

Essays on the Economics of Slavery and Serfdom

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“Say the words ‘slave trade’ and most people picture wooden ships leaving Africa for the New World, but the trade has been evolving and changing. The modern version uses false passports and airline tickets. It packs slaves into trucks and bribes border guards. It covers its tracks with false work contracts and fraudulent visas.” (Bales 2000, p.250)

Table of Contents

1	Introduction	1
1.1	Push and Pull Factors of Modern Slavery	2
1.2	Slave Recruitment	4
1.3	Types of Exploitation	5
1.4	Existing Literature	6
1.5	Structure of this Thesis	13
2	Essay 1: Masters and Slaves – A Matching Model of Forced Labor with Heterogeneous Workers	14
2.1	Introduction and Motivation	15
2.2	Literature Review	20
2.3	The Model	22
2.4	Conclusion	35
A2	Appendix – Mathematical Derivations	37
3	Essay 2: Modern Slavery, Corruption, and Hysteresis	40
3.1	Introduction and Motivation	41
3.2	The Model	47
3.3	The Political-Economy Equilibrium	53
3.4	Trade-Related Process Standards, Slavery, and Leakage	63
3.5	Summary and Conclusions	67
A3.1	Appendix – Comparative Statics of the Equilibrium	70

A3.2	Appendix – Boundary Equilibria	71
4	Essay 3: Modern Slavery – An Empirical Analysis	73
4.1	Introduction	74
4.2	Modern Slavery – An Overview	78
4.3	Pull and Push Factors of Modern Slavery	81
4.4	Principal Component Analysis and Hypotheses	83
4.5	Empirical Analysis	85
4.6	Empirical Framework and Results	90
4.7	Discussion and Conclusion	111
A4.1	Appendix – Summary Statistics and List of observed Countries	113
A4.2	Appendix – Data Work and Data Selection	115
5	References	126

List of Tables

Table 1: Comparative statics	28
Table 2: Partial comparative statics	39
Table 3: Estimation results 1	91
Table 4: Estimation results 2	94
Table 5: Predictive margins.....	95
Table 6: Predictive margins for alternative dependent variables	97
Table 7: Estimation results 3	100
Table 8: Random effects probit regression for source and destination countries	103
Table 9: Random effects probit regression for source and destination countries for different types of exploitation	106
Table 10: Conditional fixed effects Poisson regression for exports and imports (measured in number of countries)	110
Table 11: Summary statistics	113
Table 12: Component loadings (excerpt)	121
Table 13: Factor loadings (excerpt)	124

List of Figures

Figure 1: Optimal bribes and effort.....	29
Figure 2: Effect of governmental labor protection and probability of detection on bribes and effort.....	30
Figure 3: Effect of the ratio of slaveholders to workers on bribes and effort	31
Figure 4: Impact of governmental labor protection on effort and profits	34
Figure 5: Matching function converges to N	38
Figure 6: Equilibrium and comparative statics if p' is small and a is large.....	58
Figure 7: The effect of a reduction in parameter a	60
Figure 8: The effect of a reduction in V if the CE line is U-shaped	61
Figure 9: Equilibrium and comparative statics if a is small and p' is large.....	62
Figure 10: A boundary equilibrium with zero corruption	71
Figure 11: A boundary equilibrium with 100% corruption.....	72
Figure 12: Heat map of exploitation	97
Figure 13: Screeplot of eigenvalues after PCA (excerpt).....	120
Figure 14: Plot of principal component scores.....	122
Figure 15: Screeplot of eigenvalues after factor analysis (excerpt)	123
Figure 16: Factor loadings in the factor space	125

1 Introduction

The term slavery is commonly associated with slave markets in ancient Rome or colonial history. Although slavery was abolished by most countries 150 years ago, exploitive working conditions are still prevalent in modern-day societies.

The International Labour Organization (ILO) designed a variety of international conventions outlining core criteria in order to define work that is compatible with basic human rights and dignity¹. They define forced labor as “all work or service which is exacted from any person under the threat of a penalty and for which the person has not offered himself or herself voluntarily (International Labour Organization 1930, No. 29, Article 2.1). Thus, forms of labor that lack consent to a mutual agreement or freedom of movement should be outlawed worldwide (Limoncelli 2009). According to the Walk Free Foundation (2018), 44.8 million people are victims of modern slavery in 167 countries. Worldwide, 80% of the victims are female and 50% are children, whereas boys are as likely to engage in prostitution, as girls (Deshpande and Nour 2013). Despite the large number of victims, prosecution is difficult with only about 1 in 800 cases being prosecuted (Hornor 2015). Convictions are even rarer, as law enforcement officials face severe difficulties to gather sufficient evidence of misbehavior (Organization for Security and Co-operation in Europe 1999). Investigations and judicial proceedings are often too slow to catch perpetrators. Additional difficulties arise if victims and offenders come from different countries due to a lack of efficient international cooperation between authorities (Monzini 2004).

The most common forms of exploitation of men, women and children include commercial sex, forced labor, coerced marriages, forced military service, forced begging, theft and drug trafficking (U.S. Department of State 2001-16). One of the largest illegal businesses is forced

¹ For additional information, consult the ILOs Core Labor Standards (CLS).

prostitution. It is the fastest growing part of organized crime² and the second largest criminal enterprise in the world³ (Walker-Rodriguez and Hill 2011). Clause and Lawler (2013) state that modern slavery is “any form of extreme exploitation of one human being by another for financial gain”. Belser (2005) finds that oppression is a highly lucrative business and estimates an annual global profit made from exploitation of 44.3 billion USD. In his study, he finds that worldwide human trafficking generates 31.6 billion USD annually. Half of these profits “are made from people trafficked and forced to work in industrialized countries“ (Belser 2005, p.iii).

1.1 Push and Pull Factors of Modern Slavery

Abusers usually prey on economically or socially vulnerable individuals. Vulnerable people become victims due to certain *push* and *pull factors*. The terms push and pull factors refer to determinants of supply and demand of victims, respectively. Push factors are i.e. low self-esteem, need for affection or domestic violence (Raymond et al. 2002). Pull factors include the hope for a better economic life or feelings of love or indebtedness regarding the abuser (Kelly, Regan, and Willis, Carole, F. 2000). According to Limoncelli (2009) several root causes of oppression can be identified: Poverty, gender inequality, violence, (ethnic or class-based) discrimination, stigmatization, poor social protection and employment possibilities. Additional factors increasing the vulnerability of potential victims are: Homelessness, situations of family dysfunction or (child) maltreatment, physical or mental disabilities, living in orphanages or with a guardian or within a refugee camp, lack of labor market regulations⁴ or (legal) support systems (Hornor 2015).

² Not only lone perpetrators but also organized crime networks, specifically the mafia operate in human trafficking. In 2013 “an estimated 90% of women in prostitution in Spain were under the control of organized crime networks” (U.S. Department of State 2013, p. 339).

³ The most profitable international crime is the trade in illicit drugs (Walker-Rodriguez and Hill 2011).

⁴ Unregulated areas include domestic services, (forced) begging and illegal activities (e.g. drug trafficking, forced theft, forced conscription in terrorist groups).

From a global point of view, economic disparities between sending and receiving countries, conflict and militarization, structural adjustment policies, the worldwide growth of informal work, and the dependence of some governments on the remittances of (exploitable) migrants have to be considered. Although poverty is not the only factor driving cross-border human trafficking, it typically involves the movement of individuals from poorer countries to wealthier ones⁵ (Limoncelli 2009). Hence, individuals may perceive slavery abroad to be a better alternative than exploitation in their home-country (Limoncelli 2009). Moreover, ethnic or nationalist views can lead state officials to prefer migrant workers rather than ‘their own’ people to work in ‘dirty jobs’, e.g. in the sex industry (Diep 2005). Undocumented migrants are especially at risk if they are barred from entering the legal labor market. As a result, they may have to work in underground industries⁶, where they are not protected by state regulations (Limoncelli 2009).

The situation for victims gets even more problematic if they encounter corrupt officials (police, politicians, military, UN-peacekeeping, etc.) who act as active or complicit violators of human rights. State officials also play a part in fostering sex tourism, encouraging or restricting labor migration, and engaging in wars that increase vulnerability of affected individuals (Talleyrand 2000). In Tajikistan, government officials assisted entrepreneurs by providing forged passports, birth- and marriage certificates of workers. In Taiwan and Papua New Guinea, incidents of several local authorities accepting bribes and sexual services in return for ignoring illegal sex and labor activities were confirmed. Moreover, cases where local police informed employers prior to police raids were endorsed, for example in the Philippines. In 2010, more than 70 Buenos Aires police officers were accused of accepting bribes to protect brothels from impending raids in Argentina (U.S. Department of State 2001-16).

