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## Slavery, corruption, and institutions

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**Thünen-Series of Applied Economic Theory**  
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Working Paper No. 164

**Slavery, Corruption, and Institutions**

by

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# Slavery, Corruption, and Institutions

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## Abstract

We develop a model where firms profit from coercing workers into employment under conditions violating national law and international conventions and where bureaucrats benefit from accepting bribes from detected perpetrators. Firms and bureaucrats are heterogeneous. Employers differ in their unscrupulousness regarding the use of slave labour whereas bureaucrats have differing intrinsic motivations to behave honestly. Moreover, there is a socially determined warm-glow effect: honest bureaucrats feel better if their colleagues are honest too. The determination of bribes is modelled via Nash bargaining between the firm and the corrupt civil servant. It is shown that multiple equilibria and hysteresis are possible. Depending on history, an economy may be trapped in a locally stable high-corruption, high-slavery equilibrium and major changes in government policies may be necessary to move the economy out of this equilibrium. Moreover, we show that trade bans that are effective in reducing slavery in the export industry tend to raise slavery in the remainder of the economy. It is possible that this leakage effect dominates the reduction of slavery in the export sector.

**Keywords:** Coerced Labour, Modern Slavery, Corruption, Social Norms, Trade-Related Process Standards

**JEL codes:** D73, F16, J47

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# 1 Introduction and Motivation

Although slavery is condemned universally and abolished *de jure* in most countries, slavery and slavery-like practices such as compulsory labour, debt bondage, and forced prostitution exist throughout the world. Even government institutions and public authorities make use of forced labour. The International Labour Organization estimates that, as of 2016, 24.9 million persons work under conditions of forced labour of which 4.5 million are coerced by state institutions (International Labour Organization 2017, p. 18). With a global employment of 3.22 billion in 2016, this amounts to 0.8% of all persons employed, a substantial share given that most countries in which such practices prevail have ratified the relevant international conventions. Bureaucratic corruption often is an essential ingredient in making illicit practices of labour-force exploitation profitable. The U.S. Department of State (2019) reports evidence of corruption in connection with trafficking and/or forced labour for more than 40 countries in Africa, Asia, Europe, and Latin America. Corruption takes many forms, including not only bribes but also sexual services, which are offered to and accepted by police and immigration officers, government officials, prosecutors, and judges. Given that corruption is not a measurable market activity, the reported evidence is probably just the tip of an iceberg of corruption connected to forced labour and modern slavery.

This paper addresses the interplay of modern slavery and corruption. We will use the terms "slavery", "coerced labour", and "forced labour" synonymously to label all kinds of modern slavery, defined in Article 2 of the Forced Labour Convention of 1930 as "all work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily". Note that forced labour is not equivalent to poor working conditions as the key-criteria of penalty and involuntariness in the definition imply a lack of freedom and physical movement (Belser, Cock, and Mehran 2005). We will model an economy with two types of agents: firms that decide whether or not to become slave-holders and inspectors responsible for detecting illicit labour who decide whether or not to accept bribes and become corrupt. Firms are heterogeneous regarding their unscrupulousness concerning slavery and public servants are heterogeneous regarding their corruptibility. Moreover, there is a social norm of honesty that generates a "warm glow" for an honest bureaucrat if the majority of the other public servants are honest, too. Given these heterogeneities, equilibria emerge in which some firms force employees into work whereas others do not and where a share of the bureaucrats are corrupt whereas others behave

honestly. It is shown that multiple equilibria are feasible and that hysteresis is possible. As equilibria are locally stable, major parameter changes are necessary to move from a high-slavery, high-corruption equilibrium to a low-slavery, low-corruption equilibrium and vice versa. The policy parameters used for comparative statics are linked to the institutions the country has imposed to deal with illegal slave labour and corruption. We will look at the impact of punishment and of detection probability of slavery and corruption. It will be shown that most of the parameter impacts are as expected, but that increased punishment of forced labour may result in more corruption.

An international dimension arises from the fact that some countries are either unable or unwilling (or both) to deal with the issues of slave labour and corruptions. External support or external pressure are often essential in implementing effective measures to combat modern slavery as well as corruption. Moreover, forced labour is to a large extent a transnational problem. This is evident in the case of international human trafficking,<sup>1</sup> but also when goods, produced under conditions of modern slavery are traded internationally. However, in contrast to other illegal activities like the trade in drugs, counterfeit goods, or wildlife contraband, products generated by illicit labour are not prohibited per se (unlike the type of work itself). Nevertheless, importers can and do exert pressure on producers not to use coerced labour in production, e.g. by fair-trade and free-of-child-labour requirements. Thus, aspects of international cooperation will be present throughout our paper and they will be looked at explicitly in Section 4, where an open-economy version of the model is considered.

There is a substantial literature on slavery and coerced labour in economics. Initial work in the field of slavery focused mainly on the development of theoretical models in a historical context (Findlay 1975; Chwe 1990; Ergin and Sayan 1998; Eltis, Lewis, and Richardson 2005). Field (1988) was among the first to investigate slave work empirically. Subsequent work examined the transition from a slave economy to a free-labour system and vice versa (Lagerlöf 2009). Acemoglu and Wolitzky (2011) address the issue of how workers are forced to work by means of coercion and punishment. Willert (2018) develops a labour-market matching model to analyse the recruitment process of slaves and the impact of policy measures on the extent of slavery. A number of studies concerning modern slavery focus on the issue of human trafficking. Hernandez and Rudolph (2015), for example, using a gravity

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<sup>1</sup> Akee et al. (2010) find a relation between conflicts, displacement and human trafficking. Cho (2015) identifies migration as a factor influencing modern slavery.

model of illegal migration, show that institutional quality and regulation (including corruption) drive modern-day slavery. Many attempts have been made to measure the extent of women forced into prostitution (Cho, Dreher, and Neumayer 2013; Jakobsson and Kotsadam 2013). Other studies focus on ethnic fragmentation and conflicts (Akee et al. 2010) or universal determinants of human trafficking (Danailova-Trainor and Belser 2006; Frank 2013; Cho 2015). Moreover, various approaches have been proposed to examine the extent of child labour as a subset of compulsory labour. A substantial body of research focusses on the decision of (benevolent) parents regarding their child (Ranjan 2001; Weinberg 2001; Basu and Chau 2004; Dessy and Pallage 2005; Rogers and Swinnerton 2008; Strulik 2008). Dinopoulos and Zhao (2006) investigate whether child labour is a substitute for low-skilled labour. Basu (1999) examines links between international labour laws and child labour. Maffei, Raabe, and Ursprung (2006) find an impact of the level of political repression within the country on child labour. In summary, the literature review indicates that research has been limited to slavery in a historical context, human trafficking (mostly sex trafficking) and child labour. Theoretical approaches examining the mechanisms inducing forced labour have received very little attention in the literature so far.

Corruption is omnipresent globally. Although the figure of corruption costing 5% of global GDP, which is being mentioned in many contributions on the subject and even in official UN documents, cannot be traced back to a serious source (Stephenson 2016), the level of global corruption is immense. A more serious estimate is due to Kaufmann (2005), who provided a figure of 1 trillion USD of bribes being paid, at that time some 2 per cent of world GDP, however with a wide margin of uncertainty ranging from 0.6 to more than 1.5 trillion. Correspondingly, there is a vast amount of economic literature on corruption. Acemoglu and Verdier (1998) and Ryvkin and Serra (2012) outline if and under which conditions bureaucrats become corrupt. Dal Bo, Dal Bo, and Di Tella (2002) develop a model linking corruption, violence and the chance of political re-election. Smith and Varese (2016) address the interaction between entrepreneurs and mafia activities. Notable theoretical models focusing on illicit behaviour and social norms in different contexts have been developed by Myles and Naylor (1996), Nyborg and Rege (2003) and Strulik (2008).

