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How middle-men can undermine anti-corruption reforms

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Abstract

The anti-corruption reform in the Tanzanian tax bureaucracy in the mid-1990s was apparently a short-lived success. In the wake of the reform, a number of "tax experts" established themselves in the market, many of them being laid off tax bureaucrats. We argue that middle-men can undermine the effect of an anti-corruption reform by reducing the uncertainty that firms face vis-à-vis a reformed tax bureaucracy, which in turn may encourage firms to pay bribes rather than taxes. Indeed, under some circumstances, middle-men can cause corruption to be higher after the reform than before the reform. Since the demand for middle-men may increase with the extent of the reform, we also demonstrate that a small reform may be more efficient in combatting corruption than a more radical reform.

JEL: H26, K42, O12

Keywords: Corruption, reform, middle-men, institutions

1   Introduction

Corruption is a widespread phenomenon in the tax administrations of developing countries. A number of African countries have implemented bureaucratic reforms in order to reduce corruption and increase tax revenues. Tanzania introduced a major reform in 1996 with the formation of Tanzania Revenue Authority (TRA).[1] In this reform, among other measures, 35% of

[1]See Fjeldstad (2003) for further discussion of the reform in TRA.

the staff was fired. Initially, the reform appeared to be successful. Reports indicated that corruption was declining. However, it has been argued that the success did not last for long, and that the positive process experienced in the initial phase after the introduction of TRA has later been reversed.

One possible explanation for the short-lived success of the reform is that it was not sufficiently radical. There may be strong forces pulling the economy towards a highly corrupt equilibrium, and a "big push" reform may be needed to bring the economy on the path towards an equilibrium characterized by less corruption (see Andvig and Moene, 1990).

While this is a perfectly plausible argument, we suggest a different explanation. Our explanation is inspired by Fjeldstad's (2003) study of the TRA reform. He observes that following the reform, there was a sharp increase in the number of "tax experts" in Tanzania, many of them being laid off tax officers from TRA. Fjeldstad suggests that these experts entered into corruption networks with external actors. In accordance with this observation, the present study focuses on the role of middle-men as obstacles to anti-corruption reform. We argue that the anti-corruption reform may have failed not because it was too limited, as the "big-push" story suggests, but because it was *too* radical given the institutional quality of the bureaucratic structures, thus creating a market for middle-men which allowed corruption to continue in a new form.

The mechanism we propose is the following. Bureaucratic reform creates uncertainty in the business community about the degree of honesty in the bureaucracy. This uncertainty may induce some firms to pay taxes. However, the uncertainty also creates demand for middle-men with inside information about the reformed tax authority and an ability to influence the process of tax collection. A moderate reform creates limited demand for middle-man services, and hence potential middle-men may find it more profitable to seek alternative employment. A radical reform, on the other hand, may lead to the establishment of middle-men who undermine the reform process by connecting the business community with corrupt tax officers remaining in the reformed bureaucracy. The extent to which middle-men will find it profitable to operate in this way depends on the overall institutional quality of the bureaucracy, the level of punishment, and their alternative income opportunities.

How important is the role of middle-men in corruption? It is naturally difficult to establish empirical evidence in cases of corruption. In fact, as Susan Rose-Ackerman (2001) points out, it is precisely the unlawfulness of

these activities that creates demand for middle-men: "Because bribers and bribees are operating outside the law, they need to trust each other in order to maintain the relationships. They may design schemes that minimize the possibility of betrayal, such as making payment only when corrupt services are delivered, or that limit the costs of betrayal, such as the use of middlemen."

An indication of the importance of middle-men in facilitating corrupt deals with the Tanzanian tax administration can be found in *The Guardian (Tanzania)* on June 7, 2004. The main story that day reports on a consignment of electronic goods arriving at the Dar es Salaam port in the autumn of 2003. The container with the goods disappeared from the port without any import duty being paid. Apparently, a corrupt deal lay behind this incidence, involving the importer of the goods, TRA staff, a middle-man, and a clearing and forwarding firm. The importer contacted a middle-man to find ways of getting the goods out of the port without paying the required duty. A meeting was subsequently arranged at the Hill Tech Bar in Ukonga, Dar es Salaam, between officials from TRA and the clearing agents to "hatch a plot to sneak the container out of the port", as the story goes. The TRA employee and the clearing agent are reported to have been bribed 7 million Tsh and 2 million Tsh, respectively. The TRA in this way lost 20 million Tsh in customs duty on the shipment. The middle-man "played a leading role in the scandal before apparently disappearing into thin air." Evidently, this corrupt deal was not a single incidence. Rather, it "may be a pointer to other shady deals whereby containers are sneaked out of the Dar es Salaam port without customs duty being paid."

The main focus of our analysis is on the effect of a human resource reform, upgrading the degree of honesty amongst the tax bureaucrats. In most cases, however, an anti-corruption reform consists of a number of measures. By way of illustration, in Tanzania, after firing a large portion of the staff in 1996, they also developed an Anti-corruption and Integrity Development Strategy, with the aim of improving the systems of internal control, capacity building and monitoring. Yet another measure was the introduction of The Prevention of Corruption Bureau in order to improve the system of punishment of corrupt individuals.

We capture this multi-dimensional nature of an anti-corruption reform by considering three different measures available to the government. First, they may attempt to break up established networks by rotating the staff in the tax administration and to increase the degree of honesty of the administration by

firing corrupt officers and raising the ethical standards of the staff. We shall refer to these measures as a "human resource reform". Second, we consider a "legal reform" with increased punishment for corruption. Third, the government may attempt to improve control systems that make it more difficult for corrupt tax officers and middle-men to maneuver in the tax bureaucracy. We refer to such measures as an "institutional reform".

The ambition of our paper is to demonstrate that an anti-corruption reform may create a market for middle-men, which in turn may undermine the reform by creating a new channel for corruption. In fact, we show that in some cases the establishment of a market for middle-men may cause the reform to have the perverse effect of *increasing* the level of corruption in the economy, relative to the pre-reform level. We structure the analysis in the following way. Section 2 presents the model, describing first the pre-reform situation (Section 2.1), then the reform without middle-men (Section 2.2), and finally reform with middle-men (Section 2.3). Section 3 then moves on to describing how the anti-corruption reform affects the incentive for middle-men to enter the market. Section 4 demonstrates how middle-men may undermine reform. Section 5 concludes.

2 The model

Consider a bureaucracy in charge of collecting a uniform tax t from the firms in the economy. Some of the tax officers are corrupt. Firms dealing with a corrupt officer may pay a bribe, b_i, instead of the tax. Firms that are well connected with the political leadership or have low mobility costs can get away with paying a small bribe. Firms that are less influential or have high sunk costs may have to pay a higher bribe.[2]

The size of the bribe also depends on the quality of institutions, which we measure by q. The institutional quality may be seen as capturing the level of corruption among the top leaders in the tax administration and the overall quality in the administrative structures in the bureaucracy. More specifically, more or less developed control systems may be in place to supervise the tax collection process. The more developed are the control systems, the more side-payments a corrupt tax officer needs in order to make a corrupt transaction go through without being disclosed. Therefore, the higher is q,

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[2]The assumption that firms pay bribes according to their bargaining power finds empirical support in Svensson (2003).

the higher is the bribe that he will demand from a firm.[3] For simplicity, we assume that once the required bribe has been paid, the corrupt officer can complete the corrupt deal without exposing the firm to any risk of disclosure.