⁵ The same method can be observed within countries where individuals are trafficked from poorer regions to wealthier ones (mostly from the countryside to larger cities and prominent tourist destinations) (Limoncelli 2009).

⁶ Underground industries include prostitution, work in sweatshops or drug trafficking (Raymond et al. 2002; Limoncelli 2009).

Some individuals may agree to exploitative arrangements as part of a ‘family economic strategy’ (Limoncelli 2009). Due to desperation and lack of alternatives, a family member is chosen to support their kin financially, even if the employment is exploitative (Raymond et al. 2002). Raymond et al. (2002) finds that children in Venezuela were forced to work in domestic service or prostitution. Their ‘salary’ of about 400 USD for one year was paid directly to their parents.

1.2 Slave Recruitment

Enslavement is achieved through various means. One possibility is simply abducting an individual which is known as ‘complete coercion’ (Kelly, Regan, and Willis, Carole, F. 2000). Another possibility is the so called ‘finesse pimping’ where the pimp (acting as a boyfriend, ‘loverboy’) or an older ‘female friend’ (a recruiter for the pimp) introduces the victim to prostitution. Victims are lured into an abusive situation using kindness, compassion, gifts (cash, clothes, etc.) or drugs to make them feel grateful or indebted to the pimp (Deshpande and Nour 2013).

Recruitment also takes place via intimidation, force or coercion (also known as ‘guerilla pimping’)⁷. In order to break the spirit of the victim, starvation, confinement, physical violence (beatings, rape), threats to family members and forced drug use are common. This form of abuse aims at the formation of a ‘trauma bond’, in which the victim is afraid to be harmed by the oppressor and yet is grateful to the oppressor for allowing the victim to live (Hornor 2015).

⁷ Some victims (mostly women from Africa e.g. Nigeria) are tricked into forced labor and prostitution through voodoo rituals (U.S. Department of State 2019).

Another way to lure victims into oppression is recruitment fraud. Fraudulent brokers advertise jobs and opportunities, which lead to exploitative situations and restriction of movement⁸. In these cases, individuals are offered jobs as waitresses, models or nannies abroad or in big cities. Upon arrival at the destination, victims are not employed as promised but coerced into prostitution (Tyldum, Tveit, and Brunovskis 2005). In addition, withholding of passports and wages by the oppressors results in increased vulnerability (U.S. Department of State 2019). Domestic workers are particularly vulnerable because they are confined to a private home and often isolated from the protection offered in a regular workplace (Freedom United 2018).

Once a victim is trapped in an exploitative situation, the main goal becomes tending to her/his basic needs or merely surviving. A vicious circle is established when the victim is dependent on the abuser or even grateful for letting her/him live.

1.3 Types of Exploitation

Various types of exploitation can be distinguished. O'Connell Davidson (2010) states that slavery ranges along a “continuum of exploitation, shading off into servitude and other forms of exploitation, rather than existing as a wholly distinct, isolated phenomenon” (O'Connell Davidson 2010, p. 246). According to Koettl (2009) most forms of modern slavery involve some form of forced labor or forced prostitution.

In some parts of Africa and Asia, slavery-based caste systems are still in practice. Certain individuals are traditionally viewed as inferior and are therefore marginalized. They are prevented from owning property or other forms of wealth. Victims are born into slavery castes⁹

⁸ Fraudulent marriage brokers use the same tactics by promising a better quality of life or residency status in a wealthy country. Subsequently, victims are sold into prostitution by their husbands or members of the trafficking-ring (Raymond et al. 2002).

⁹ Slavery castes are present for example in Niger, Uganda, and Somalia (U.S. Department of State 2019).

and are forced into the servitude of more powerful individuals or clan members (U.S. Department of State 2019).

Debt bondage is also a common form of suppression. The victim (or the family of the victim) is granted a loan (e.g. for travel expenses to another county), which has to be repaid via forced prostitution or forced labor. High debts, low pay and harsh working conditions make it difficult to repay the loan. An example is the *chukri* system in Bangladesh and India, where sex workers have to work without pay, sometimes for years, in order to repay the brothel owner for food, clothes, make-up and living expenses (Limoncelli 2009). In 2016 an estimated 24.9 million people were exploited in conditions of forced labor. Bonded labor is mostly prevalent in the private sector¹⁰ (International Labour Organization 2018). Some relatives (parents, grandparents, spouse, uncles, aunts), sell their children, wives or siblings into forced prostitution or servitude for money, drugs, or food (U.S. Department of State 2019).

Forced marriages, namely the tradition of *ukuthwala* in South Africa is still practiced in remote villages in Eastern and Western Cape provinces, where girls as young as twelve are forced to marry adult men. As a result, these girls are more vulnerable to forced labor and prostitution. Similarly, the practice of temporary- or fixed-term marriages, common in some countries in the Middle East, contributes to the vulnerability of the involved ‘wives’¹¹ (U.S. Department of State 2019).

1.4 Existing Literature

There is a substantial literature on slavery and exploitation in economics. Initial work in the field of slavery focused mainly on the development of theoretical models in a historical context

¹⁰ The International Labour Organization (2018) estimates that 16 million people are maltreated by individuals or enterprises in the private sector.

¹¹ Such ‘summer marriages’ are common in: Afghanistan, Chad, Egypt, Indonesia, Iran (*sigheh*), Iraq (*muta’a*), Mauritania, Saudi Arabia, Yemen (U.S. Department of State 2019).

(Findlay 1975; Chwe 1990; Ergin and Sayan 1997; Eltis, Lewis, and Richardson 2005; Edlund and Ku 2013). Scheidel (2012) discusses slavery in the Roman economy. Edlund and Ku (2013) model the implications of the historic slave trade on present-day social norms.

Scant attention has been paid to modern slavery of adults in the theoretical literature. Lagerlöf (2009) examined the transition from a slave economy to a free-labor system and vice versa. Acemoglu and Wolitzky (2011) model an environment where forced labor is achieved through coercion and punishment.

Many theoretical studies examine child labor, which is a subset of compulsory labor. A substantial body of research focuses on decisions of (benevolent) parents regarding their child (Basu and Van 1998; Ranjan 2001; Weinberg 2001; Basu and Chau 2004; Dessy and Pallage 2005; Rogers and Swinnerton 2008; Strulik 2008). Moreover, Dinopoulos and Zhao (2007) have identified child labor as a substitute to low-skilled labor. In contrast to other models, they assume selfish parents who support child employment. Thus, the authors are able to analyze the effect of child labor bans on child labor demand in the agricultural sector without driving the output to zero. Rogers and Swinnerton (2008) compare different types of child labor. Swaminathan (1998), Ranjan (1999) and Neumayer and DeSoysa (2005) find a connection between child labor, globalization, and economic growth. Beber and Blattman (2010) study child soldiering. Noteworthy studies of child trafficking were carried out by Dessy, Mbiekop, and Pallage (2005), Dessy and Pallage (2005) and Kudlac (2015). Basu (1999) examines links between international labor laws and child labor. Maffei, Raabe, and Ursprung (2006) find an impact of the level of political repression within the country on child labor.

Field (1988) was among the first to investigate slave work empirically. Research concerning modern slavery primarily focusses on the empirical aspects of human trafficking. Akee et al. (2010) provide evidence that ethnic fragmentation, conflict, displacement and trafficking are interlinked. Their findings reveal that fragmentation and conflicts predict displacement, which

in turn amplifies trafficking. Simmons and Lloyd (2010) investigate transnational crime and human trafficking. Akee et al. (2014) focus on illegal activities and migration. Estimation results from a gravity model show that illegal activities in both domestic and foreign markets reinforce one another and thus the probability of trafficking (Akee et al. 2014). Moreover, it has been shown that human rights, human trafficking and trade are interlinked (Srinivasan 1998; Cleveland 2002; Hernandez and Rudolph 2015). Cho (2013) investigates how human trafficking, women's rights and globalization are interconnected. Her findings reveal increased human trafficking inflows with regard to cultural proximity and increased migration between countries.

In their studies, Danailova-Trainor and Belser (2006) and Frank (2013a) focus on universal determinants of human trafficking. Hernandez and Rudolph (2015), for example, using a gravity model of illegal migration, show that institutional quality and regulation (including corruption) drive modern-day slavery. Cho (2015) tests the robustness of various push and pull factors of human trafficking. She concludes that crime, inequality, migration and institutional quality significantly affect exploitation. Frank and Simmons (2013) investigate whether domestic- and international laws affect human trafficking. In addition to laws, several papers have studied the effect of specific anti-trafficking measures such as prosecutions against traffickers, protection of victims and trafficking-prevention policies. Cho and Vadlamannati (2012) examine several anti-trafficking measures and find that the ratification of anti-trafficking protocols has the strongest effect on crime prevention policies. Cho, Dreher, and Neumayer (2014) develop an index to capture governmental anti-trafficking measures and find that corruption decreases compliance. Potrafke (2016) examines how countries differ in their anti-trafficking policies by developing a new index.