In the literature, various mechanisms to induce multiple equilibria regarding exploitative (child) labour have been discussed. Research conducted by Rogers and Swinnerton (2008) suggests that the probability to be abducted and forced to work leads to multiple equilibria. Other variables generating multiple equilibria are different wages in different industries

(Dessy and Pallage 2005), socio-economic local history (Strulik 2008) and (labour market) policy interventions (Basu and Pham 1998), respectively. In contrast to the aforementioned research, a social "warm glow" increasing the utility of honest bureaucrats is responsible for the existence of multiple equilibria in our model, similarly to the tax-evasion model of Myles and Naylor (1996). Another source of multiple equilibria is found in the shape of the function linking the size of illegal bribe income to the probability of discovery of corruption.

This paper is, to our knowledge, the first to link bureaucratic corruption to modern slavery. Besides the heterogeneity of employers and bureaucrats, the "warm glow" is another ingredient of the model that will drive some of the results. We model this à la Myles and Naylor (1996), who used a similar approach to model social rewards to honesty in a tax-evasion context. The remainder of this paper is organised as follows. The next section sets up the model with its behavioural assumptions and looks at the interactions of corrupt bureaucrats and slaveholders in a Nash-bargaining framework, where the bribes are negotiated. Section 3 determines the general equilibrium, in particular the shares of corruption in the state authorities and illicit labour in the economy and looks at comparative statics. Which policy instruments are appropriate to cope with the problems of corruption and slave labour? In section 4, we extend the model and introduce trade to capture trade-related process-standards that curb coerced labour. Some final remarks in Section 5 conclude the paper.

## **2 The Model**

Let us consider an economy with a continuum of firms of mass 1 and a continuum of mass 1 of bureaucrats responsible for inspecting the firms. We assume division of labour in the bureaucracy. Each firm will be inspected by exactly one public servant. Multiple inspections are excluded. In the first step, bureaucrats decide whether or not they will be corrupt and firms decide whether or not to use slave labour. In the second step, inspections take place. Firms that are detected using coerced labour either pay the fine or they pay a bribe if the inspector is corrupt. The bribe is determined by Nash bargaining between the firm and the corrupt inspector. This results in an equilibrium bribe depending on, amongst other parameters, the share of slave-holding firms. The model will be solved in the usual backward fashion. The bargaining game of the negotiation of bribes is solved first and the result is then used to determine the shares of corrupt bureaucrats and slave holders.

## 2.1 Firms

Firms employing slaves have different profits than other firms employing only legal labour. Let this extra profit be denoted by  $\pi$ .  $\pi$  is firm-specific and may be negative. On the one hand, there are firms that are pure profit maximisers and have large values of  $\pi$ . On the other hand, firm owners may feel socially responsible and the disutility from employing coerced labour reduces the extra profit. The larger  $\pi$ , the less socially responsible is the firm. Moreover, the profitability of using coerced labour may differ across sectors. Let the density function be  $f(\pi)$  with  $F(\pi)$  as the cumulative density and let  $s$  be the share of slave holders at the end of the day. Slavery is detected with some probability  $q$ , which is treated as exogenous. The inspector detecting the offence can either be corrupt or honest. In the case of corruption, the firm pays a bribe,  $B$ . In case the inspector is honest, the owner of the firm has to pay a fine (punishment),  $P$ , which may exceed the firm's profit. If the share of corrupt bureaucrats is  $\beta$ , the expected profit of a firm using coerced labour is

$$\Pi^e = \pi - (\beta B + (1 - \beta)P)q. \quad (1)$$

The firm abstains from hiring slaves if the expected profit is negative.

## 2.2 Bureaucrats

The decision whether to be corrupt is endogenous. If the bureaucrat decides to be corrupt, her/his utility depends on the expected bribe income. The probability  $p$  that corruption is detected is increasing in the bribery income. The higher the income, the more obvious it is that there must be other income sources than the official salary.<sup>2</sup> Thus, the corrupt bureaucrat's expected income is  $Y + B - p(sqB)V$ , where  $Y$  is the legal income, i.e. the official salary,  $sqB$  is the expected illegal income based on bribes,  $V$  is the punishment in case the corruption is disclosed and  $p$  is the corresponding probability.  $p' \geq 0$ ,  $p(0) = p^{min} \geq 0$ ,  $p(\infty) = p^{max} \leq 1$ , and  $p^{min} < p^{max}$ . The sign of  $p''$  is ambiguous. If, for example, the increase in the probability is logistic, we have  $p'' > 0$  if  $sqB$  is small

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<sup>2</sup> Although the probability of detection is non-constant, the process of corruption disclosure is exogenous to the model. In particular we neglect the possibility that inspectors are controlled by their superiors or other civil servants, who themselves may again be either honest or corrupt.



and  $p'' < 0$  if  $sqB$  is large. The non-corrupt bureaucrat, on the other hand, derives utility from her/his salary and from being an honest person. The utility derived from honesty consists of two components. The first component is the intrinsic motivation to behave well. It is implemented by adding some extra utility  $\gamma \geq 0$ , which is distributed with density  $g(\gamma)$ , the cumulated density being  $G(\gamma)$ . For a person not feeling any moral obligation to reject bribes,  $\gamma = 0$ . For all others,  $\gamma > 0$ . Moreover, there is a "social warm glow": an honest bureaucrat feels better in a world where her/his colleagues are honest too, compared to a world where the majority of public servants are corrupt. See Myles and Naylor (1996), who model the preferences of a taxpayer considering tax evasion in the same way. Basically, honest persons feel like idiots in an environment where everyone else is behaving dishonestly. This is modelled by adding  $a(1 - \beta)$  to the utility, where  $a$  is a positive parameter and  $(1 - \beta)$  is the share of honest civil servants. Thus, a bureaucrat will be corrupt if

$$Y + sqB - p(sqB)V > Y + \gamma + a(1 - \beta). \quad (2)$$

A necessary condition to make corruption beneficial to the least honest bureaucrat ( $\gamma = 0$ ) is  $B > \frac{p(sqB)V}{sq}$ .

### 2.3 The Bargaining Process

Assume that a bureaucrat has decided to be corrupt and that the illegal use of coerced labour by a firm has been uncovered. Then the bribe to be paid by the firm is determined in a Nash bargaining process. The firm's gain from bribing the corrupt inspector is  $(P - B)$ . The corrupt bureaucrat, on the other hand, benefits from the additional income,  $B$ , but faces an increase in the risk of being caught. There are two ways of modelling this. The simple version is to argue that the individual firm with which the bargain is made is marginal such that the expected risk of being caught is unaffected by an increase in the bribe. Then the gain from the deal is simply  $B$  and the bargaining outcome is  $B^* = \frac{1}{2}P$ . The alternative assumption is that the bureaucrat considers the fact that all firms she/he is bargaining with about bribes are equal. In that case, she/he anticipates that there will be an effect on the risk of detection because all the horse trades with all perpetrators yield the same outcomes, which add up to a significant illegal extra income. In this case, the expected gain from the bargain is  $B - p(qBS)V$ . This is always positive since, from (2), a necessary condition for the existence of corruption is  $B > \frac{p(sqB)V}{sq}$  with  $sq < 1$ . Thus, the Nash product is

$$(P - B)(B - p(sqB)V).$$

Maximising it with respect to  $B$  yields

$$(P - B^*)(1 - sqVp') - (B^* - pV) = 0, \quad (3)$$

where the asterisk denotes the optimum value and where the argument of the  $p(\cdot)$  function is omitted for convenience. The second-order condition is