To capture in a simple way the assumptions that a bribe depends negatively on the firm's bargaining power, and positively on the quality of institutions and the tax rate, let the bribe demanded by a corrupt tax officer from firm i be given by,

$$b_i = \frac{c_i t}{1 - q},$$ (1)

where c_i is an inverse measure of bargaining power, assumed to be uniformly distributed across firms within an industry with the support $[0, 1]$.[4] The firm with the lowest bargaining power, i.e., characterized by $c_i = 1$, must pay a bribe equal to $t/(1 - q)$. Clearly, for the least influential firm, $q > 0$ implies $b_i > t$. Hence, this firm has nothing to gain from offering a bribe to its corrupt tax officer. At the other extreme, the most influential firm is characterized by $c_i = 0$, and for this firm, $b_i = 0$ for any $q < 1$. Due to its close connections with the political leadership or high degree of mobility, in any less than perfect institutional environment the most influential firm can get away without paying any bribe at all. For $q = 1$, we assume that no firm can afford to pay the bribe that the corrupt tax officer demands.

The government observes that corruption is a problem in the tax administration, and wishes to do something about it. It is, however, very difficult to establish exact knowledge about this problem. In particular, it is difficult to obtain evidence on corrupt transactions. Assume that the government can separate tax officers who are not involved in corruption from those who *may* be involved in corrupt transactions. The anti-corruption reform that the government considers to implement affects only this second group of tax officers, their number being given by n. The key feature of the campaign is a human resource reform, where some of these n tax officers are singled out, fired and replaced, while the rest are subject to internal rotation.[5] In this

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[3]One could argue that the bargaining strength of the tax collector also depends on the total number of corrupt tax collectors. It is straightforward to incorporate this feature in the model, but it will not affect the qualitative results.

[4]We can think of the firms characterized by $c_i \leq 1$ as a subset of all firms in the economy. These are the potentially corrupt firms. In addition, there may be firms characterized by $c_i > 1$, firms which, for moral reasons for instance, would never choose to pay a bribe. These firms play no role in the present analysis.

[5]For an experimental study of the effects of staff rotation in anti-corruption policies,

way, the government attempts to break up relationships established between firms and tax officers in the pre-reform regime.

2.1 The pre-reform situation

Prior to the anti-corruption campaign, firms have a long-standing relationship with their respective tax officers in the tax administration. We simplify by assuming that all firms know with certainty what kind of tax officer they are dealing with, i.e., whether he is corrupt or not. In the absence of middlemen, each tax official is assigned the responsibility for a group of firms, which we will refer to as an "industry". For simplicity, the industries are assumed to be identical.

Suppose that among the n tax officers that are affected by the reform, there are $l^0 < n$ tax officers that do not take bribes and $n - l^0$ that are corrupt. Recall, however, that the government does not have perfect information about which of the n officers are corrupt, and which are honest. In an industry dealing with one of the $n - l^0$ corrupt tax officers, the marginal bribe payer can be found from the condition $b_i = t$ and (1) as,

$$c_i = 1 - q \equiv c^0. \tag{2}$$

Since there are $n - l^0$ corrupt officers in the pre-reform regime, the total number of bribe paying firms is given by $(n - l^0) c^0$. A share $1 - c^0 = q$ of the firms in an industry dealing with a corrupt tax officer pay taxes prior to the reform, since the bribe demanded by the corrupt tax officer exceeds the tax. From (2) we can conclude that,

Lemma 1 *Prior to the reform, a share c^0 of the firms in an industry dealing with a corrupt tax officer pay bribes. The total number of bribes is given by $(n - l^0) c^0$.*

Clearly, the better is the institutional quality, the more firms pay taxes prior to the reform. As q approaches unity, the bribe a firm needs to pay approaches infinity, and the number of bribe paying firms goes to zero. For $q = 0$, all firms with $c_i < 1$ have something to gain from a bribe.

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see Abbink (2004).

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2.2 Reform and corruption without middle-men

A human resource reform in the tax administration aims at breaking up existing networks between bureaucrats and firms. In our model, firms belonging to the n industries affected by the reform have to deal with a new tax officer, and they do not know whether this tax officer is corrupt or not. This uncertainty may reduce the number of firms that choose to pay bribes.[6]

Reforms in the tax administration are usually reported extensively in the media and discussed and analyzed in the business community, and hence we can reasonably assume that firms are well informed about the aggregate performance of the reform. With respect to a human resource reform, this amounts to having a reasonable estimate of l, which denotes the number of honest tax officers in the group of n tax officers in the post-reform regime. We will restrict our attention to a "successful" reform, in the sense that the human resource reform increases the number of honest tax bureaucrats, i.e., $l > l^0$. Moreover, we limit our analysis to $l < n$, meaning that not *all* corrupt tax officers can be removed by the reform.

The human resource reform takes place in an environment of a given set of legal and institutional standards, and the effect of the human resource reform depends on these standards. Moreover, the government may seek to change the institutional and legal environment. We shall consider both a "legal reform" involving increased punishment p for firms that are caught offering bribes, and an "institutional reform" aimed at improving institutional quality, q. Unless otherwise stated, we limit our attention to $q < 1$ and $p > 0$, meaning that the institutional quality is less than perfect, and that there is a positive punishment for corruption.

An improvement in the institutional quality of the tax administration makes it more difficult for corrupt tax officers to operate. From (1) we see that an increase in q increases the bribe a firm needs to pay in order to avoid the tax. The higher is q, the lower is c^0, and hence the fewer are the firms that are willing to pay this bribe and the more firms choose to pay the tax. In addition, as will be clear later, improving the institutional quality also affects the ability of middle-men to operate, thereby reducing the extent of corruption via such intermediaries.

We make the assumption that the chance of making a bribe offer to an honest tax collector after the reform is proportional to the share of honest

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[6]We can think of the reform as institutionalizing the process of rotation, and therefore introducing uncertainty on a permanent basis for the business community.

tax officers in the reformed bureaucracy, i.e., l/n. Let $\bar{\pi}$ represent profits prior to taxes or bribes. For simplicity, we assume that $\bar{\pi}$ is the same for all firms. The expected profit of a firm suggesting a corrupt transaction in the reformed bureaucracy is given by,

$$\pi_i^b = \bar{\pi} - \left(\frac{n-l}{n}\right) b_i - \frac{l}{n}(t+p). \tag{3}$$

The second term on the right hand side gives the likelihood that the firm is matched with a corrupt bureaucrat times the bribe it has to pay. The third term gives the likelihood that the firm is connected to an honest bureaucrat, in which case it has to pay the tax plus a punishment. Note that this punishment is not necessarily the result of a verdict in a court of law. Indeed, it may be difficult to convict firms for making corrupt offers. Still, offering a bribe to an honest bureaucrat is likely to be costly to a firm. The bureaucrat may decide to investigate the firm's past tax record and to closely monitor its current operations. In this process, irregularities could well be disclosed that would not have come to the attention of the authorities had the firm paid the tax in the first place. In the following, however, we will have in mind a legal punishment when we discuss the implications of increasing p as part of an anti-corruption reform.