Particular attention is given to transnational trafficking for the purpose of sexual exploitation. Literature on prostitution laws and international sex slavery includes e.g. Jakobsson and

Kotsadam (2013) and Aghatise (2004). Jakobsson and Kotsadam (2013) use cross country data to show that forced prostitution is prevailing in countries where prostitution is legal. Aghatise (2004) examines sex-trafficking in Italy and discusses strategies to discourage human trafficking. Danailova-Trainor and Belser (2006) investigate what determines supply and demand for transnational sex trafficking. A number of other studies address health consequences of sex trafficking (Beyrer and Stachowiak 2003; Zimmerman et al. 2003; Limoncelli 2009).

The availability of data on illicit activities is limited and therefore research on slavery is challenging. Nevertheless, some attempts have been made to quantify the extent of human trafficking. The Walk Free Foundation (2018) publish their ‘Slavery Index’ annually since 2004. It ranks countries according to the estimated number of victims. The United Nations Office on Drugs and Crime (2020) reports a yearly index on a scale from zero to six to describe the incidence of trafficking. Frank (2013a) has generated categorical variables capturing different types of trafficking and governmental efforts to prevent human trafficking. Belser, Cock, and Mehran (2005) create, in cooperation with the International Labor Organization, a cross-sectional dataset, which contains the number of human trafficking cases for 74 countries.

In summary, the literature review indicates that most of the research has been limited to slavery in a historical context, human trafficking (mostly sex trafficking), and child labor. Theoretical approaches examining the mechanisms inducing forced labor have received very little attention in the literature so far. The aim of this dissertation is to find out how situations of slavery and suppression are created and which factors drive modern slavery.

Recruitment of Slaves. In Essay 1, I develop a labor-market matching model to analyze the recruitment process of slaves and the impact of policy measures on the extent of slavery. I introduce the novelty that employers search for workers (potential victims) whereas the previous literature on labor market matching has taken the opposite approach by modeling workers who exert

effort in order to find a suitable job (and not the other way round). Matches take place if a potential slaveholder is successful in exerting effort to acquire slaves. The effort of the employer to recruit slaves is influenced by government activities (labor protection, prosecution). To increase chances of success, employers choose their effort by taking the potential vulnerability of the victim into account. Potential slaves are heterogeneous regarding their individual vulnerability and protection against labor exploitation. These individual characteristics include education, age, gender, ethnicity, social situation, family background and endowments. A higher level of vulnerability indicates a higher risk of being enslaved. In addition to their effort, the costs accruing to a slaveholder include bribes to avoid detection and penalties if she/he is detected. Solving the model yields that a high probability of detection and strict labor protection lead to a reduction in slavery. Moreover, I show that a high ratio of slaveholders to the available workforce increases the probability of enslavement and thus, the number of slaves. These results are in line with the empirical findings of Jakobsson and Kotsadam (2013) and Hernandez and Rudolph (2015). Surprisingly, strict labor protection increases the effort of the slaveholder, but also decreases their profit. Consistent with this result, Cho, Dreher, and Neumayer (2013) and Jakobsson and Kotsadam (2013) find that stricter law enforcement curbs the profitability of human trafficking.

Slavery and Corruption. As even government institutions and public authorities make use of forced labor¹², Essay 2¹³ investigates the link between slavery and corruption. In our framework, slaveholders can buy protection from punishment by bribing corrupt inspectors. The decisions whether or not to become a slaveholder and whether or not to be corrupt are endogenous and depend on each other. We develop a model where firms profit from coercing workers into employment under conditions violating national law and international conventions. In addition, corrupt public servants prosecuting violations of these rules are

¹² In Burundi, the Ukraine, Uzbekistan and Vietnam prisoners are punished with forced manual labor for political or religious offences (U.S. Department of State 2019). In 2019, Nigerian “military officials fraudulently recruited approximately 100-200 women and girls to work outside” their camps but subsequently forced them into prostitution (U.S. Department of State 2019, p. 354).

¹³ Essay 2 is co-authored by Michael Rauscher.

willing to look away from misbehavior if bribed. Firms and public servants are heterogeneous: firms benefit differently from the use of coerced labor whereas public servants have differing intrinsic motivations to behave honestly. Moreover, there is a socially determined warm-glow effect: honest public servants 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. We show that multiple equilibria and hysteresis are possible. Depending on its history, an economy may be trapped in a locally stable high-corruption, high-slavery equilibrium. Major changes in government policies may be necessary to move the economy out of this ‘bad’ equilibrium. We examine the impact of punishment and of detection probability of slavery and corruption. We find that most of the parameter impacts are as expected, but that increased punishment of forced labor may result in more corruption.

Due to globalization, coerced labor does not stop at national borders. Thus, in addition to the closed-economy setting, we also extend our model to the open-economy case. After all, international trade can be a lever to enforce anti-slavery and, more generally, fair-trade objectives in countries where regulations are weak or are insufficiently enforced. In our paper, we look at restrictions on the use of illicit labor imposed by foreign importers of domestic products. The analytical framework is a modified version of the Ricardo-Viner model of a two-sector small open economy. 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. Moreover, it is possible that this leakage effect dominates the reduction of slavery in the export sector.

Determinants of Modern Slavery. The main findings of previous empirical studies are that migration flows, quality of institutions, legal framework and crime prevalence influence human trafficking. The aim of Essay 3 is to confirm determinants of modern slavery from the previous literature as well as to identify additional factors with the aforementioned new dataset. This panel dataset contains the estimated number of victims for 198 countries from 2002 to 2016. The

dataset was constructed by the author and is based on the Human Trafficking Reports of the U.S. Department of State (2001-16). The focus is particularly on the role of laws combating modern slavery and their enforcement. To the best of my knowledge, the actual enforcement of existing laws has not been studied previously in the economics literature. In contrast to other studies, I do not focus on the trafficking process itself, but investigate the following issues: Which factors drive the exploitation of adults already present in a certain country? Are forced prostitution and forced labor affected by the same causes? Which factors drive the exploitation of children? What are the differences between adult slave labor and child slavery? How do source and destination countries differ? Why does the number of countries where victims originate from, differ significantly across exploiting countries?

The evidence from this study suggests that effective policies against modern slavery require sound institutions, implementation of relevant laws and their enforcement. Moreover, the findings of this study support the idea that law abundance in general is an important factor. My results regarding GDP and development are consistent with the literature. I find that wealthy, highly developed or corrupt economies attract exploitation. My findings support the hypothesis that source and destination countries differ significantly regarding political regimes and socio-economic factors. Both abundance and enforcement of the law lead to increased detection rates of modern slavery. These findings suggest that the results are partly driven by distortions caused by the data generation process. Hence, the main effects in my data are strongly correlated with the control variables. Unfortunately, it has not been possible to locate suitable identifying strategies to address this potential endogeneity.

1.5 Structure of this Thesis

Essay 1 “Masters and Slaves – A Matching Model of Forced Labor with Heterogeneous Workers” presents a theoretical model concerning forced labor. The developed matching model addresses how oppressors recruit their victims. The recruitment process contains involuntariness, which is a central aspect of modern slavery. How the extent of exploitation is affected by certain mechanisms is examined as well.

Essay 2 “Modern Slavery, Corruption, and Hysteresis” investigates the link between slavery and corruption. We developed a theoretical model where slaveholders can buy protection from punishment by bribing corrupt inspectors. Bribery is modelled via Nash bargaining. We show that multiple equilibria and hysteresis are possible. Due to globalization, coerced labor does not stop at national borders. Thus, in addition to the closed-economy setting, we also extend our model to the open-economy case.

Essay 3 “Modern Slavery – An Empirical Analysis” is an empirical approach to study how political decision-making, institutional environment and coercive labor practices are interlinked. Social and economic determinants of modern slavery are examined using a novel dataset. The dataset contains information of exploitation of 198 countries from 2002 to 2016. A detailed description of the variable generation process can be found in Appendix A4.2.