$$\Delta = -2(1 - sqVp') - (P - B^*)(sq)^2Vp'' < 0. \quad (4)$$

It should be noted that  $\Delta$  may be positive in general due to the fact that  $p''$  can be negative. However, since there must be an interior maximum in the interval  $[0, P]$ , this maximum will satisfy (4). The first-order condition, (3), can be rewritten as:

$$B^* = \frac{1 - sqVp'}{2 - sqVp'}(P + pV) \quad (3')$$

The bargaining outcome is a weighted average of the minimum bribe needed to compensate for the bureaucrat's risk,  $pV$ , and the bribe maximising her/his rent and driving the perpetrator's benefit to zero,  $P$ . The weight is less than  $\frac{1}{2}$ . The larger  $p'$ , i.e. the more sensitive is the risk of detection to an increase in bribe income, the smaller is this weight. Thus,  $B^* < \frac{1}{2}P$  if  $p'$  is large and  $B^* > \frac{1}{2}P$  if  $p'$  is small. If, however, the bureaucrat considers the firm to be marginal and neglects the impact of any single bilateral bargaining process on bribe income,  $B^* = \frac{1}{2}P$ , i.e. the gain from the bargain is equally shared amongst the two parties and does not depend on any other parameters of the model besides  $P$ .

In the general case, the comparative statics follow from (3):

$$\frac{dB^*}{dP} = -(1 - sqVp')\Delta^{-1} > 0 \quad (5a)$$

$$\frac{dB^*}{dV} = ((P - B^*)sqp' - p)\Delta^{-1} \lesseqgtr 0 \quad (5b)$$

$$\frac{dB^*}{dq} = ((P - 2B^*)p' + (P - B^*)sqB^*p'')sV\Delta^{-1} \lesseqgtr 0 \quad (5c)$$

$$\frac{dB^*}{ds} = ((P - 2B^*)p' + (P - B^*)sqB^*p'')qV\Delta^{-1} \lesseqgtr 0 \quad (5d)$$

$$\frac{dB^*}{d\beta} = 0 \quad (5e)$$

The results (5a-e) can be interpreted as follows. An increase in the fine to be paid by the firm has a positive impact on the bribe since the pie shared by the two parties is increased. The impact of the fine to be paid by a bureaucrat convicted of corruption is ambiguous. On the one hand, the minimum bribe needed to make the bargain profitable is raised. On the other hand, the increase in the fine raises the marginal risk of being detected and this has a negative impact. The impacts of  $q$  and  $s$  are ambiguous, too. Consider the term  $(P - 2B^*)p'$  on the right-hand sides of (5c) and (5d). As shown above,  $B^* < \frac{1}{2}P$  if  $p'$  is large and  $B^* > \frac{1}{2}P$  if  $p'$  is small. Neglecting the remainder of the right-hand side for a moment, we would have  $\frac{dB^*}{dq} > 0$  and  $\frac{dB^*}{ds} > 0$  if  $p'$  is small and the converse otherwise. Moreover, an additional ambiguity arises from the change in the marginal probability,  $p''$ , which can be positive, zero, or negative. Note that the impacts of  $q$  and  $s$  are proportional:  $\frac{dB^*}{dq} / \frac{dB^*}{ds} = \frac{s}{q}$ . Finally, the share of corrupt public servants has no impact since the negotiation between a firm and a corrupt bureaucrat are not affected by the number of corrupt bureaucrats.

### 3 The Political-Economy Equilibrium

This section of the paper is devoted to the determination of the degrees of slavery and of corruption in the economy. As a first step, we will consider the absence of policy interventions and the conditions for the boundary cases  $\beta = 0$ ,  $\beta = 1$  and  $s = 0$ ,  $s = 1$ . The *laissez-faire* case is useful as a benchmark to which equilibria with government interventions can be compared. The consideration of boundary conditions is useful to establish the existence of a general equilibrium in cases where interior solutions do not exist.

#### 3.1 Laissez Faire and Boundary Solutions

Under *laissez faire*,  $P = V = 0$ , the level of slavery in the economy is maximised, but corruption is non-existent since there is no scope for bargaining. If an anti-slavery regulation is introduced,  $P > 0$  and corruption will emerge. From (3') we have that  $B^* = \frac{1}{2}P$  as long as there is no anti-corruption policy. With an increase in  $P$ , the number of slave-holders will decline and if the decline in slavery is faster than the increase in the punishment (which is

realistic for large  $P$  as the benefits from using coerced labour are limited), the benefits from corruption will have a Laffer-curve shape such that  $\beta$  will initially rise and then decline. Of course, anticipating the Laffer-curve effect bureaucrats could have an incentive to adjust their bargaining strategies appropriately. However, as an individual bureaucrat is infinitesimal compared to the size of the public sector, she/he would not take this effect into account as she/he would provide a public good to the group of all corrupt public servants.

The remainder of this section is devoted to the consequences of and the conditions for boundary solutions.

- a) If there are no corrupt bureaucrats ( $\beta = 0$ ), only few firms will engage in slavery. It follows from (1) that  $s = 1 - G(P)$ .
- b) If all bureaucrats are corrupt ( $\beta = 1$ ),  $s = 1 - G(B^*)$ . As  $B^* < P$ , slavery will be more prevalent than in the absence of corruption.
- c) If there is no slavery ( $s = 0$ ), there will be no corruption since there are no perpetrators who can be detected. We accept that in the real world corruption may exist nevertheless as citizens who behave lawfully can be accused of having misbehaved, but this is outside the scope of this analysis.
- d) If all firms engage in slavery ( $s = 1$ ), the share of corrupt bureaucrats is determined by  $\beta = G(qB^* - p(qB^*)V - a(1 - \beta))$  from condition (2). Whether or not  $\beta = 1$  in this case, depends on the shape of the density function  $g(\gamma)$ .

Results a) and b) suggests that increasing the punishment of slavery is good since it reduces the share of slaveholders and, according to (5a), at the same time raises the bribes that non-compliant firms pay to corrupt inspectors, which deters additional firms from entry. However, things are more complex in the general equilibrium as  $B^*$  also depends on  $s$ . Result c) suggests that the policies that successfully reduce slavery will also reduce corruption – at least in this model, where the only source of bribes is the detection of coerced labour.

Besides looking at the consequences of boundary solutions, one can ask for the conditions under which such solutions occur. These conditions are useful for establishing the existence of an equilibrium of the economy.

- e) Slavery vanishes ( $s = 0$ ) if there is a  $\pi^{max}$  such that  $f(\pi) = 0$  for all  $\pi \geq \pi^{max}$  and  $\pi^{max} \leq (\beta B^* + (1 - \beta)P)q$ . As  $B^* < P$ , this is possible for small  $\beta$  and large  $P$ .

- f) All firms employ illicit labour ( $s = 1$ ) if there is a  $\pi^{min}$  such that  $f(\pi) = 0$  for all  $\pi \leq \pi^{min}$  and  $\pi^{min} \geq (\beta B^* + (1 - \beta)P)q$ . This is possible for large  $\beta$  and small  $P$ .
- g) All bureaucrats are honest ( $\beta = 0$ ) if  $sqB^* - p(sqB^*)V \leq a$ , which may happen if corruption is sufficiently heavily punished.
- h) All bureaucrats are corrupt ( $\beta = 1$ ) if there is a  $\gamma^{max}$  such  $g(\gamma) = 0$  for  $\gamma \geq \gamma^{max}$  and  $\gamma^{max} \leq sqB^* - p(sqB^*)V$ . This is possible if  $V$  is small.