If a firm decides to pay the official tax, its profits are given by,

$$\pi^t = \bar{\pi} - t. \tag{4}$$

Using (3) and (4), the condition $\pi_i^b = \pi^t$ gives us the share of firms that choose to continue to offer bribes, despite the uncertainty imposed on them by the reform,

$$c_i = \max\left\{\left[1 - \left(\frac{l}{n-l}\right)\frac{p}{t}\right](1-q), 0\right\} \equiv c^*. \tag{5}$$

From (2) and (5) we see that,

Lemma 2 *After a human resource reform, in the absence of middle-men, a share $c^* < c^0$ of the firms in each of the n industries affected by the reform offer bribes. The total number of successful bribe attempts is given by $(n-l)c^* < (n-l^0)c^0$.*

Note that the firms with the strongest bargaining power, i.e., with the lowest c_i, are the ones that continue to offer bribes after the reform. Intuitively, these are the firms that have the most to gain from paying a bribe rather than the honest tax. Consequently, a share c^* choose to offer bribes and a share $(1 - c^*)$ choose to pay the tax.

From (5) we also see that,

Lemma 3 *For $c^* > 0$, $\frac{\partial c^*}{\partial l} = -\frac{pn(1-q)}{t(n-l)^2} < 0$, $\frac{\partial c^*}{\partial p} = -\frac{l(1-q)}{t(n-l)} < 0$, and $\frac{\partial c^*}{\partial q} = -\left(1 - \frac{l}{n-l}\frac{p}{t}\right) < 0$.*

The policy implication from Lemma 3 is that the government should carry out as radical a reform as possible. This means replacing as many corrupt tax officers as possible, and increasing the level of punishment and improving the institutional quality as much as possible. Ideally, this should imply a reformed bureaucracy consisting of only honest tax officers ($l = n$), eliminating the ability of firms to avoid taxation. Alternatively, the government could impose an infinitely high punishment, say, death penalty, for offering bribes.[7] In this case, even the smallest human resource reform would eliminate all corruption. There may, however, be problems with both of these recommendations. Regarding punishment, it may be politically unfeasible to raise the punishment above a level that people regard as "fair". As for firing and hiring tax officers reform, it is probably impossible to identify all corrupt bureaucrats and replace these with equally competent, but honest, people.

As a result of these limitations to reform, dishonest bureaucrats are likely to remain in the reformed bureaucracy. Similarly, the level of punishment will not be sufficiently high to eliminate all corruption. Networks may then be established between these corrupt tax officers and firms, by the assistance of middle-men. We now turn to an analysis of how the presence of middle-men affect the reform.

2.3   Reform and corruption with middle-men

The fired tax officers, or other individuals with inside information and connections in the reformed bureaucracy, face the choice of entering into some

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[7]Tanzi (1998: 574) reports that for instance China has applied the death penalty to some individuals accused of corruption.

productive activity or establishing themselves as "tax experts", who we shall generally refer to as middle-men. We will for now assume that a middle-man has indeed entered the market. The present section derives the share of firms that will make use of his services. We later deal with the issue of whether a middle-man will in fact choose to enter or not.

The middle-men have inside information about the people in the bureaucracy, and can assist firms wishing to make a corrupt transaction. For simplicity, we assume that each middle-man can service only one industry. Middle-men are able to influence procedures, such that a firm wishing to pay a bribe rather than the tax is guided to a corrupt tax officer. Their ability to do so, however, depends on the quality of institutions. We assume that the probability $s(q)$ of a middle-man successfully connecting a firm to a corrupt tax officer depends negatively on q. To simplify, we assume that $s(q) = 1 - q$, and that q also represents the probability of the middle-man failing to influence the process. When $q = 0$, institutional control systems are entirely absent. The middle-men are then in full control and can completely eliminate any uncertainty for the firms, whereas $q = 1$ reflects the situation where middle-men have no influence in this process.[8]

A firm's expected profits if it uses the services of a middle-man, gross of the payments to the middle-man, is now given by,

$$\pi_i^m = q\pi_i^b + (1 - q)(\bar{\pi} - b_i). \tag{6}$$

The first term represents the probability of the middle-man not influencing the process, in which case the firm's profit is identical to the situation where it bribes alone, given by (3). The second term gives the probability of the middle-man connecting the firm with a corrupt officer, in which case the firm's profits is given by the pre-tax profits minus the amount of bribes. Using (3) in (6) we can express the firm's expected profits from using a middle-man as a function of the parameters of reform,

$$\pi_i^m = \bar{\pi} - \left(\frac{n - ql}{n}\right) b_i - \frac{ql}{n}(t + p). \tag{7}$$

Like the corrupt tax officer, we assume that the middle-man is able to price discriminate between the firms when charging compensation for his

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[8]The institutional quality may also affect the level of corruption among tax officers, as discussed in Chand and Moene (1999). In our model, however, the level of corruption in the bureaucracy is determined uniquely by the degree of the human resource reform.

services. For simplicity, we assume that the middle-man's marginal cost in servicing the firms in an industry is zero. This implies that all firms with a positive willingness to pay for middle-man services will make use of these services if offered. Comparing (3) and (7) we see that $\pi_i^m > \pi_i^b$ for $q < 1$. Hence, all firms that offer bribes in the absence of a middle-man have a positive willingness to pay for such services, and will therefore make use of them once made available. In addition, the entry of middle-men may induce some firms to pay bribes rather than taxes. Since these firms are the marginal users of middle-men, the share of firms that offer a bribe in the presence of middle-men can be found from the condition $\pi_i^m = \pi^t$, which, from (3) and (7) results in,

$$c_i = \max \left\{ \left[1 - \left(\frac{lq}{n - lq} \right) \frac{p}{t} \right] (1 - q), 0 \right\} \equiv c^{**}. \qquad (8)$$

A share c^{**} of the firms in each industry offer bribes through middle-men. Of these, a fraction $1 - q$ reach a corrupt officer with certainty. The remaining fraction, q, are in the same situation as if they were bribing on their own, and thus reach a corrupt officer with probability $n - l$. In sum, the number of successful bribe attempts in the presence of middle-men is given by $(1 - q) nc^{**} + q (n - l) c^{**} = (n - ql) c^{**}$. Using this information and comparing (5) and (8), we observe that,

Lemma 4 *After a human resource reform, in the presence of middle-men, a share $c^{**} > c^*$ of the firms in each of the n industries affected by the reform offer bribes. The total number of successful bribe attempts is given by $(n - ql) c^{**} > (n - l) c^*$.*

For any given human resource reform, Lemma 4 shows that corruption with middle-men is higher than without middle-men.