2 Essay 1: Masters and Slaves – A Matching Model of Forced Labor with Heterogeneous Workers¹⁴

Abstract

At present, most countries have officially ratified the ILO Convention concerning forced or compulsory labor; however, serfdom is still present in the twenty-first century. This paper addresses how oppressors recruit their victims and how certain mechanisms affect the extent of modern slavery. We use a matching model to analyze this recruitment process, incorporating involuntariness, which is the distinctive factor of employment relationships in modern slavery. In contrast to the standard matching model, not the workers exert effort to find jobs but the employers exert effort to find and hire slaves. Workers are heterogeneous regarding their vulnerability to enslavement, which is ex-ante unknown to the potential employers. The employer's decision whether and to what extent to engage in forced labor depends on governmental labor protection and on the probability of detection. The model includes the possibility of bribery such that an employer can avoid sanctions if illicit behavior is detected. Solving the model yields that a high probability of detection and strict labor protection decrease slavery. We show that a high share of slaveholders increases the probability of enslavement and thus, the number of slaves. Surprisingly, strict labor protection increases the slaveholder's effort, but also decreases their profit.

Keywords: Coerced Labor, Modern Slavery, Matching

JEL codes: J23, J47, J71

¹⁴ This essay has been published as: Willert, Bianca. 2021. Masters and Slaves: A Matching Approach with Heterogeneous Workers. CESifo Economic Studies, ifab011.

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2.1 Introduction and Motivation

Although slavery and slave like practices are nowadays outlawed, coerced labor still persists in various forms in many countries (The Economist 2018). In some parts of the world, ‘anti-slavery protection’ only exists on paper, despite prohibiting forced labor by national law. In addition, the majority of countries ratified the 1926 *Slavery Convention* of the League of Nations and the 1956 *Supplementary Convention on the Abolition of Slavery, the Slave Trade, and Institutions and Practices Similar to Slavery* (Allain 2008). Belser, Cock, and Mehran (2005, p.1) assume that there are “at least 2 victims of forced labor per 1000 inhabitants. In relation to the total world labor force, the minimum estimate corresponds to about 4 persons in forced labor per 1000 inhabitants”. As abusive labor practices often happen in legally gray areas or are concealed, the real extent of forced labor remains unknown.

According to the ILO “Forced Labor Convention”, forced or compulsory labor is defined 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” (International Labour Organization 1930, No. 29, Article 2.1). Andrees and Belser (2009, p.179) define contemporary forced labor as a situation where “people are subjected to psychological or physical coercion ... in order to perform some work or service that they would otherwise not have freely chosen.” This definition suggests that some form of penalty and involuntariness are necessary in order to refer to forced labor. Hence, coerced labor is not necessarily equal to poor working conditions

(Belser, Cock, and Mehran 2005). The terms forced labor, coerced labor, and modern slavery are used synonymously in this paper.

Modern slavery is a very broad field where most forced labor cases can be attributed to the following economic sectors: prostitution, domestic service, manual labor in agriculture, factories (e.g. carpet factories), fishing, mining, the hotel and restaurant industry, and the entertainment industry (U.S. Department of State 2019). Acts of intimidation are not isolated to existing employment contracts, but an instrument of recruitment (Kelly and Regan 2000). Thus, the following questions regarding the recruitment of slaves come to mind: What are the mechanisms that lead to forced labor? How do victims end up in the hands of slaveholders as not all individuals are recruited by their exploiters in the same way?

Based on theoretical and empirical evidence the following factors affecting the success of a slaveholder are addressed.

Effort and slave-recruitment. According to Kelly and Regan (2000), different approaches of ‘victimization’ exist. Simply abducting an individual is considered ‘complete coercion’. When victims are promised jobs in the legitimate economy, but are forced into servitude later on, the authors speak of ‘deception’. Sometimes individuals are only told ‘half-truths’, e.g. they are made to believe, that they will be working for example as exotic dancers but are forced into (sexual) servitude instead. In other cases, victims willingly become bonded laborers, but are unaware of the extent of intimidation, exploitation and indebtedness of the ‘contract’. In the interviews conducted by Raymond et al. (2002) women from Eastern Europe describe how they were lured to work in the United States via fraudulent job offers. The women were deceived by newspaper advertisements and employment agencies promoting jobs as models, dancers, waitresses, babysitters and office administrators. Upon arrival in the United States, however, they were forced into prostitution (Raymond et al. 2002). Perpetrators use the same tactics to recruit workers for Europe (Hughes 2000). Fletcher, Bales, and Stover (2005) give an overview

of 131 forced labor cases¹⁵ in the United States from 1998 to 2003. On the basis of several selected showcases, the authors elaborate how workers were contacted, recruited, and deceived in order to be exploited in domestic service, factories or agricultural work (Fletcher, Bales, and Stover 2005).

Punishment and detection of illicit behavior. Forced labor is highly profitable and often tied to organized (international) crime and driven by the demand for cheap (sex) services. As most coerced labor takes place in the absence of labor force protection, e.g. in remote regions where enforcement of existing rules is weak, ‘employers’ often get away unpunished easily. Even if the illicit behavior is detected, punishment is seldom harsh (Fletcher, Bales, and Stover 2005). Victims scarcely report misconduct because of fear (of painful punishment or deportation) or lack of physical mobility (e.g. to a police station) (U.S. Department of State 2019).

Weak institutions and corruption. Weak institutions are often accompanied by corruption (Bjørnskov 2011). Also, the existing literature has clearly linked corruption to modern slavery (Hernandez and Rudolph 2015). In their interviews with Thai women in prostitution, Raymond et al. (2002) provide evidence that criminal networks rely on the cooperation of public officials. These public employees for example issue false documents for trafficking victims or turn a blind eye to labor market regulations or human rights. The services of corrupt public officials are bought with bribes. These inducements can take the form of monetary rewards but also include other advantages such as sexual favors (Transparency International 2018).

Vulnerability to enslavement. The chance to be enslaved depends on the individual wealth, ethnicity and (physical) health of a person. Moreover, social status and family background are important explanatory factors affecting the individual vulnerability. In a comprehensive survey of locally and internationally trafficked persons, Raymond et al. (2002) find that 70 percent of the respondents were single parents before being recruited. Twenty percent of the victims

¹⁵ Each case involves between one and thousands of victims (Fletcher, Bales, and Stover 2005).

indicated to be orphans. Illegal migrants, often stigmatized as undesirable criminal aliens, face an increased risk of being exploited due to their fear of deportation (Raymond et al. 2002). Although uneducated or handicapped people from impoverished areas and ethnic minorities are the most vulnerable, individuals from developed countries fall prey to slaveholders as well (Fletcher, Bales, and Stover 2005).

From the point of view of economics, many questions arise in the context of modern slavery. We will answer the following ones: Why do some firms turn into slaveholders and how many workers do they enslave? Which mechanisms and policy measures have an impact on the extent of modern slavery? How can forced labor be curbed?

The aim of this paper is to model by which means a slaveholder is able to force individuals to work and how many slaves can be acquired. Furthermore, we examine how certain policy measures influence the success of a slaveholder. As weak institutions, corruption and slavery are interlinked; bribery of governmental officials needs to be part of the model. Our model captures recruitment into forced prostitution, forced domestic service and forced labor in sweatshops, factories and on farms. Due to the complexity of the model, only firms willing to engage in slavery are examined. A discussion regarding the incentives and conditions that induce employers to become slaveholders are beyond the scope of this paper. Moreover, in this paper only coerced labor of adults is examined. The discussion of child labor is not addressed since different mechanisms such as the influence of parents would have to be considered¹⁶.

The analytical framework is a labor-market model in which masters and slaves are matched via a matching function. We use a matching approach à la Cahuc, Carcillo, and Zylberberg (2014, p. 583-87), in order to model how many workers are successfully enslaved. In contrast to the

¹⁶ The kidnapping of children e.g. for the purpose of child soldiering (Beber and Blattman 2010) bears some resemblance to the abduction of adult victims. However, in our model we exclusively focus on adult forced labor, as modelling child labor requires some unique properties that do not apply to adults. In addition, our model does not capture the dynamics of debt bondage.

standard matching model, not the workers exert effort to find jobs but the employers exert effort to find and hire slaves. This effort corresponds to the psychological or physical coercion expressed by the ILO Convention No. 29 (1930, Article 2.1). Moreover, we account for involuntariness, which is a central aspect of employment relationships in modern slavery. According to Fletcher, Bales, and Stover (2005) not all human beings are equally likely to fall prey to slavery. Thus, we account for the individual vulnerability of enslavement, which is ex ante unknown to the potential employers. We treat these socio-economic factors influencing vulnerability as exogenous and thus, do not model them explicitly. To our knowledge, introducing heterogeneity among potential victims is novel – as is the application of the search modeled to the supply side of the labor market. The decision whether and to what extent an employer engages in slavery depends on governmental labor protection and the probability of detection of the illicit activity. In order to reduce detection and avoid punishment the slaveholder can pay bribes to e.g. governmental officials.