Regarding condition e), it is realistic that the potential extra profit to be reaped from using slave labour is limited. So, if the punishment and the detection probability are sufficiently large, slavery will indeed vanish. Condition f) will be violated if there are some firms for which  $\pi < 0$ , be it because for them coerced labour is less productive than legal labour, be it because moral convictions prevent their owners from hiring slave labour even in the absence of punishment. Condition g) states that a minimum profit from corruption is necessary to outweigh the social warm glow from honesty. If slavery is absent, this condition is the mirror image of c). Finally, condition h) states that full corruption is possible if the loyalty of public servants has an upper limit. If, however, there are public servants who resist any temptation to accept any bribe no matter how large it is and how small the risk of punishment, condition h) will be violated.

### 3.2 Equilibrium Conditions and Comparative Statics

In the equilibrium,  $s$  and  $\beta$  are determined by the critical values of  $\pi$  and  $\gamma$  at which firms are indifferent between using coerced versus legal labour and at which a bureaucrat is indifferent between corruption and honesty. From (1), we have  $\pi \geq (\beta B + (1 - \beta)P)q$  and, using asterisks to denote equilibrium values, it follows that

$$s^* = 1 - F((\beta^* B^* + (1 - \beta^*)P)q). \quad (6)$$

By the same reasoning, (2) implies  $\gamma < sqB - p(sqB)V - a(1 - \beta)$ . Thus

$$\beta^* = G(s^* q B^* - p(s^* q B^*)V - a(1 - \beta^*)). \quad (7)$$

Comparative statics are

$$\begin{pmatrix} 1 + q\beta^* \frac{dB^*}{ds} f & -q(P - B^*)f \\ (p'V - 1) \left( qB^* - s^* q \frac{dB^*}{ds} \right) g & 1 - ag \end{pmatrix} \begin{pmatrix} ds^* \\ d\beta^* \end{pmatrix} =$$

$$\begin{pmatrix} -\beta^* q \frac{dB^*}{dV} f & -\left((1-\beta^*)q + \beta^* q \frac{dB^*}{dP}\right) f & -\left(\beta^* B^* + (1-\beta^*)P + \beta^* q \frac{dB^*}{dq}\right) f & 0 \\ \left(s^* q(1-p'V) \frac{dB^*}{dV} - p\right) g & s^* q(1-p'V) \frac{dB^*}{dP} g & (1-p'V)s^* \left(B^* + q \frac{dB^*}{dq}\right) g & -(1-\beta^*)g \end{pmatrix} \begin{pmatrix} dV \\ dP \\ dq \\ da \end{pmatrix},$$

where the derivatives of  $B^*$  are given by (5a-d) and where  $f$  and  $g$  are the values of the density functions for  $s = s^*$  and  $\beta = \beta^*$ , respectively. Analytical results cannot be derived as seven out of twelve elements in the two matrices have ambiguous signs. Thus, consider the case where bureaucrats do not take the probability of being fined into account when bargaining. Then  $B^* = \frac{1}{2}P$ . This implies that  $\frac{dB^*}{dV} = \frac{dB^*}{dS} = \frac{dB^*}{dq} = 0$  and  $\frac{dB^*}{dP} = \frac{1}{2}$ . Thus,

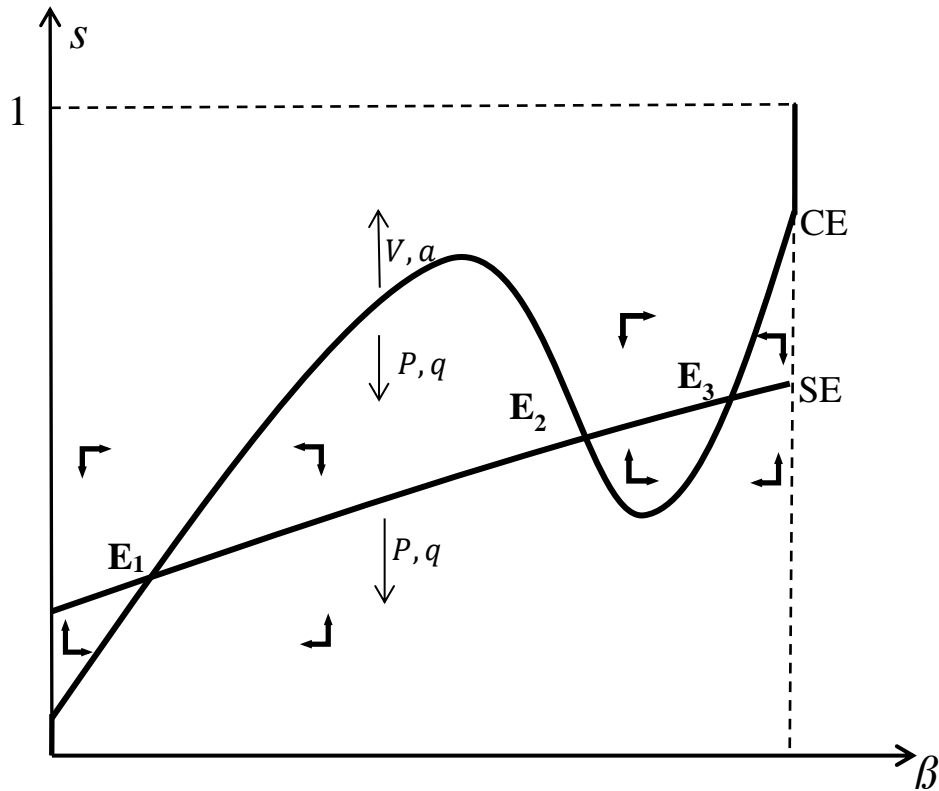
$$\begin{pmatrix} 1 & -\frac{1}{2}qPf \\ \frac{1}{2}(p'V - 1)qPg & 1 - ag \end{pmatrix} \begin{pmatrix} ds^* \\ d\beta^* \end{pmatrix} = \begin{pmatrix} 0 & -\left(1 - \frac{1}{2}\beta^*\right)qf & -\left(1 - \frac{1}{2}\beta^*\right)Pf & 0 \\ -pg & \frac{1}{2}(1-p'V)s^*qg & \frac{1}{2}(1-p'V)s^*Pg & -(1-\beta^*)g \end{pmatrix} \begin{pmatrix} dV \\ dP \\ dq \\ da \end{pmatrix}. \quad (8)$$

As the elements  $(1 - ag)$  and  $(1 - p'V)$  in the matrix on the left-hand side can be positive or negative, implying that all comparative-static results are ambiguous, we use a graphical approach to investigate the impacts of the parameters.

### 3.3 The Impact of the Social Warm Glow of Honesty

Initially, assume that  $p'V < 1$ , i.e. higher bribes increase the corrupt bureaucrat's utility despite the increase in the probability of detection. In this case, the source of ambiguity is the term  $(1 - ag)$ , which may be negative if the warm-glow parameter,  $a$ , is large. Equation (6) defines the share of slavery as a function of corruption, which we will term the slavery equilibrium, SE. Correspondingly, equation (7) constitutes the corruption equilibrium, CE. Both equilibrium conditions will be drawn into a  $(\beta, s)$  diagram. See Figure 1. From the first-row elements of the matrix on the left-hand side of (8), we can infer that SE is positively sloped. Matters are more complicated regarding the CE curve. Determining the impact of  $(1 - ag)$  requires deeper consideration of the density function  $g(\gamma)$ . This function is defined for  $\gamma \geq 0$  and it is known that  $g(\gamma) \rightarrow 0$  for  $\gamma \rightarrow \infty$ , i.e. if  $\beta \rightarrow 0$ . Given that and excluding multimodal functions,  $g(\gamma)$  can either be hump-shaped, e.g. lognormal, or declining, e.g. Pareto. In the first case,  $(1 - ag)$  is U-shaped with the possibility of a negative segment for

some  $0 < \beta < 1$ . This implies that the CE line is S-shaped with respect to  $\beta$ . In the second case,  $(1 - ag)$  is declining with possibly a negative segment for some  $0 < \beta \leq 1$ . This implies that the CE function is U-shaped. Moreover, we know from earlier considerations that  $\beta = 0$  as long as  $sqB^* - p(sqB^*)V \leq a$ . See condition g) in Section 3.1. Figure 1 depicts an S-shaped CE line. Note that the section of the  $s$  axis between the origin and the intercept of the CE curve is a part of the CE curve. There are up to three equilibria as shown in Figure 1. The comparative statics are shown by arrows shifting the curves up or down.