From (8) we can find that,

Lemma 5 *For $c^{**} > 0$, $\frac{\partial c^{**}}{\partial l} = -\frac{qpn(1-q)}{t(n-lq)^2} \leq 0$, with $\frac{\partial c^{**}}{\partial l} = 0$ for $q = 0$, $\frac{\partial c^{**}}{\partial p} = -\frac{lq(1-q)}{t(n-lq)} \leq 0$, with $\frac{\partial c^{**}}{\partial p} = 0$ for $q = 0$, $\frac{\partial c^{**}}{\partial q} = -\left(1 - \left(\frac{lq}{n-lq} \right) \frac{p}{t} \right) - \left(\frac{pnl(1-q)}{t(n-lq)^2} \right) < 0$, where $1 - \left(\frac{lq}{n-lq} \right) \frac{p}{t} > 0$ since $c^{**} > 0$.*

From Lemma 5 we observe that the policy implication is clear, and similar to the case without middle-men: In the presence of middle-men, strengthen

the institutional quality as much as possible and implement as radical human resource and legal reforms as possible. These measures will all unambiguously reduce corruption in society. The policy implication is, however, less clear if a reform were to *cause* the entry of middle-men to the market. We now turn to the relation between anti-corruption reform and the market for middle-men. We will demonstrate that reforms may indeed pave the way for middle-men, and that a possible effect of the reform is to *increase* corruption relative to the pre-reform level. Our analysis will specify under which conditions a reform could lead to such a perverse outcome, and offer advice on how to carry out a successful anti-corruption reform.

3   How reform may create a market for middle-men

How does an anti-corruption reform affect the incentive for middle-men to enter the market? We model the supply of middle-men as simply as possible. The fired tax officers, or other individuals with inside information about the reformed bureaucracy, face the choice between establishing themselves as tax experts or engaging in some productive activity at a given wage $W > 0$. Hence, a middle-man establishes himself only if the industry level demand for middle-man services $M(l, p, q) > W$. A reform in the tax administration may increase the demand for middle-man services, such that $M(l, p, q) - W$ changes from being negative to positive, and thereby leads to the entry of middle-men.

In order to establish this, we have to study more carefully the composition of the demand for middle-man services among the various groups of firms. We have already assumed that the middle-man is able to price discriminate among the firms. Moreover, in the bargaining process between the middle-man and the firm, we assume that the middle-man captures a share λ of each firm's willingness to pay. The share λ may reflect the competitive pressure between middle-men (although we abstract from any explicit analysis of such competition).

The willingness to pay for middle-man services depends on the value of the alternative option for the firm, which determines the bargaining position of the firm. Thus, it differs between firms that alternatively pay taxes and firms that alternatively pay bribes on their own. In this part of the analysis,

it is useful to introduce some labels to the firms in the economy. A share c^* of the firms offer bribes irrespective of whether a middle-man is in the market or not. We shall refer to this group of firms as "bribe firms". A share $c^{**} - c^*$ of the firms are *potentially* corrupt, in the sense that although they pay taxes in the absence of a middle-man, they would make use of the corrupt services of a middle-man if such were offered. We shall refer to this group of firms as "tax firms". Finally, a share $1 - c^{**}$ of the firms pay the tax irrespective of whether a middle-man is present or not. We shall refer to this group of firms as "honest firms".[9] In sum, we have three types of firms in the economy, as illustrated in Figure 1.
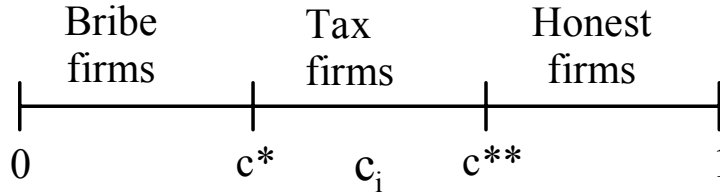

Figure 1: Composition of firms in the presence of middle-man

We can now write the industry level demand for middle-man services as:

$$M(l,p,q) = \begin{array}{l} \lambda \left\{ m^b \left(l,p,q\right) c^*(l,p,q) \right\} + \\ \lambda \left\{ m^t \left(l,p,q\right) \left[c^{**}(l,p,q) - c^*(l,p,q) \right] \right\}, \end{array} \tag{9}$$

where m^b and m^t are the average willingness to pay for middle-man services among bribe firms and tax firms, respectively. In (9) we have made explicit the fact that both the average willingness to pay and the composition of firms depend on all the three dimensions of the anti-corruption reform. In order to see how the total willingness to pay for middle-man services depends on the extent of the reform, we study in more detail both how a reform affects the composition of firms and the average willingness to pay for middle-man services in each of the two groups of firms in the economy.

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[9]Note, however, that the only reason these firms are honest is that their bargaining position is too low relative to the institutional quality to make it worth while offering a bribe.

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3.1   Composition of firms

Figure 2 illustrates how the composition of firms is affected by a human resource reform.[10] For instance at l_1, the share of bribe firms is given by c_1^b, the share of tax firms by c_1^t, and the share of honest firms by $\left(1 - c_1^h\right)$. Beyond l^*, there are only honest firms and tax firms in the industry. Increasing the human resource reform beyond l^* reduces the number of tax firms and increases the number of honest firms. At l_2, the share of tax firms is given by c_2^t, and the share of honest firms by $\left(1 - c_2^h\right)$, with $c_2^b = 0$.
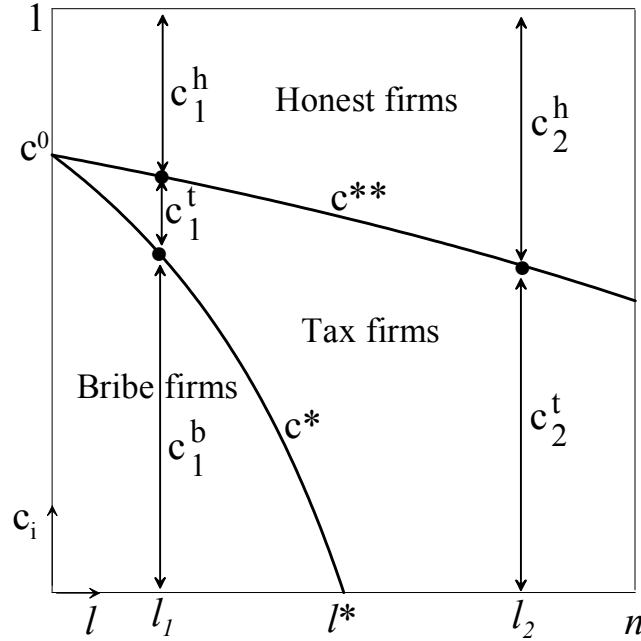