Solving the model, we show that a higher probability of detection or stricter labor protection reduces the number slaves, as sound institutions are an effective protection against exploitation. Moreover, if the share of slaveholding firms is high, the probability of being enslaved increases and so does the number of slaves. Evidently, illicit behavior is associated with corruption and weak institutions. Surprisingly, we find that stricter regulation might induce more effort of slaveholders to acquire slaves, as recruitment becomes increasingly difficult. Further results show that the effort of the slaveholder to acquire slaves increases with stricter labor force protection, although strict labor protection reduces profits. If profits become zero or even negative, employers will refrain from slavery. It is found that the effort of the employer is increasing for low values of governmental labor protection, and drops to zero if a critical level of government protection of labor is reached. At this point, the number of slaves drops from strictly positive to zero. The main qualitative results of the paper are in line with findings of the

empirical literature (Aghatise 2004; Broadhurst, Lauchs, and Lohrisch 2012; Cho, Dreher, and Neumayer 2013; Jakobsson and Kotsadam 2013; Cho 2015; Hernandez and Rudolph 2015).

2.2 Literature Review

Preliminary works in the field of slavery focused primarily on the development of theoretical models in a historical context (Findlay 1975; Chwe 1990; Ergin and Sayan 1997; Eltis, Lewis, and Richardson 2005; Edlund and Ku 2013). One of the first empirical investigations into slavery was performed by Field (1988). Scheidel (2010) discusses slavery in the Roman economy. Edlund and Ku (2013) model the implications of the historic slave trade on present-day social norms.

More recent studies focus on the transition from a slave economy to a free-labor system and vice versa (Lagerlöf 2009) and on the use of punishment to achieve labor coercion (Acemoglu and Wolitzky 2011).

Research concerning modern slavery mostly focusses on the empirical aspects of human trafficking. Some of these studies focus on the effects of prostitution (Cho, Dreher, and Neumayer 2013; Jakobsson and Kotsadam 2013), others on ethnic fragmentation and conflicts (Akee et al. 2010) or determinants of human trafficking in general (Danailova-Trainor and Belser 2006; Frank 2013; Cho 2015).

A substantial body of research focusses on child labor, which is a subset of forced labor. Various approaches have been put forward to account for the influence of the parents on child labor (Ranjan 2001; Weinberg 2001; Basu and Chau 2004; Dessy and Pallage 2005; Rogers and Swinnerton 2008; Strulik 2008). Moreover, child labor has been identified as being a substitute to low-skilled labor (Dinopoulos and Zhao 2007). Noteworthy studies of child soldiering and child trafficking were carried out by (Beber and Blattman 2010) and (Dessy, Mbiekop, and

Pallage 2005) respectively. Links between international labor laws and child labor has been discussed by Basu (1999).

Very little has been written on forced labor of adults. Fletcher, Bales, and Stover (2005) and Belser, Cock, and Mehran (2005) attempt to measure the extent of forced labor in the United States and worldwide respectively.

The review of the literature indicates that research has been limited to slavery in a historical context, human trafficking (mostly sex trafficking) and child labor. Theoretical approaches examining the mechanisms inducing forced labor have received very little attention in the literature. Acemoglu and Wolitzky (2011) model an environment of labor coercion and address how employers hold their forced laborers at bay. In their model, firm and worker are randomly matched in contrast to the search-model developed in this paper. Rauscher and Willert (2020) develop a model where firms coerce workers into employment if corrupt bureaucrats are accomplices upon accepting bribes. The authors model the decision to become a slaveholder, but do not model the matching process explicitly.

To the best of our knowledge, previous work has focused on workers executing effort in order to find a suitable job and not the other way round. In this paper, we introduce the novelty that employers search for workers (potential victims). In addition, to our knowledge, this paper is the first to use a matching approach to model the recruitment process of slaves and the impact of policy measures on the extent of slavery. As opposed to Acemoglu and Wolitzky (2011), matches take place if a potential slaveholder successfully exerts effort to acquire slaves. To increase chances of success employers choose their effort according to the potential vulnerability of the victim. The effort of the employer to recruit slaves as well as her/his expenditure on bribes is influenced by government activities (labor protection, prosecution). Potential slaves are heterogeneous regarding their individual vulnerability and protection against labor exploitation. These individual characteristics include education, age, gender,

ethnicity, social situation, family background and endowments. All these characteristics are exogenous and thus not considered explicitly. Thus, we condense them into a single parameter called ‘vulnerability’. A higher level of vulnerability indicates a higher risk of being enslaved. We solve the model to determine the impact of policy parameters on slavery and derive comparative-static results.

The remainder of this paper is organized as follows. The next section outlines the theoretical model and its major assumptions. In Subsection 2.3.4, a model with heterogeneous slaves is developed using a matching approach. Subsections 2.3.7 and 2.3.8 provide a detailed explanation of all inner solutions and the boundary case, respectively. Section 0 concludes. All mathematical derivations of results can be found in Appendix A2.

2.3 The Model

We start by outlining the characteristics of workers, employers and the governmental protection against slavery used in the forthcoming model. Building on an idea by Dessy, Mbiekop, and Pallage (2005) used in their model of child labor, we argue that there are private and public measures that protect individual laborers from slavery. Private measures are incorporated in the variable termed vulnerability to enslavement, public measures take the form of governmental labor protection, and both of them influence the decisions of potential slaveholders.

2.3.1 Workers

There is a continuum of workers with mass N . Each individual has her/his own individual vulnerability to be enslaved, v_i , based on education, external characteristics (age, gender, race) and endowments, where $v_i \in \{0,1\}$. As mentioned above, potential slaves are assumed to be heterogeneous with respect to vulnerability to enslavement and v_i is assumed to be equally distributed in the population. The degree of an individual’s vulnerability is unknown to the

employer, who is assumed to be risk-neutral. However, the density function of v_i is known. Individual V is the cut-off individual, i.e. all individuals with $v_i \geq V$ become slaves and all individuals with $v_i < V$ are ‘normal’ workers. Thus, $V \cdot N$ is the number of slaves in society and correspondingly $(1-V) \cdot N$ will denote the number of ‘normal’ workers. In contrast to employees in the legal labor market, slaves will only receive a subsistence wage and suffer from poor working conditions. Both wages and working conditions will not be modeled explicitly but captured by extra profits of exploiting firms in Subsection 2.3.5.

2.3.2 Employers

Only employers willing to engage in slavery are considered. Assume a continuum of homogeneous firms, K , willing to engage in forced labor (prices are given). An employer k , who wants to engage in slavery, chooses the level of effort, e , necessary in order to break down the protective barrier. Employers know the distribution of the v_i in the society.

2.3.3 Government Protection against Slavery

Workers are protected against slavery by government policy, e.g. labor protection laws and their enforcement. Let its strictness be denoted by g . Governmental protection is exogenous to the firm and in practice country-specific. E.g., g is likely to be small in corrupt states and high in countries with strong and reliable institutions.

2.3.4 Matching

The following matching model is based on Cahuc, Carcillo, and Zylberberg (2014, 583–87) and Pissarides (2000, p. 124–29). Our matching model differs from their models in several aspects. First, job vacancies are not filled with unemployed individuals but with individuals vulnerable to exploitation. Second, workers do not signal their job qualifications but are heterogeneous regarding their individual vulnerability to enslavement. Third, we do not model wage formation as a bargaining process, as victims have no bargaining power and exploiters are only willing to

pay a subsistence wage (see Subsection 2.3.5). Last, as shown below, the number of matches does not depend on the ratio of job vacancies and job seekers, but on the number of potential victims available in the society and on the effort the slaveholder is willing to exert.

In our model, slaves and slave-masters are matched randomly. They are selected from the workers available in society, N , and from the employers willing to engage in forced labor, K , respectively.

In order to recruit a slave, an employer j chooses an effort level e_j beforehand. Since the employer does not know the vulnerability of the potential victim, the match (actual enslavement) is successful only with a certain probability p . The probability of success depends on the number of available workers, N , and the chosen effort level e_j . The continuum of potential slaves is represented by the integral from zero to N . Further, the individual firm is too small to exert any monopolistic power.

The number of matches in the economy is:

$$M = M(N, e) = \int_0^N \left[1 - \prod_{j=1}^K \left(1 - \frac{e_j * v_i}{N} \right) \right] di, \quad (1)$$

where $\left(1 - \frac{e_j * v_i}{N} \right)$ is the probability that an individual i is not ‘offered’ a job in slavery by a particular employer. Aggregating over all firms K , $1 - \prod_{j=1}^K \left(1 - \frac{e_j v_i}{N} \right)$ is the probability that an individual i does receive an ‘offer’ to be enslaved by at least one firm.

Summing up over all workers, we get the number of matches, which equals the number of slaves in the society.