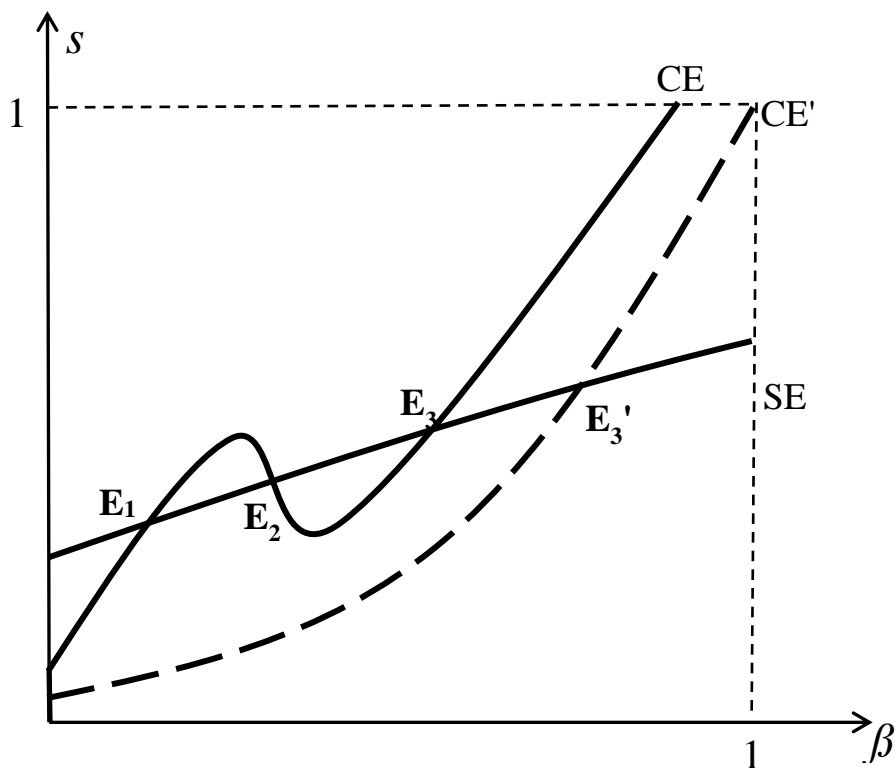


**Figure 1: Equilibrium and comparative statics if  $p'$  is small and  $a$  is large**

Although this is a static model, we can think of adjustment dynamics. They are depicted by bold arrows in the diagram. Condition (1) implies that, everything equal, the expected profit from slavery is increased if  $\beta$  is larger than in the equilibrium and slavery is increasing. To the right of the SE line,  $s$  will rise, to the left of the SE line,  $s$  will shrink. The adjustment dynamics of  $\beta$  follow from (2). Everything else being equal, an increase in slavery will increase the profitability of corruption. Thus, above the SE line corruption tends to rise, below this line it tends to decline. It can be seen that the equilibria  $E_1$  and  $E_3$  are stable whereas  $E_2$  is unstable. Applying the comparative statics to the stable equilibria, we have:

- An increase in the punishment of corrupt public servants and an increase in the warm glow of being an honest employee in an honest team unambiguously reduces corruption as well as slavery.
- An increase in the punishment and in the detection of employment of slave labour reduces slavery but might increase bribery and corruption. The underlying reason is that higher punishment of perpetrators raises the profitability of corruption.

Moreover, it is seen that small changes in government regulation will not change the equilibrium. Once an economy is in the high-slavery high-corruption equilibrium  $E_3$ , it will remain there unless drastic policies against slavery and, in particular, corruption are implemented. Once the economy has attained the low-slavery, low-corruption equilibrium the equilibrium remains even if the strict policy measures are removed. Of course, the removal of the policy measures will change the location of  $E_1$ , but the economy will not return to  $E_3$  since  $E_1$  is locally stable. The economy is hysteretic. How can the economy be shifted from the "good" to the "bad" equilibrium? Remove the warm-glow effect and the CE curve loses its S shape such that the equilibria  $E_1$  and  $E_2$  vanish. See Figure 2.



**Figure 2: The effect of a reduction in  $a$**



A reduction in  $V$  has a similar effect although the S shape is maintained, but as the CE curve is shifted downwards, equilibria  $E_1$  and  $E_2$  may also vanish. In terms of catastrophe theory, a fold catastrophe occurs along the move from CE to CE'. Finally, Figure 3 shows the impact of a reduction in  $V$  on the U-shaped CE line. Again, this may cause a fold catastrophe such that the stable no-corruption, low-slavery equilibrium,  $E_1$ , and the unstable equilibrium,  $E_2$ , vanish and the economy is afterwards trapped in  $E_3$ .

