in the ransom produces the same result, as it increases the amount of the political contribution or bribe.

On the other hand, an increase in the size of the market incentivises governments to establish a strict anti-kidnapping policy, since the benefit gained through consumer and producer surplus is greater the larger the market.

Political corruption can increase or inhibit the action of local actors and produce some unexpected results in the fight against kidnapping. Corruption can work against policy efforts if economic conditions offer favourable alternatives for growth. For this reason, fighting corruption in developing countries may be the most appropriate strategy for stopping kidnapping. Institutional anti-corruption

reforms and economic incentive programmes aimed at replacing kidnappers could reduce the problems associated with this criminal activity.

The limitations of the model are due to its enormous simplification. The model only defines two homogeneous representative agents and does not consider the diversity of both criminal activities and the characterisation of honest people who are only net consumers. Making honest people also part of the factors of production would make the model more realistic. On the one hand, kidnapping and kidnappers are very diverse: economic kidnapping with and without violence, intimidation instead of bribery, the government being part of the activity or only receiving a bribe for changing public policy, are just a few scenarios that may affect the result obtained because it would change or eliminate the principal-agent approach. On the other hand, if firms lobby the government by promoting an anti-kidnapping policy, it would create lobbying competition and favour the group that offers the greatest political contribution. All these limitations promote possible extensions that enrich the model, although model management could be complicated.

Another possible extension of the model would be the incorporation of other agents. For example, in the case of Colombia, the presence of an armed conflict may or may not affect the balance depending on whether the criminal organisation (for example, guerrilla groups) uses kidnapping to finance its movement. If kidnapping is part of the income obtained to finance the armed struggle of these guerrilla groups, as in Gilbert (2022), this will reduce the benefit for the kidnappers and will encourage a stricter policy against kidnapping because the government would have a greater incentive to fight this criminal activity and reduce the flow of income to violent groups. On the other hand, as in the Mexican case, it is also possible that these groups could have an absorption or agreement to maximize the benefit of both, and end up merging their criminal capacities. Finally, if the guerrilla groups do not finance their criminal activities with kidnapping, there does not seem to be a major impact on the balance, although there may be multiple secondary scenarios.

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