It is assumed that N is large compared to e ; therefore $1 - \frac{e_j v_i}{N}$ can be approximated by $\exp[-(\frac{e_j v_i}{N})]$ and the matching function is:

$$M = \int_0^N \left[1 - \exp\left(-\frac{eK v_i}{N}\right) \right] di, \quad (1')$$

where multiplying over all employers leads to the emergence of K in the numerator and e is the average effort to recruit a slave.

Solving the integral, substituting $v_i = \frac{i}{N}$ and inserting upper and lower bounds yields¹⁷:

$$M = N \left[1 - \frac{N}{eK} \left(1 - \exp\left(-\frac{eK}{N}\right) \right) \right]. \quad (2)$$

Let us define $m\left(\frac{eK}{N}\right) \equiv \left[1 - \frac{N}{eK} \left(1 - \exp\left(-\frac{eK}{N}\right) \right) \right]$ as the matching function measuring the average probability of an individual to be enslaved by some firm. It is monotonously increasing and strictly concave¹⁸. The total amount of effort of all employers is $e \cdot K$. Thus, the probability of an employer j to recruit a slave is $\frac{e_j M}{eK}$. Therefore, an employer has a greater chance to enslave an individual, the greater her or his level of relative effort $\frac{e_j}{e}$ is. If the relative effort of a firm tends to infinity, all individuals will be enslaved; whereas at an effort level of $e = 0$ no one has to endure slavery. For the remainder of the paper, we use $m(\cdot)$ instead of the explicit function derived above, i.e.

$$M = Nm\left(\frac{eK}{N}\right), \quad (3)$$

with $m' > 0$ and $m'' < 0$ as noted above.

¹⁷ A detailed derivation of the matching function can be found in Appendix A2.

¹⁸ For proof, see Appendix A2.

2.3.5 The Decision of the Firm

Compared to hiring workers on the legal market, the additional revenue generated by slaves for a representative firm is:

$$Y = S\pi, \quad (4)$$

where the number of slaves per firm is

$$S = \frac{N}{K} m\left(\frac{eK}{N}\right) = \frac{m(e\sigma)}{\sigma}, \quad (5)$$

where $\frac{K}{N} = \sigma$ represents the ratio of slaveholders to the available workforce.

The extra profit derived from employing a slave instead of a ‘normal’ worker is π . This additional profit arises from the fact that slaves earn lower wages and suffer from worse working conditions than employees in the legal labor market. Equation (5) shows that the effect of σ on the number of slaves is ambiguous. The probability of an individual being enslaved is positively dependent on the ratio of slaveholders to workers. The number of slaves an individual firm gets is positively dependent on its inverse.

2.3.6 Costs

The costs accruing to a representative slaveholder are threefold. First, costs for dealing with legal institutions (executive, judiciary) arise in the form of bribery B . The potential slaveholder will bribe state officials, e.g. police officers in order to avoid detection in the first place. Second, upon detection, costs C arise¹⁹. These costs incur in the form of monetary penalties or jail sentences. On the one hand, these costs increase with stricter law enforcement, g , and a higher

¹⁹ $C_B < 0$, $C_S > 0$, $C_g > 0$, $C_{BB} > 0$, $C_{SS} < 0$, $C_{Bg} < 0$, $C_{BS} < 0$, $C_{Sg} > 0$, subscripts representing the respective partial first, second, and cross derivatives. All second order conditions are met.

number of employed slaves, S . On the other hand, C is decreasing in B . Third, recruiting slaves with effort e is costly as well as it is measured in monetary units. Capturing individuals via fraudulent job advertisements or kidnapping generates costs. The probability of detection is denoted by q .

$$B + qC(B, S, g) + e. \quad (6)$$

A representative employer maximizes profits,

$$\Pi = S\pi - B - qC(B, S, g) - e, \quad (7)$$

with respect to B and e subjects to the constraints $B \geq 0$, $e \geq 0$, $\pi \geq 0$ and $\Pi \geq 0$.

The first-order conditions are:

$$\frac{\partial \Pi}{\partial B} = 0: qC_B = -1 \quad (8)$$

$$\frac{\partial \Pi}{\partial e} = 0: m'\pi = qC_S m' + 1 \quad (9)$$

Equation (8) states that the expected marginal benefit of bribery (the reduction in the expected cost of punishment) equals its marginal costs, which is unity in this model. In equation (9), the marginal additional profits generated by slaves equal the marginal costs of acquiring slaves times the probability of detection plus the marginal cost of effort, which is unity here.

2.3.7 Results

Based on the first-order conditions (8) and (9), we obtain the following comparative-static results. Table 1 shows that all results are ambiguous (proof in Appendix A2).

Table 1: Comparative statics

Effects of a change in			
on	g	σ	q
B	$+/-$	$+/-$	$+/-$
e	$+/-$	$+/-$	$+/-$

In order to provide more intuition, we now turn to a graphical display of our results. Figure 1 depicts the first-order optimum conditions for B and e , B^{opt} and e^{opt} , respectively. In this section, we address only those economies in which slavery is positive in the equilibrium. For simplicity and better visualization, the following curves are assumed linear, but they can also be curved.

The B^{opt} -curve has a positive slope²⁰ and starts from the origin since slaveholders will not pay bribes if they exert no effort to recruit workers. In other words, in the absence of slaves the payment of bribes is unnecessary.

The e^{opt} -curve has a positive slope²¹ as well. Increased effort results in a higher number of slaves, which in turn increases the payment of bribes. However, the e^{opt} -curve starts in point E which represents a society without corruption. Without bribes, slavery is possible, as the e^{opt} -curve has a positive slope. However, fewer slaves can be acquired compared to point A – where

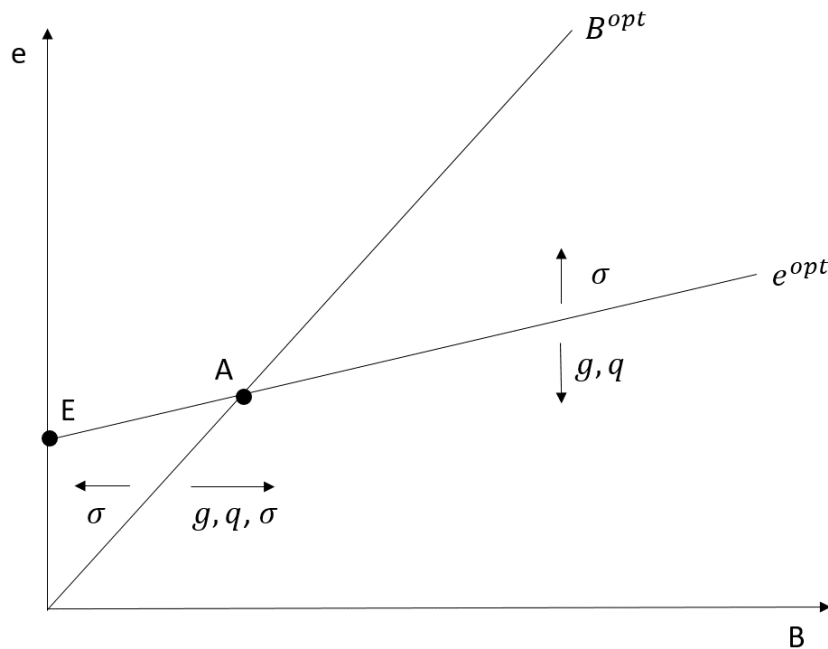
²⁰ This follows from the first-row signs of the Hessian matrix in Appendix A2, equation A.3.

²¹ This follows from the second-row signs of the Hessian matrix in Appendix A2, equation A.3.

institutional bribery is possible. In other words, if bribery is institutionally impossible, no slaves can be acquired successfully until point A is feasible.

Given (A.2) and (A.2.a) we know that $m' > 0$ and $m'' < 0$. Moreover, we know that $C_{BB} \cdot C_{SS} - C_{BS}^2 > 0$ and that the B^{opt} -curve is steeper than the e^{opt} -curve because of the positive sign of the Hessian Matrix (Appendix A2, equation A.3). The arrows in Figure 1 correspond to the results of the comparative statics and indicate how a change in g , σ or q rotates or shifts the B^{opt} - and e^{opt} -curves.

Figure 1: Optimal bribes and effort



As shown in Appendix A2, the partial derivatives of the first-order conditions with respect to g and q have the same signs. Thus, the impacts of these variables on bribery and effort can be discussed jointly in Figure 2. Three cases are depicted²²: In the first case, starting from point A , an increase of governmental protection or of the probability of detection strengthens the marginal effect of bribery on punishment reduction and thus induces increased bribery. At the same time, an increase in bribes leads to increased effort, see point A' . In the second case, an

²² The signs of the corresponding partial derivatives can be found in Table 2 in the Appendix.

increase in g or q increases the marginal costs to acquire slaves and thus decreases effort to recruit slaves (shift from A to A''). In this case, the effect on bribes is negligible. In the third case, the marginal costs to acquire slaves are increased by stricter governmental labor protection, g , or a higher probability of detection, q . Thus, the effort to recruit slaves is reduced accordingly, which results in a lower number of slaves. Since fewer slaves can reduce the marginal effect of bribery, a lower amount of bribes is paid in A''' . Note that an increase in effort and a simultaneous decrease in bribes is not possible, as only solutions in the gray area are feasible.