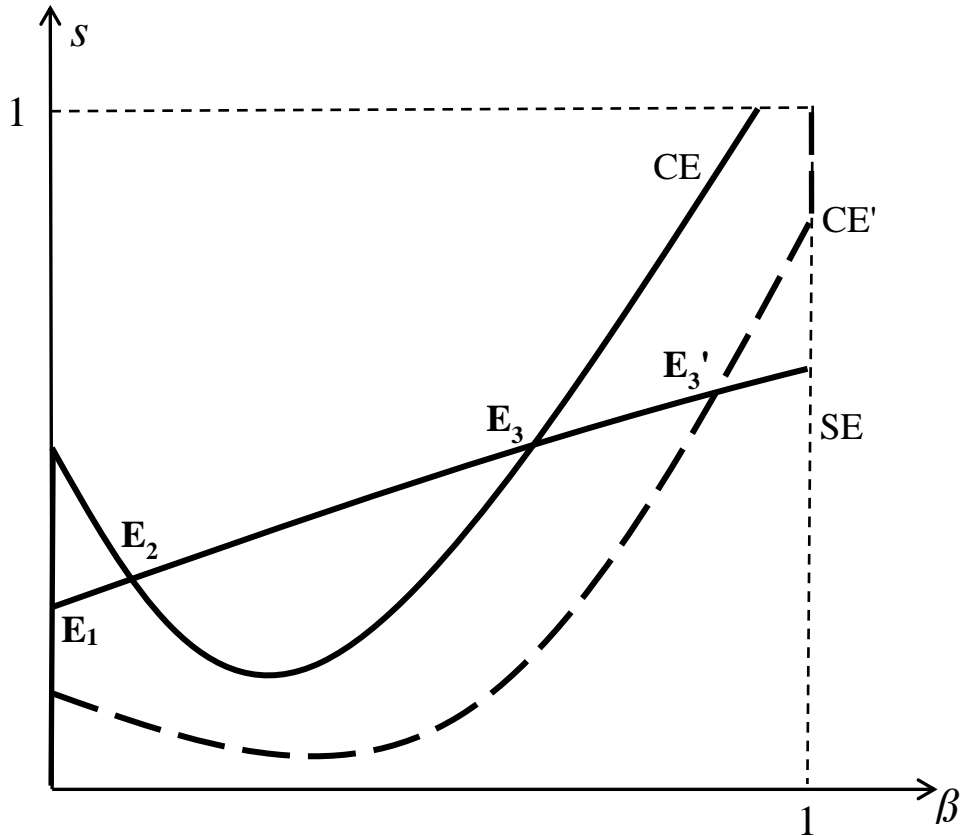
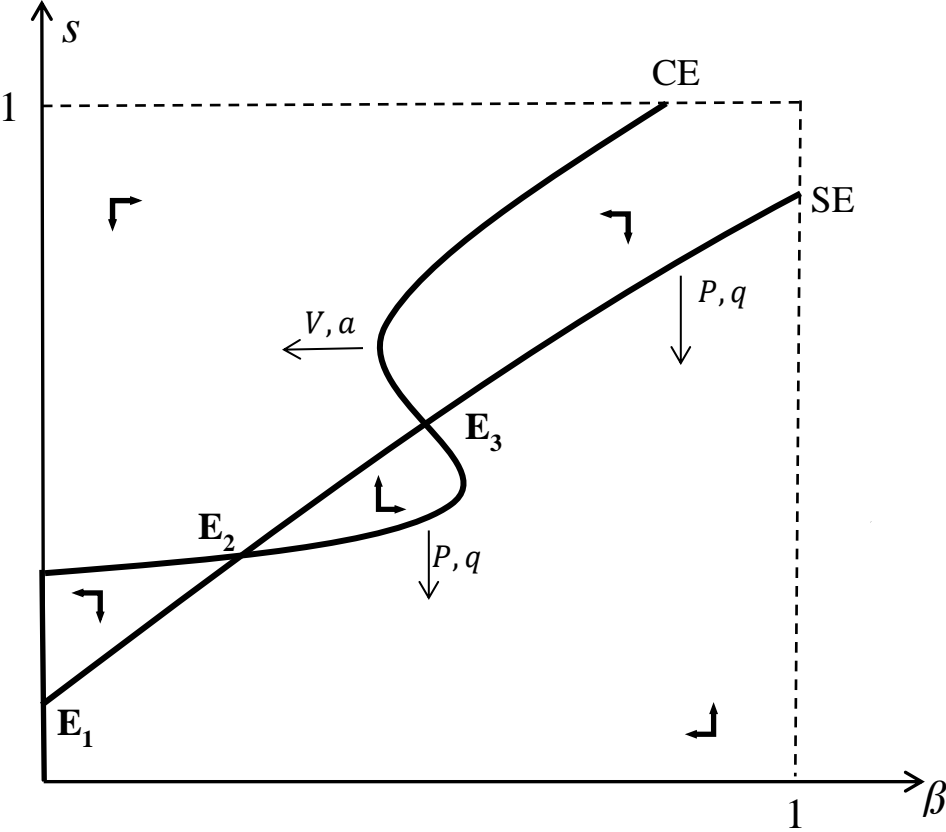


Figure 3: The effect of a reduction in  $V$  if the SE line is U-shaped

### 3.3 The Impact of Bribes on the Probability of Detection

Let us now consider the impact of the other ambiguity,  $1 - p'V \lesseqgtr 0$ , on the equilibrium.  $p(sqB)$  is an increasing function defined in the interval  $p^{min} \leq p \leq p^{max}$ , where  $p^{min} \geq 0$  and  $p^{max} \leq 1$ . We imagine two types of curvature of the  $p(\cdot)$  function in this interval. One of them is a strictly concave function approaching  $p^{max}$  in the limit, the other one is smoother for small arguments and looks like a logistic function. In the first case,  $p'$  is largest if  $s$  is

small. This implies that for small values of  $s$  the increase in the expected punishment is larger than the increase in the bribe income. Thus, there is no incentive to be corrupt for small levels of  $s$ . However, large-scale corruption may pay off if the punishment is not too large compared to the bribe income. In the other case,  $p'$  is largest for intermediate levels of  $s$  such that the expected utility from bribery declines but is nevertheless still positive. Figure 4 shows this in the  $(\beta, s)$  space.

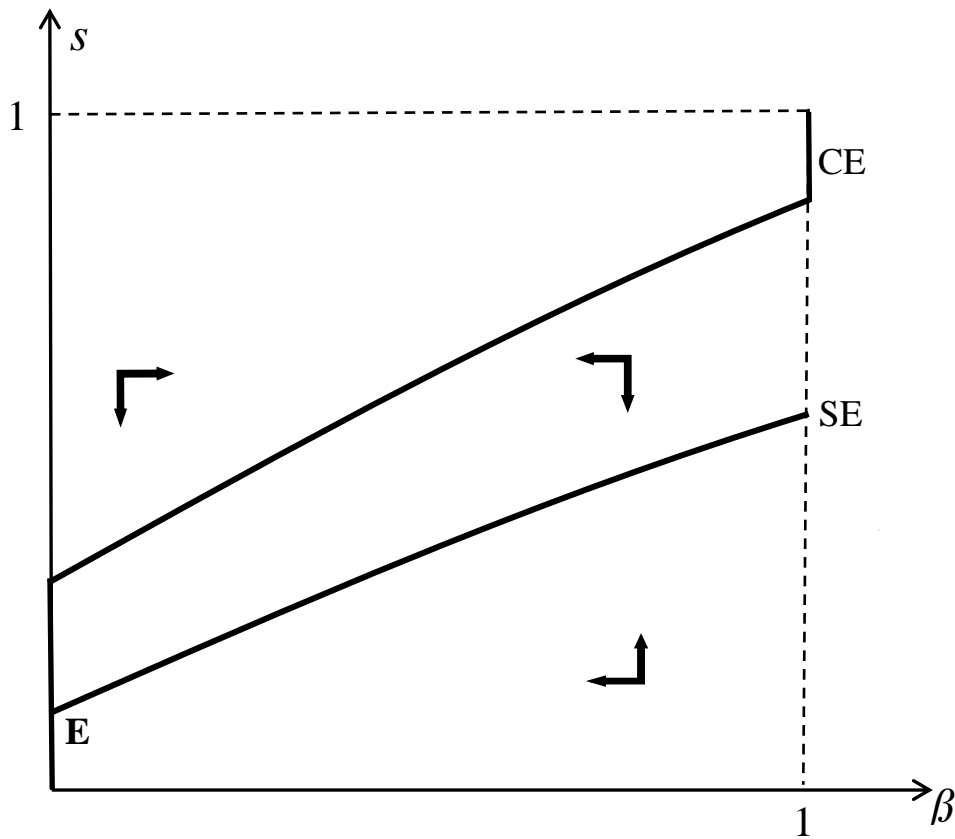


**Figure 4: Equilibrium and comparative statics if  $a$  is small and  $p'$  is large**

Again, there are three equilibria, where  $E_1$  is a zero-corruption equilibrium.  $E_2$  is unstable, and  $E_3$  is stable. The comparative statics regarding  $E_3$  are the same as before. Increases in the social warm glow of honesty and in the punishment of corrupt bureaucrats reduce both slavery and corruption. However, increases in the detection probability and the punishment of slavery have ambiguous impacts on corruption since corrupt public servants can negotiate higher bribes.

### 3.4 Boundary Equilibria

In case the SE and CE curves have no intersection points, there will be boundary equilibria. If the CE curve is located above the SE curve like in Figure 5, there is only one equilibrium, E, with zero corruption and low or zero slavery, which is stable. Figure 5 shows the case of zero corruption and low slavery. If the SE curve is moved further down, slavery is reduced even further and can become zero. An equilibrium with zero slavery and positive corruption is not possible since there are no perpetrators who are willing to pay bribes to avoid punishment.



**Figure 5: A boundary equilibrium with zero corruption**

If the SE curve is located above the CE curve, there is an equilibrium with 100% corruption or 100% slavery (or both). It is also stable. Figure 6 shows the case of full corruption and high, but less than 100%, slavery. If the SE curve is moved upwards, the share of slaveholders is increased further and may reach 1. In case the SE curve is kinked at  $s = 1$  and is intersected by the CE curve in its horizontal segment,  $\beta < 1$  and  $s = 1$ .