Figure 2: Human resource reform and the composition of firms

Figure 2 illustrates the fact that as long as $c^* > 0$, i.e., as long as there are bribe firms in the economy, an increase in the number of honest tax collectors increases the number of tax firms. It is also clear from Figure 2 that without bribe firms in the economy, i.e., for $c^* = 0$, which is true for $l > l^*$, the number of tax firms falls in the number of honest tax collectors. Hence, the

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[10]Figure 1 is based on $p = t$, $n = 1$, $q = 0.25$. Given these values, $c^0 = 0.75$, $l^* = 0.5$. We have also chosen $l^0 = 0$.

number of tax firms increases in l until $c^* = 0$, and then falls in l. The same is true for a legal reform. Increasing the punishment for corruption increases the number of tax firms, given that $c^* > 0$. For $c^* = 0$, increased punishment reduces the number of tax firms. Hence, the number of tax firms rises in p until $c^* = 0$, and then falls in p. These observations can be demonstrated more formally as follows:

Lemma 6 *Comparing (5) and (8), we find that* $c^{**} - c^* = \frac{lpn(1-q)^2}{t(n-lq)(n-l)}$. *For* $c^* > 0$, $\frac{\partial(c^{**}-c^*)}{\partial l} = \frac{pn(1-q)^2\left(n^2 - l^2 q\right)}{t(n-lq)^2(n-l)^2} > 0$, $\frac{\partial(c^{**}-c^*)}{\partial p} = \frac{nl(1-q)^2}{t(n-lq)(n-l)} > 0$, $\frac{\partial(c^{**}-c^*)}{\partial q} = -\frac{lpn(1-q)[(n-lq)+(n-l)]}{t(n-lq)^2(n-l)} < 0$.

The effect of reform on the number of tax firms for $c^* = 0$ can be found from Lemma 5.

Table 1 summarizes the effect on the composition of firms of an anti-corruption reform involving the three dimensions, human resource reform, legal reform, and institutional reform. In the table, "$-$" indicates a reduction in the share of this type of firm, "$+$" an increase in the share of this type of firm. The sign "$+/-$" for tax firms under an increase in l and p reflects the situation with $c^* > 0$ and $c^* = 0$, respectively. The table is based on $q > 0$.

Table 1. Composition of firms

	$l \uparrow$	$p \uparrow$	$q \uparrow$
Bribe firms	$-$	$-$	$-$
Tax firms	$+/-$	$+/-$	$-$
Honest firms	$+$	$+$	$+$

3.2 Average willingness to pay

We now turn to a discussion of the average willingness to pay for each group of firms. For the bribe firms, the best alternative is to offer a bribe directly to the bureaucrat. The average bargaining position of a bribe firm is given by $c^*/2$. For the tax firms, on the other hand, the best alternative is to pay the tax. The average bargaining position for this group of firms is given by $c^* + (c^{**} - c^*)/2 = (c^{**} + c^*)/2$.

Define the profits of an average tax firm using the services of a middle-man by $\hat{\pi}_t^m$. For this firm, the value added from using the services of a

middle-man is given by,

$$\hat{\pi}_t^m - \pi^t = t - \frac{(n - ql)}{n} \frac{t(c^{**} + c^*)}{2(1-q)} - \frac{ql(t+p)}{n}. \tag{10}$$

This expression is not necessarily positive. For instance, if q is sufficiently high, $\hat{\pi}_t^m < \pi^t$ and the average tax firm strictly prefers to pay the tax rather than make use of the services of a middle-man, and the willingness to pay for these services would then be zero. The average willingness to pay for middle-man services for this type of firm can be found as,

$$m^t = \max\left(\hat{\pi}_t^m - \pi^t, 0\right). \tag{11}$$

From (10) we can find that:

Lemma 7 (a) For $c^* > 0$, $\frac{\partial m^t}{\partial l} = \frac{(1-q)np}{2(n-l)^2} > 0$, $\frac{\partial m^t}{\partial p} = \frac{(1-q)l}{2(n-l)} > 0$, $\frac{\partial m^t}{\partial q} = -\frac{pl}{2(n-l)} < 0$.

(b) For $c^* = 0$, $\frac{\partial m^t}{\partial l} = -\frac{q(t+p)}{2n} \leq 0$, with $\frac{\partial m^t}{\partial l} = 0$ for $q = 0$, $\frac{\partial m^t}{\partial p} = -\frac{lq}{2n} \leq 0$, with $\frac{\partial m^t}{\partial p} = 0$ for $q = 0$, $\frac{\partial m^t}{\partial q} = -\frac{l(t+p)}{2n} < 0$.

It is interesting to note that the average tax firm's willingness to pay for middle-man services increases in l as long as there are bribe firms in the economy. This is true even though the willingness to pay for middle-man services for any given tax firm falls with a human resource reform or a legal reform. The reason is that the human resource reform causes the weakest bribe firms to convert into tax firms and the weakest tax firms to convert into honest firms. This makes the average tax firm more influential and thus more in demand of middle-man services. Hence, the average willingness to pay, m^t, increases with l. Note that when there are no bribe firms in the economy, m^t falls in l. In this case, the rise in average bargaining power is dominated by the reduction in each firm's willingness to pay. The same is true for a legal reform increasing p, causing an increase in m^t as long as $c^{**} > 0$, and then reducing m^t for $c^{**} = 0$.

Define the profits of an average bribe firm using the services of a middle-man by $\hat{\pi}_b^m$ and the average bribe firm's profits approaching the bureaucracy directly by $\hat{\pi}^b$. The average willingness to pay for middle-man services for bribe firms can then be found as

$$m^b = \hat{\pi}_b^m - \hat{\pi}^b = \frac{l}{n}(1-q)\left[t\left(1 - \frac{c^*}{2(1-q)}\right) + p\right], \tag{12}$$

where $m^b > 0$ as long as $c^* > 0$. From (12) we can find that:

Lemma 8 *For* $c^* > 0$, $\frac{\partial m^b}{\partial l} = \frac{(1-q)\left[t(n-l)^2 + p(n-l)^2 + pn^2\right]}{2n(n-l)^2} > 0$, $\frac{\partial m^b}{\partial p} = \frac{l(1-q)(2n-l)}{2n(n-l)} > 0$, $\frac{\partial m^b}{\partial q} = -\frac{l[t(n-l)+p(2n-l)]}{2n(n-l)} < 0$.

If bribe firms exist, m^b increases with l and p. Intuitively, bribe firms are involved in corruption with or without middle-men. An increase in the chances of being caught or an increase in punishment increases the value of middle-man services for this group of firms.

Table 2 summarizes the effect of a human resource, legal, and institutional reform on the average willingness to pay for middle-man services of tax firms and bribe firms. Again, the sign "$+/-$" reflects the situation with $c^* > 0$ and $c^* = 0$, respectively.