Figure 2: Effect of governmental labor protection and probability of detection on bribes and effort

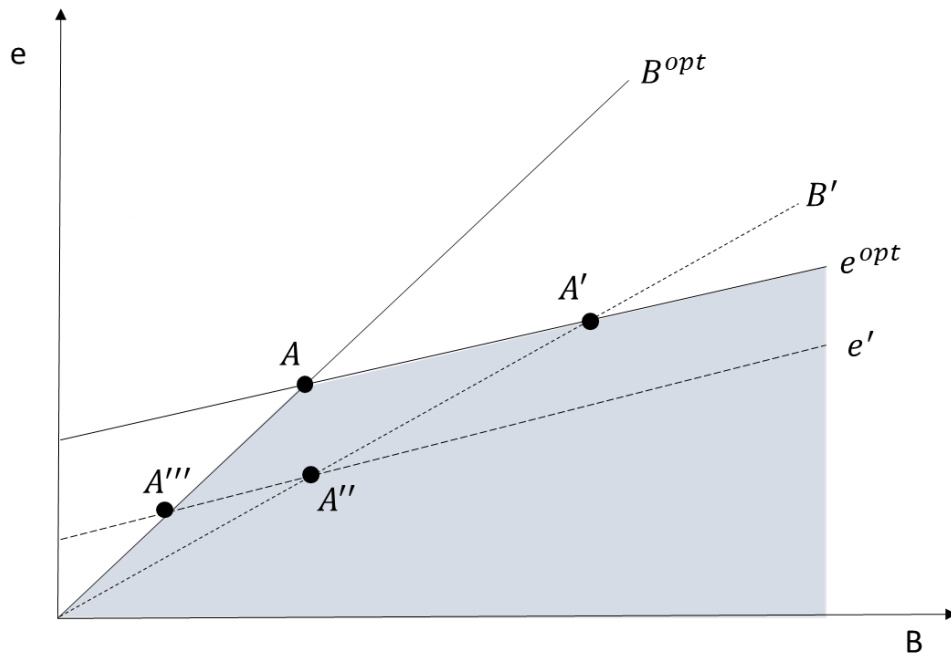


Figure 3 shows the effect of σ on bribes and effort²³. As shown earlier, the effect of σ on the number of slaves is unclear. Hence, the effect of σ on effort and bribery is ambiguous as well. Starting from point A , if σ is large, an increase in the number of potential slaves increases effort, see A' . The effect on bribery is negligible in this case.

²³ The signs of the corresponding partial derivatives can be found in Table 2 in the Appendix.

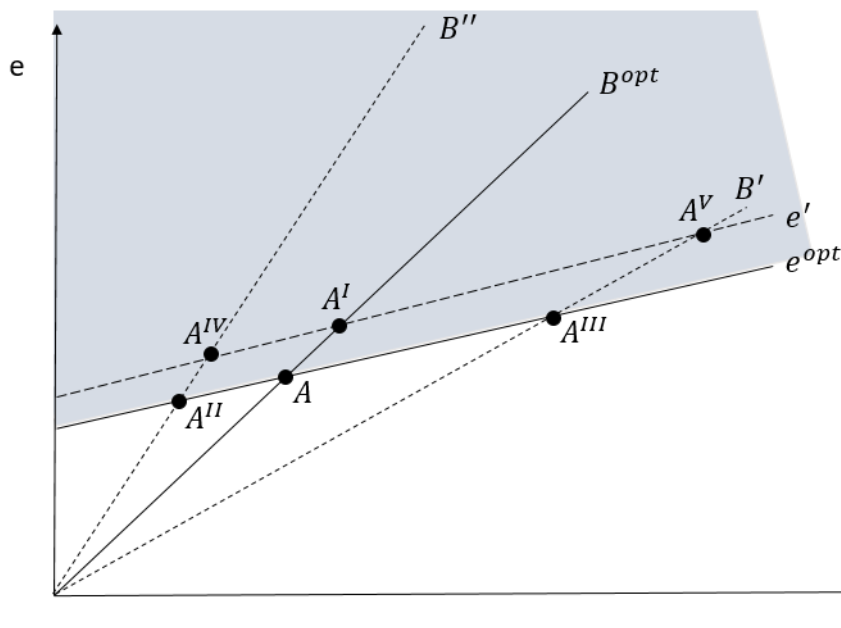
If σ increases, a large number of employed slaves increases the marginal costs of punishment and effort is decreased. At the same time, an increase in σ decreases the marginal profit of exploiting slaves. Thus, the amount of bribes is reduced as well in A^{II} .

A high number of slaves employed strengthens the marginal effect of bribery on punishment reduction, which increases bribery, see shift from A to A^{III} . The effect on effort is negligible here.

If σ is large, the probability of being enslaved, m , increases (thus the number of slaves increases). Simultaneously, the probability that a specific firm can hire a slave is small. Thus reduced profit leads to a decrease in bribes as well (see A^{IV}).

A high number of slaves strengthens the marginal effect of bribery on punishment reduction and thus induces increased bribery. More bribes paid lead to an increase in effort and we observe a shift from A to A^V . Note that a decrease in effort lower than the e^{opt} -curve is not possible. Only equilibria in the gray area are feasible.

Figure 3: Effect of the ratio of slaveholders to workers on bribes and effort



Our results regarding governmental labor protection and probability of detection are in line with the empirical findings of Jakobsson and Kotsadam (2013) and Hernandez and Rudolph (2015). The authors find that corruption, malfunctioning legal institutions and high probabilities of illicit activities are interlinked.

In regard to the ratio of slaveholders to workers Broadhurst, Lauchs, and Lohrisch (2012) find that gang rivalry diminishes profits of illicit activities. Cho (2015) shows that destination countries for human trafficking are characterized by high corruption and low labor regulations. These conditions are favorable for illicit activities and thus exploitation flourishes.

2.3.8 Negative Profits and the Prevention of Slavery

All our previous results require that the maximized profits are strictly positive. However, if the economic conditions are unfavorable for bribery, profits can be negative even in the optimum. In this case, the firms will abstain from slavery and the corresponding effort will be zero. In order to analyze how firms determine the impact of exogenous parameters on their maximized profits, the boundary solution where the profits of the slaveholder become zero, needs to be examined. The maximized profits are differentiated with respect to the exogenous parameters, g , K_S , N and q .

Differentiating equation (7) with respect g yields:

$$\frac{d\Pi}{dg} = \frac{\partial \Pi}{\partial g} + \frac{de}{dg} \frac{\partial \Pi}{\partial e} + \frac{dB}{dg} \frac{\partial \Pi}{\partial B}. \quad (10)$$

Due to the envelope theorem (first-order conditions of the decision maker), the last two terms cancel out. Thus,

$$\frac{\partial \Pi}{\partial g} = -qC_g < 0. \quad (11)$$

The same applies to the comparative statics with respect to the other parameters:

$$\frac{\partial \Pi}{\partial K} = Nm' \frac{e}{N} \pi - qC_S \frac{e}{N} < 0 \quad (12)$$

$$\frac{\partial \Pi}{\partial N} = m'eK\pi - qC_N eK > 0 \quad (13)$$

$$\frac{\partial \Pi}{\partial q} = -C(B, S, g) < 0 \quad (14)$$

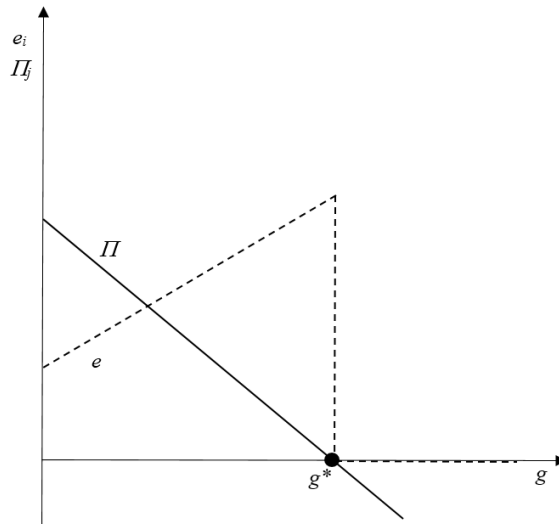
The signs of the comparative statics can be interpreted as follows: Stricter governmental law enforcement g , a higher probability of detection q , and more firms engaging in slavery K decrease the profits of the individual slaveholder Π . Consistent with our result, Cho, Dreher, and Neumayer (2013) and Jakobsson and Kotsadam (2013) find that stricter law enforcement curbs the profitability of trafficking. Moreover Aghatise (2004) and Jakobsson and Kotsadam (2013) state that sound institutions and thus the probability of detection reduce illegal activities. According to Broadhurst, Lauchs, and Lohrisch (2012) criminal gangs diversify their portfolio of illicit activities, as rivalry with competing gangs can lead to increased violence which lowers profits.