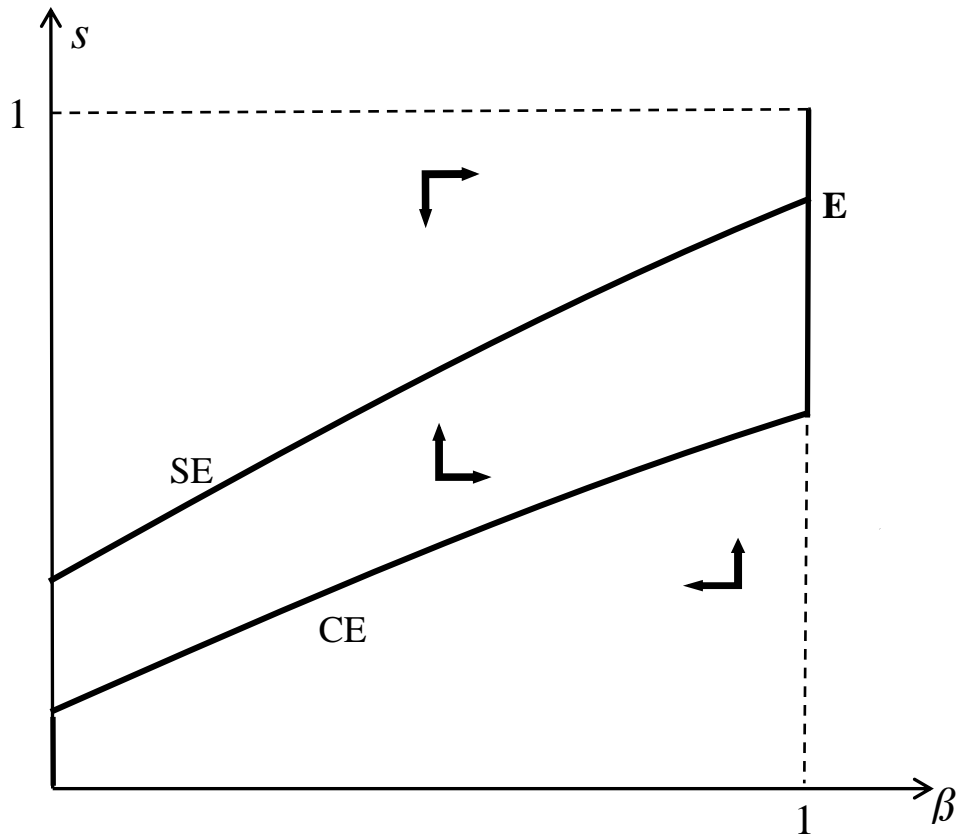


Figure 6: A boundary equilibrium with 100% corruption

#### 4 Trade-Related Process Standards, Slavery, and Leakage

International trade can be a lever to enforce anti-slavery, anti-child-labour and, more generally fair-trade objectives in countries where regulations are weak or are insufficiently enforced. Commodities produced under conditions that violate basic principles of human dignity such as modern slavery and child labour are increasingly difficult to be sold in global markets. Many consumers have become aware of the poor working conditions prevailing in other countries and of their own responsibilities regarding these conditions. Thus, the indirect use of illicit labour can be extremely harmful to the reputation of big players in global markets. A prominent example is the mid-1990s IKEA scandal, when rugs and carpets that IKEA imported from India were found to be produced by children. See Bartlett, Dessain, and Sjöman (2006). IKEA and other firms accused of similar practices reacted by taking effective measures against exploitative working conditions in their upstream supply chains.

Nevertheless, the question arises if such policies, may have undesired side effects and aggravate the problems of slavery and similar practices in other parts of the economy, which are not subject to international attention. Will there be leakage effects and if so what determines their magnitude?

Dealing with leakage in this model requires investigation of the impact of trade-related process standards on the slaveholder's participation constraint, Equation (1), and, correspondingly, the SE curve used in the previous section. To address the issue, we will extend our model to the open-economy case and consider restrictions on the use of illicit labour imposed by foreign importers of domestic products. The analytical framework is a modified version of the Ricardo-Viner (RV) model of a two-sector small open economy developed by Jones (1971) and Samuelson (1971). Restrictions on the use of illicit labour in the export industry spill over to the remainder of the economy via the labour market. We consider labour as the mobile factor of production and in contrast to the classical RV model we assume that its supply is elastic. Like in the original RV model, there are decreasing returns to scale with respect to labour. Thus, pure profits/rents are feasible and they will be a major ingredient to explain intersectoral spillovers and leakage effects. The specific factors of production are not modelled explicitly, but we assume that the number of firms active in each sector of the economy is constant due to limited supply of land and specific capital. The two sectors in our RV model are the exporting industry, indicated by  $X$ , and the import-competing industry, indicated by  $M$ . The world market prices of these goods faced by the small open economy are normalised to 1. Let the shares of firms operating in the two industries be constant,  $\mu$  in the import-competing industry and  $(1 - \mu)$  in the export sector, the total mass of firms in the economy being unity as before. Regarding the mobile factor, we distinguish slaves,  $S^i$ , and workers hired via proper employment contracts,  $L^i$ , where  $i = M, X$ . Individual firms decide whether or not to become slaveholders according to (1). The case that firms use legal and illegal labour at the same time is excluded.

- Slaves. We assume that there is a reserve army of rural and urban proletariats living on subsistence income 1, which is also the expenditure per slave of a firm using slave labour. Thus, slaves will be employed up to the point where their marginal productivity is 1. Although firms are immobile across sectors in the short run, we assume that long-run adjustments of the specific factors in the past have equalised profits in the two sectors and all slaveholders make the same profit,  $\bar{\pi}$ . However, due to different

technologies, the number of slaves per firm will in general be different across sectors:  $S^M \neq S^X$ . Finally let  $s^M$  and  $s^X$  be the shares of slave-holding firms in the import-competing and export industries, respectively.

- Legal labour. Legal labour is supplied elastically via an increasing labour supply function,  $N(w)$ , with  $N'(w) > 0$ , and  $N(1) = 0$ . Let the production functions of the firms in the export and import-competing sectors be  $M(\cdot)$  and  $X(\cdot)$ , respectively, with positive and declining marginal productivities. Then  $M'(L^M) = X'(L^X) = w$ , determining negatively sloped labour demand functions,  $L^M(w)$  and  $L^X(w)$ , and declining and strictly concave profit functions  $\pi^M(w) < \bar{\pi}$  and  $\pi^X(w) < \bar{\pi}$ .

The research question is how an exogenous change in  $s^X$ , resulting from an effective ban of slavery in the export sector, will affect the share of slavery in the import-competing industry,  $s^M$ , the share of slavery in the economy,  $s = \mu s^M + (1 - \mu)s^X$ , and the total number of slaves,  $S = \mu s^M S^M + (1 - \mu)s^X S^X$ . The mechanism is that these trade restrictions raise the demand for legal labour in the export sector, which raises the official wage rate,  $w$ , which in turn makes illicit labour more attractive for firms not affected by trade restrictions.

The market for legal labour is in equilibrium if

$$\mu(1 - s^M)L^M(w) + (1 - \mu)(1 - s^X)L^X(w) = N(w).$$

Total differentiation yields

$$-\mu L^M ds^M - (1 - \mu)L^X ds^X = (\varepsilon - \eta) \frac{L}{w} dw, \quad (9)$$

where  $\varepsilon > 0$  and  $\eta < 0$  are the elasticities of legal-labour supply and demand, respectively.