Table 2. Average willingness to pay

	$l \uparrow$	$p \uparrow$	$q \uparrow$
Tax firms	$+/-$	$+/-$	$-$
Bribe firms	$+$	$+$	$-$

3.3 Total willingness to pay

As the disaggregated analysis of the demand for middle-man services should make clear, the effect of an anti-corruption reform on the total willingness to pay for middle-man services is non-monotonic and complex. A human resource reform negatively affects the share of bribe firms in the economy ($\frac{\partial c^*}{\partial l} < 0$, see Lemma 3), but at the same time increases the average willingness to pay for middle-man services by this group of firms ($\frac{\partial m^b}{\partial l} > 0$, see Lemma 8). Hence, the total effect of a human resource reform on bribe firms' demand for middle-man services, i.e., $\frac{\partial M^b}{\partial l}$, is undetermined. Similarly, the effect of a human resource reform on tax firms' average willingness to pay depends on whether c^* is positive or zero ($\frac{\partial m^t}{\partial l} > 0$ for $c^* > 0$ and $\frac{\partial m^t}{\partial l} < 0$ for $c^* = 0$, see Lemma 7). The effect of such a reform on the share of tax firms also depends on whether c^* is positive or zero ($\frac{\partial (c^{**}-c^*)}{\partial l} > 0$ for $c^* > 0$, and $\frac{\partial (c^{**}-c^*)}{\partial l} < 0$ for $c^* = 0$, see Lemma 6).

In sum, the exact relationship between M and the various anti-corruption measures is intricate, since both m^b and m^t vary with l, p, and q, as do the

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critical levels of bargaining power c^* and c^{**}. However, our main point can be shown without a full characterization of $M(l, p, q)$. It is sufficient to establish the following lemmas.

Lemma 9 *The total willingness to pay for middle-man services is always increasing in the size of the human resource reform if the initial level of corruption in the bureaucracy is sufficiently large.*

    Proof. See Appendix. ∎

Lemma 10 *The total willingness to pay for middle-man services is always increasing in the size of the punishment if the initial level of punishment in the bureaucracy is sufficiently low.*

    Proof. See Appendix. ∎

Lemma 11 *The total willingness to pay for middle-man services is always decreasing in the level of institutional quality.*

    Proof. See Appendix. ∎

Given these lemmas, we can establish the following proposition.

Proposition 1 *A human resource reform may establish a market for middle-men. Similarly, an increase in punishment may contribute to establishing a market for middle-men. An improvement in institutional quality never contributes to a market for middle-men being established.*

    Proof. (i) Let us first prove that a human resource reform may lead to a market for middle-men being established. From Lemma 9 and the fact that $M(0, p, q) = 0$, it follows that there exists $l^+ > 0$ such that $M(l^+, p, q) > 0$ if $q < 1$ and $p > 0$. Suppose that $M(l^+, p, q) > W > 0$ and $l^+ > l_0$. It now follows that a market for middle-men will be established by a human resource reform generating l^+ honest tax officers.

    (ii) We now prove that an increase in punishment may contribute to establish a market for middle-men. From Lemma 10 and the fact that $M(l, 0, q) = 0$, it follows that there exists $p^+ > 0$ such that $M(l, p^+, q) > 0$. Suppose that $M(l, p^+, q) > W > M(l, 0, q)$ and $p^+ > 0$. It now follows that a market for middle-men is only established if a human resource reform generating l honest tax officers is combined with a legal reform increasing the punishment from 0 to p^+.

(iii) Finally, let us show that an improvement in institutional quality never contributes to a market for middle-men being established. By Lemma 11, we know that $M(l, p, q^+) < M(l, p, q)$ for any $q^+ > q$. Hence, if a human resource reform does not generate a market for middle-men, then neither will a further improvement in institutional quality. ■

The establishment of a market for middle-man always reduces the effect of an anti-corruption reform (as discussed in Section 2.3). However, to evaluate whether the anti-corruption reform has been successful or not, we are interested in comparing the level of corruption after the reform with the pre-reform level. In the following, we demonstrate that corruption may in fact be higher after the reform than before the reform.

4   How middle-men may undermine reform

A human resource reform followed by the entry of middle-men results in nc^{**} bribe attempts, and $(n - ql) c^{**}$ successful bribe offers. Hence, relative to the pre-reform situation, the increase in completed corrupt transaction caused by a human resource reform followed by the entry of middle-men is given by

$$(n - ql) c^{**} - \left(n - l^0\right) c^0 = \left(l_0 - \frac{lq (p + t)}{t}\right) (1 - q). \tag{13}$$

We can easily show that,

$$(n - ql) c^{**} > \left(n - l^0\right) c^0 \Rightarrow \frac{l_0}{l} > q \left(1 - \frac{p}{t}\right). \tag{14}$$

We are now ready to establish the main proposition of the paper.

Proposition 2 *A human resource reform may lead to more corruption than in the pre-reform situation.*

Proof. (i) From Proposition 1, it follows that there exist some l^+ and W such that a human resource reform generates a market for middle-men.

(ii) The result can be established by considering (14). For any $p > 0$, the right-hand side of the inequality (14), $q \left(1 - \frac{p}{t}\right) < 1$. It then follows straightforwardly that there exists some cases where l_0 is sufficiently close to l^+ such that $\frac{l_0}{l^+} > q \left(1 - \frac{p}{t}\right)$. ■

This observation clearly demonstrates that middle-men may undermine anti-corruption reform. Without middle-men, the anti-corruption reform would have reduced corruption in society. With middle-men, corruption may in fact be higher than it was before the reform.

It also turns out that a small reform may be preferable to a radical reform.

Proposition 3 *A small human resource reform may reduce corruption, whereas a more radical reform may increase corruption.*

Proof. (i) From Proposition 2, it follows that there exists l_0, l^+ such that corruption increases by a human resource reform generating l^+ honest tax officers.

(ii) By Lemma 9, it follows that there exists some l^*, where $l^+ > l^* > l_0$ and $M(l^+, p, q) > M(l^*, p, q)$.

(iii) Suppose that $M(l^+, p, q) > W > M(l^*, p, q)$. In this case, it follows that no market for middle-men will be established by a smaller human resource reform generating l^* honest tax officers. Hence, by Lemma 2, it follows that corruption will be reduced compared to the pre-reform situation. ∎

Figure 3 illustrates the result from Proposition 3. The curve denoted "Middle-men" shows the profitability of entry of middle-men, more specifically $M - W$. We see that middle-men enter the market for $l \in (l_1, l_3)$. The pre-reform level of corruption is given by $(n - l^0) c^0$. A small human resource reform, such that $l \in (l^0, l_1)$ reduces corruption. At l_1, however, demand for middle-man services is such that middle-men find it profitable to enter. This leads to a radical increase in corruption. Indeed, for $l \in (l_1, l_2)$, post-reform corruption exceeds the pre-reform level. For $l \in (l_2, l_3)$, post-reform corruption is lower than the pre-reform level. For $l > l_3$, the demand for middle-men is sufficiently low not to make it profitable for middle-men to enter. Beyond $l > l_3$, if such a reform is practically feasible, no middle-men establish themselves in the market, all firms choose to pay taxes, and corruption is eliminated.

So far we have established that a human resource reform may increase corruption and that a small reform may be preferable to a radical reform. But how often should we expect this to be the case? Given that our analysis is motivated by references to problems in countries with a low wage rate and poor institutional quality, the following observation should be of much importance.
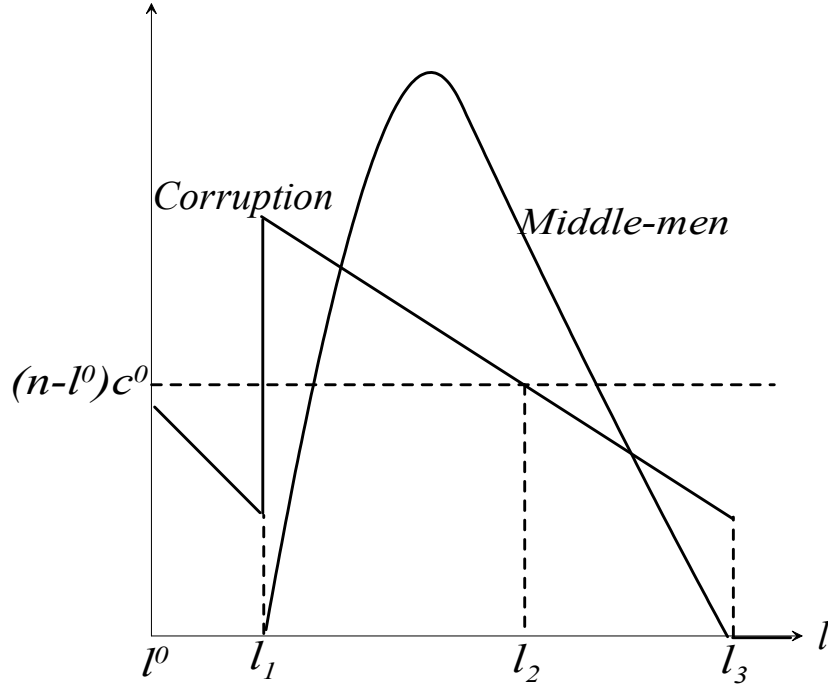
Figure 3: Corruption and the size of reform

Proposition 4 *For a sufficiently low level of institutional quality and wage rate, every human resource reform increases corruption.*

Proof. Assume $p > 0$ and $q = 0$.

(i) By (8), it follows that $c^{**} = 1$ for any l, $l_0 < l < n$. Hence, by (9), (10) and (11), it follows that $M(l, p, q) > 0$ for any $l_0 < l < n$.

(ii) Suppose that $W < \min_l M(l, p, q)$ for $l_0 < l$. It then follows from (i) that any human resource reform generates a market for middle-men. In this case, it follows straightforwardly from (13) that corruption increases, since for any l, $\frac{l_0}{l} > q(1 - \frac{p}{t}) = 0$.

(iii) More generally, there is always some $q > 0$ that makes this statement true. ∎

Figure 4 illustrates the observation made in Proposition 4. When W is sufficiently low, a middle-man enters the market for any $l > l^0$. In the figure, this is illustrated by the fact that the curve denoted "Middle-men" is always positive for $l > l^0$, indicating that $M > W$. If $q = 0$, the level of corruption

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in the economy is given by n, see Lemma 4. The willingness to pay for middle-men increases until there are no bribe firms left in the economy. The reason is that an increase in l makes it less attractive for firms to bribe on their own. More firms will then have paying the tax as their best alternative, and this increases the demand for middle-man services. When l is sufficiently high, there are no bribe firms left in the economy. Beyond this point, the demand for middle-man services is simply a trade-off between two certain options, namely to pay the tax or to bribe via the middle-man, which with $q = 0$ involves no risk. An increase in l beyond this point does not affect this trade-off, and hence does not affect the willingness to pay for middle-man services.
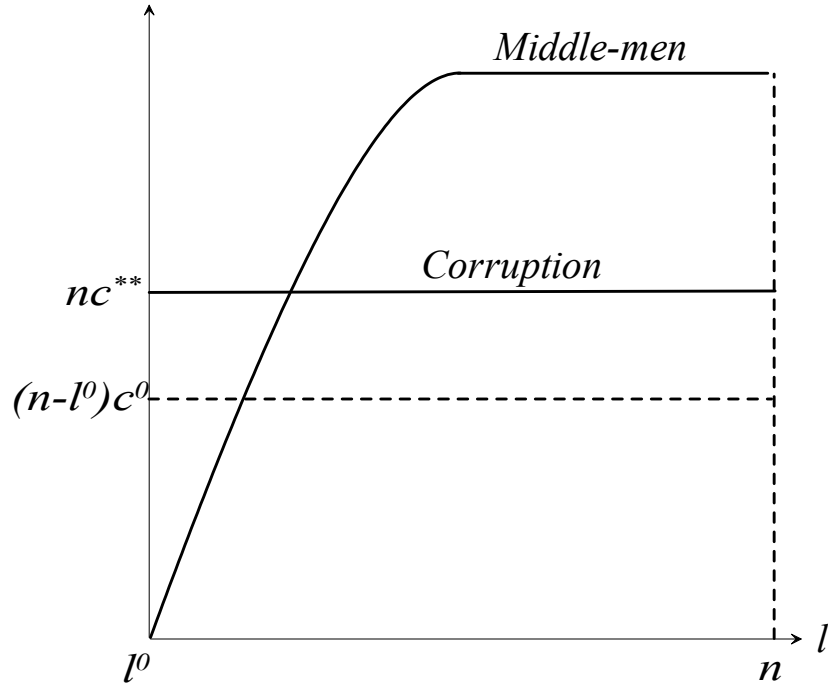

Figure 4: Reform with low-quality institutions

At the same time, it is important to notice that a sufficiently radical reform will be successful in an environment of high institutional quality.

Proposition 5 *For a sufficiently high level of institutional quality, a radical reform reduces corruption.*

Proof. From (8), it follows that $c^{**} = 0$ if $\frac{1}{q}\frac{t}{t+p} \leq \frac{l}{n}$. It follows that for a sufficiently high level of q, the left hand side of this expression is strictly less than 1. Hence, for a sufficiently radical reform, the inequality will be satisfied. If $c^{**} = 0$, then it follows that $M(l, p, q) = 0$. Hence, there will be no market for middle-men. From Lemma 2, we know that in this case, a reform reduces corruption. ∎

Let us consider how a legal reform and an improvement in institutional quality will affect the consequences of a human resource reform.

Proposition 6 *An increase in punishment may contribute to a further increase in corruption.*

Proof. (i) It follows from Proposition 1 that there exist l, W, $p^+ > 0$ such that a market for middle-men only will be established by a human resource reform generating l honest tax officers if it is combined with a legal reform increasing the punishment from 0 to p^+.

(ii) By Lemma 2, it follows that corruption decreases unless there is an increase in punishment. It follows straightforwardly from (14) that there exists some cases where l_0 is sufficiently close to l such that $\frac{l_0}{l} > q\left(1 - \frac{0}{t}\right) = q$.
∎

In a number of the reported results, we have illustrated how a human resource reform may undermine an anti-corruption reform in an environment of low institutional quality. Let us close this section by reporting a result that shows that there are no cases where we have a paradoxical relationship between an improvement in institutional quality and the level of corruption.