The share of import-competing firms employing workers under conditions of forced labour and modern slavery is determined in a similar fashion as in Section 2.1. Let  $\pi$  denote the unscrupulousness of employers concerning employment conditions that violate human dignity and basic human rights and let  $f(\pi)$  with  $F(\pi)$  be the corresponding simple and cumulated density functions having the usual properties.<sup>3</sup> Given that slavery is economically profitable only if  $\pi^M(w) < \bar{\pi}$ , we have

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<sup>3</sup> Note that in contrast to the previous chapters,  $\pi$  does not represent firm diversity any more, but solely the attitudes of the owners towards slavery. Entrepreneurs who feel socially responsible and behave altruistically are characterised by  $\pi < 0$ . People with  $\pi > 0$ , on the other hand may be

$$\Pi^{e,M} = \pi + \bar{\pi} - \pi^M(w) - (\beta B + (1 - \beta)P)q$$

as a modified version of (1). It follows that

$$s^M = 1 - F(\pi^M(w) - \bar{\pi} + (\beta B + (1 - \beta)P)q). \quad (10)$$

Restricting the analysis to the SE curve, we can keep  $\beta$  and  $B$  constant and together with (9) we have

$$\begin{pmatrix} (\varepsilon - \eta) \frac{L}{w} & \mu L^M \\ f\pi^{M'} & 1 \end{pmatrix} \begin{pmatrix} dw \\ ds^M \end{pmatrix} = \begin{pmatrix} -(1 - \mu)L^X \\ 0 \end{pmatrix} ds^X. \quad (11)$$

This implies that a foreign trade restriction, resulting in a reduction in  $s^X$ , leads to an increase in the formal-labour-market wage rate and to an increase in slavery in the sectors of the economy not affected by the trade restriction. Noting that the total number of firms in the economy employing illicit labour is affected by a change in  $s^X$  such that  $\frac{ds}{ds^X} = (1 - \mu) + \mu \frac{ds^M}{ds^X}$ , it follows from (11) that

$$\frac{ds}{ds^X} = (1 - \mu) \frac{(\varepsilon - \eta) \frac{L}{w} - \mu(L^M - L^X) f\pi^{M'}}{(\varepsilon - \eta) \frac{L}{w} - \mu L^M f\pi^{M'}}. \quad (12)$$

For given  $\beta$  and  $B$ , the total number of firms in the economy employing illicit labour will increase if this is negative. A necessary condition is  $L^X > L^M$ , i.e. the representative exporting firm using legal labour has a larger number of employees than the corresponding firm in the import-competing sector of the economy. If  $L^X > L^M$ , a firm moving from slavery to legal employment in the  $X$  sector demands more workers than a firm in the  $M$  sector moving from legal labour to slavery is willing to lay off. The larger the difference, the larger is the excess demand for legal labour and, thus, the upwards pressure on the wage rate. However,  $L^X > L^M$  is not sufficient. The negative effect is possible only if labour supply and demand react inelastically to rising wages and if a rising wage has a strong negative effect on the profit in the  $M$  sector. This is plausible since inelastic labour markets induce large wage increases in response to excess demand. Additional incentives to substitute illicit for legal labour in the

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categorised as sadists as they are willing to keep slaves even if the monetary benefit from doing so is zero or negative.

import-competing sector are generated if the profits from employing legal labour decline drastically in wages.

Equation (12) determines the change in the SE curve. It is shifted down if the abolishment of slavery in (parts of) the exporting industry reduces overall slavery,  $\frac{ds}{ds^X} > 0$ , and up if  $\frac{ds}{ds^X} < 0$ . As the two curves are both increasing in a stable interior equilibrium (see Figures 1 and 3), corruption reduced in the first case and increased in the second.<sup>4</sup> The effect on the equilibrium number of slaveholders depends on the slopes of the SE and CE curves, denoted  $SE'$  and  $CE'$ , respectively:

$$\frac{ds^*}{ds^X} = \frac{CE'}{CE' - SE'} \frac{ds}{ds^X}. \quad (13)$$

where  $CE' > SE' > 0$  such that the fraction on the right-hand side is larger than 1 and there is an amplification effect.<sup>5</sup> In case  $\frac{ds^*}{ds^X} < 0$ , a scenario cannot be excluded where the economy is shifted from a low-slavery, low-corruption equilibrium to a high-slavery, high-corruption equilibrium by the introduction of anti-slavery standards in the export industry. Moreover it is possible that the total number of workers employed under conditions of forced labour is increased, in particular if  $S^M > S^X$ . In this case a firm moving from legal to illicit labour in the  $M$  sector coerces more workers into slave labour than a firm abolishing slavery in the  $X$  sector lays off after an introduction of trade-related anti-slavery standards.

## 5 Summary and Conclusions

Although slavery and coerced labour are prohibited globally, they are omnipresent in many countries. Of course, there are regulatory deficits, but often corrupt civil servants are inclined to keep a blind eye on slavery if they are appropriately bribed. This paper has investigated the link between slavery and corruption in a framework where slaveholders can buy protection from punishment by bribing corrupt inspectors and in which the decisions whether

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<sup>4</sup> In the case of Figure 4, where the SE curve is negatively sloped in the stable interior equilibrium, the effects on slavery and corruption go into opposite directions.

<sup>5</sup> Using (8) to substitute for  $CE'$  and  $SE'$  does not yield further insights.



or not to become a slaveholder and whether or not to be corrupt are endogenous. Many results are ambiguous and multiple equilibria may arise:

- Although it can be shown that an increase in the punishment of slave-holders increases bribes, the impacts of other parameters are ambiguous if the bureaucrat considers the effect of additional bribe income on her/his risk of detection during the bargaining process.
- Multiple equilibria are possible. They can emerge due to social rewards, constituting an externality in the public sector, and to the marginal risk of corruption being detected.
- Multiple equilibria cause hysteresis. As both the low-corruption, low slavery equilibrium and its high-corruption, high-slavery counterpart are locally stable, major policy changes are necessary to move an economy from one equilibrium to the other. This transition involves a bifurcation of the fold-catastrophe type.
- Small increases in government regulation will usually shift the economy towards lower levels of both corruption and slavery. However, depending on the parameters of the model, it is possible that increases in the punishment of slavery and in its probability of detection raise corruption as these policy changes may make it more attractive for public servants to extract additional rent income by blackmailing perpetrators.
- In an open economy, which we modelled in a Ricardo-Viner framework, restrictions on the use of coerced labour that are effective in curbing slavery in the export industry have undesired leakage effects such that slavery in the remainder of the economy increases. Under particular parameter constellations, the leakage effects may dominate the direct effect of the policy and slavery – and possibly corruption, too – may be increased economywide.

It should be noted that the comparative statics have been analysed for simplified versions of the model only. The interaction of the effects of social rewards and of marginal detection risk as well as the consideration of the ambiguity of the impacts of various variables on the bargaining outcome would yield an even richer set of results, which can, unfortunately, not be analysed analytically.

It is evident that, besides modern slavery, our basic model can be applied to other types of illicit activities where potential perpetrators differ with respect to their unscrupulousness, e.g. production and trafficking of illegal drugs or counterfeit commodities or trade in endangered species and products made of them. Of course, one may think of extensions of

the model into various directions. One of them is the endogenisation of the detection probability of slavery. The possibility of extracting additional bribe income from convicted perpetrators will raise the effort invested by inspectors to detect slavery. This might reduce slavery at the cost of increased corruption. Another extension would be to look at the trade-and-slavery issue in a different modelling context. This could be done in a Melitz (2003) type modelling framework, where exporters are more productive than non-exporters and where restrictions imposed on exporting firms would definitely affect the producers of non-traded goods via mechanisms different from those identified in our Ricardo-Viner model. We hope that our work is a starting point for future research into these directions.

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