Proposition 7 *An improvement in institutional quality always reduces corruption.*

Proof. By Proposition 1, we know that if a human resource reform does not generate a market for middle-men, then neither will a further improvement in institutional quality. Hence, from Lemma 2 it follows that an improvement in institutional quality will reduce corruption. Moreover, if a human resource reform actually generates a market for middle-men, then an improvement in the institutional quality may eliminate this market and, from Lemma 3 and 4, reduce corruption. In any case, by Lemma 5 it follows that an improvement in institutional quality reduces corruption even if the middle-men remain in the market. ∎

5 Concluding remarks

The reform in the Tanzanian tax administration in the mid-1990s appears to have been a short-lived success. In the wake of the reform, a number of "tax experts" established themselves in the market, many of them being laid off tax bureaucrats. There are indications that these experts provided services to firms that allowed corruption to rise. Our analysis provides a formal analysis of how middle-men can undermine anti-corruption reform. They do so by reducing the uncertainty that firms face in corrupt dealings with the reformed tax bureaucracy.

While focusing on an increase in the number of honest tax bureaucrats, we have also investigated other dimensions of the anti-corruption campaign, notably increased punishment for corruption and improved institutional quality. Our main conclusions are that in an imperfect institutional environment, firing more corrupt tax officers and increasing the punishment for corrupt crimes may be counterproductive. These measures may increase the demand for middle-man services and thereby create a market for middle-men, which allows "corruption as usual" to continue through new channels.

Our study has been inspired by the anti-corruption reform in Tanzania, but we believe that there are important general lessons to be learned from our analysis. First, we demonstrate how reform in an environment of weak institutions may go wrong. Second, we highlight the need for a broad approach to anti-corruption work. For example, neither an institutional reform nor an increase in the share of honest tax officers will improve the situation if corruption is not punished. Similarly, if institutions are sufficiently poor, increasing the share of honest tax officers or increasing punishment will have little effect if middle-men play an important role in mediating corruption. Our main policy advice is therefore that the government should be careful with implementing anti-corruption reforms in an environment of weak institutions. The probability that the anti-corruption campaign will be successful increases if the government implements institutional reforms, strengthening transparency and accounting systems in the organization, prior to implementing a human resource reform.

We have focussed on the effect of anti-corruption reform on the demand for middle-man services. The supply of such services was modelled in a very simple way, as a choice for the fired tax bureaucrat between a given wage in some productive activity and the monopolistic rents that he would earn as a middle-man. A more careful analysis of the supply side would involve dealing

with issues such as the degree of competition between tax experts and the possibility of middle-men being punished for their involvement in corrupt transactions. We leave these interesting extensions to future research.

6   Appendix

6.1   Proof of Lemma 9

Proof. Given $q < 1$ and $p > 0$ and (9), consider the case where $l = 0$:

$$\frac{\partial M(0,p,q)}{\partial l} = \begin{array}{l} \lambda[\frac{\partial m^b(0,p,q)}{\partial l}c^*(0,p,q) + m^b(0,p,q)\frac{\partial c^*(0,p,q)}{\partial l} + \\ \frac{\partial m^t(0,p,q)}{\partial l}[c^{**}(0,p,q) - c^*(0,p,q)] + \\ m^t(0,p,q)\frac{\partial(c^{**}(0,p,q)-c^*(0,p,q))}{\partial l}]. \end{array} \qquad (15)$$

Evaluating the four terms inside the brackets for $q < 1$, it follows from Lemma 8 and (5) that the first term is positive (because $\frac{\partial m^b(0,p,q)}{\partial l} > 0$ and $c^*(0,p,q) = 1 - q$, respectively), from (12) that the second term is zero (because $m^b(0,p,q) = 0$), from Lemma 6 that the third term is zero (because $c^{**}(0,p,q) - c^*(0,p,q) = 0$), and from (10) that the fourth term is zero (because $m^t(0,p,q) = 0$). ■

6.2   Proof of Lemma 10

Proof. Given $q < 1$ and (9), consider the case where $p = 0$:

$$\frac{\partial M(l,0,q)}{\partial p} = \begin{array}{l} \lambda[\frac{\partial m^b(l,0,q)}{\partial p}c^*(l,0,q) + m^b(l,0,q)\frac{\partial c^*(l,0,q)}{\partial p} + \\ \frac{\partial m^t(l,0,q)}{\partial p}[c^{**}(l,0,q) - c^*(l,0,q)] + \\ m^t(l,0,q)\frac{\partial(c^{**}(l,0,q)-c^*(l,0,q))}{\partial p}]. \end{array} \qquad (16)$$

Evaluating the four terms inside the brackets for $q < 1$, it follows from Lemma 8 and (5) that the first term is positive (because $\frac{\partial m^b(l,0,q)}{\partial p} > 0$ and $c^*(l,0,q) = 1 - q$ respectively), from (12) and Lemma 3 that the second term is negative (because $m^b(l,0,q) > 0$ and $\frac{\partial c^*(l,0,q)}{\partial p} < 0$), from Lemma 6 that the third term is zero (because $c^{**}(l,0,q) - c^*(l,0,1) = 0$), and from (10) that the fourth term is zero (because $m^t(l,0,q) = 0$). It is straightforward to establish that the first term is greater than the second term. ■

6.3   Proof of Lemma 11

Proof. Given $q < 1$ and (9),

$$\frac{\partial M(l,p,q)}{\partial q} = \begin{aligned} &\lambda[\frac{\partial m^b(l,p,q)}{\partial q}c^*(l,p,q) + m^b(l,p,q)\frac{\partial c^*(l,p,q)}{\partial q} + \\ &\frac{\partial m^t(l,p,q)}{\partial q}[c^{**}(l,p,q) - c^*(l,p,q)] + \\ &m^t(l,p,q)\frac{\partial(c^{**}(l,p,q)-c^*(l,p,q))}{\partial q}]. \end{aligned} \tag{17}$$

Evaluating the four terms inside the brackets for $q < 1$, it follows from Lemma 8 and (5) that the first term is negative (because $\frac{\partial m^b(l,p,q)}{\partial q} < 0$ and $c^*(l,p,q) \geq 0$, respectively), from (12) and Lemma 3 that the second term is negative (because $m^b(l,p,q) \geq 0$ and $\frac{\partial c^*(l,p,q)}{\partial q} < 0$), from Lemma 6 and Lemma 7 that the third term is negative (because $\frac{\partial m^t(l,p,q)}{\partial q} < 0$ and $c^{**}(l,p,q) - c^*(l,p,q) > 0$), and from (10) and Lemma 6 that the fourth term is negative (because $m^t(l,p,q) \geq 0$ and $\frac{\partial(c^{**}(l,p,q)-c^*(l,p,q))}{\partial q} < 0$). ∎

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