A large working population N indicates a higher number of potential slaves and increases the profits of the slaveholder. This result is consistent with the findings of Hernandez and Rudolph (2015). The authors show that a large population is strongly associated with increased trafficking activities.

Strict governmental labor regulations and a high probability of detection are complements. A larger working population implies more firms engaging in slavery, thus N and K are complementary. The probability of detection and the number of firms engaging in slavery are substitutes.

Figure 4 shows the impact of governmental labor protection g , on the effort e_i , and the profits Π_j , of the slaveholder. Stricter governmental labor protection requires higher e in order to recruit slaves successfully. Accordingly, effort increases with higher g until the critical value g^* , where further effort is not profitable anymore. Profits however, decrease with stricter labor protection levels. When profits become zero or negative, slaveholders will choose an effort of zero and will not engage in slavery anymore. Thus, if labor protection is stricter than g^* , employers will abstain from slavery. Poutvaara and Priks (2009) and Poutvaara and Priks (2011) identify similar regime changes in different contexts.

Figure 4: Impact of governmental labor protection on effort and profits



2.4 Conclusion

This paper has gone some way towards understanding the mechanisms associated with labor coercion. The main objective was to find out how the recruitment of victims can be modeled and how labor protection, probability of detection and the number of existing slaveholders affect the extent of modern slavery.

A novel application of the matching approach was used: employers exert effort to recruit slaves – differing from the standard matching model where employers exert effort to find a job. Moreover, the introduction of heterogeneous victims and capturing their individual vulnerability was examined.

Some results confirm the a priori expectations; for example, a higher probability of detection increases the amount of bribes. Some results are less intuitive, but can be explained. For example, the presence of stricter labor force protection induces more effort of the slaveholder to acquire slaves. At the same time, however, strict labor protection reduces profits. If profits become zero or even negative, employers will abstain from recruiting slaves. Thus, the effort is increasing for low values of governmental labor protection and then drops to zero if a critical level of government protection of labor is reached. At this point, the number of slaves drops from strictly positive to zero. Our results are consistent with the findings of the empirical literature.

Future research may address how a ‘slaveholder society’ can evolve into a ‘slave-free society’ and vice versa. It is expected that hysteresis plays a major role here, i.e. that large changes in parameters are necessary to move from one regime to the other. Novel modelling strategies going beyond the simple model presented here are needed to address these discontinuities.

Future work may also look at welfare implications of different policies. In addition, one could model heterogeneous slaveholders who differ with regard to their degree of risk aversion or

unscrupulousness. Furthermore, empirical studies of labor coercion are needed²⁴. An aggregate version of the model analyzed in Section 2.3 could be used to address slavery on a country level with maximum likelihood methods, which are the appropriate way to deal with the discontinuities identified in the theoretical model.

²⁴ Determinants of modern slavery are examined empirically in Essay 3 (see Section 4).

A2 Appendix – Mathematical Derivations

2.4.1 Calculating the Matching Function

The matching function is (equation (1') in the text):

$$M = \int_0^N \left[1 - \exp\left(-\frac{eK*v_i}{N}\right) \right] di. \quad (A.1)$$

In the next step we insert $v_i = \frac{i}{N}$, which gives

$$M = N - \int_0^N \exp\left(-\frac{eK*i}{N^2}\right) di. \quad (A.1.a)$$

Solving the integral yields:

$$M = N + \left[\frac{N^2}{eK} * \exp\left(-\frac{eK*i}{N^2}\right) \right]_0^N. \quad (A.1.b)$$

Inserting upper and lower bounds:

$$M = N - \frac{N^2}{eK} + \frac{N^2}{eK} * \exp\left(-\frac{eK}{N}\right), \quad (A.1.c)$$

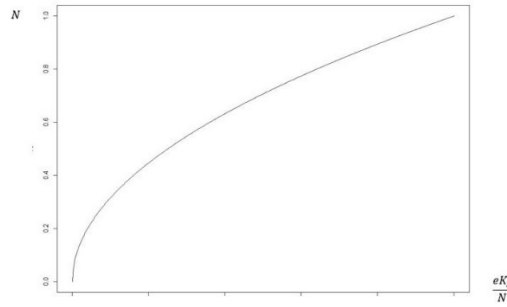
which yields after rearranging:

$$M = N \left[1 - \frac{N}{eK} \left(1 - \exp\left(-\frac{eK}{N}\right) \right) \right] \equiv Nm\left(\frac{eK}{N}\right). \quad (A.1.d)$$

2.4.2 Properties of the Matching Function

The matching function $m(\cdot)$ has a positive slope with $m'(\cdot) > 0$ and $m''(\cdot) < 0$ and its values range from 0 to 1.

Figure 5: Matching function converges to N



Source: Author's Calculation.

Proof: For $m(\cdot) \lim_{x \rightarrow \infty} \frac{1 - \exp^{-x}}{x} = 0$ and applying the rule of de l'Hospital $\frac{1 - \exp^{-x}}{x} \lim_{x \rightarrow 0} \frac{\exp^x}{1} = 1$.

To save on notation, let us replace $x \equiv \frac{eK}{N}$.

The first derivative of $f(x) = 1 - \frac{1 - e^{-x}}{x}$ is:

$$f'(x) = -\frac{(1 - e^{-x}) - xe^{-x}}{x^2} = \frac{-(1 - e^{-x}) + xe^{-x}}{x^2} = \frac{(x+1)e^{-x} - 1}{x^2}, \quad (\text{A.2})$$

where $(x + 1)e^{-x} - 1 > 0$ and $x + 1 > e^{-x}$.

Calculating the second derivative of $f(x)$ yields:

$$f''(x) = \frac{2x - x^3 e^{-x} - xe^{-x} - e^{-x}}{x^3}. \quad (\text{A.2.a})$$

2.4.3 Comparative Statics

Total differentiation of equations (8) and (9) yields:

$$\begin{pmatrix} -qC_{BB} & -qC_{BS}m' \\ -qC_{BS}m' & m''\sigma((\pi - qC_S) - qC_{SS}m'^2) \end{pmatrix} * \begin{pmatrix} dB \\ de \end{pmatrix} = \begin{pmatrix} qC_{Bg} & qC_{BS}\frac{m'e\sigma - m}{\sigma^2} & C_B \\ qC_{Sg}m' & \frac{m''e\sigma - m'}{\sigma^2}(\pi - qC_{SS}) & C_Sm' \end{pmatrix} * \begin{pmatrix} dg \\ d\sigma \\ dq \end{pmatrix} \quad (\text{A.3})$$

Combining the determinant of the matrix on the left-hand side of (A.3), D ,²⁵ with the corresponding adjoints leads to:

$$\frac{dB}{dg} = \frac{1}{D} (qC_{Bg}(m''\sigma((\pi - qC_S) - qC_{SS}m'^2) + q^2C_{Sg}C_{BS}m'^2)) \quad (\text{A. 4. a})$$

$$\frac{de}{dg} = \frac{1}{D} (-q^2C_{BB}C_{Sg}m' + q^2C_{Bg}C_{BS}m'^2) \quad (\text{A. 4. b})$$

$$\frac{dB}{d\sigma} = \frac{1}{D} \left(qC_{BS} \left(\frac{(m'e\sigma - m)}{\sigma^2} m''\sigma((\pi - qC_S) - qC_{SS}m'^2) + m' \left(\frac{m''e\sigma - m'}{\sigma^2} \right) (\pi - qC_{SS}) \right) \right) \quad (\text{A. 4. c})$$

$$\frac{de}{d\sigma} = \frac{1}{D} \left(-qC_{BB} \frac{m''e\sigma - m'}{\sigma^2} (-\pi + qC_{SS}) + (qC_{BS})^2 m' \frac{m'e\sigma - m}{\sigma^2} \right) \quad (\text{A. 4. d})$$

$$\frac{dB}{dq} = \frac{1}{D} (C_B m''\sigma((\pi - qC_S) - qC_{SS}m'^2)) \quad (\text{A. 4. e})$$

$$\frac{de}{dq} = \frac{1}{D} (qm'(-C_{BB}C_S + qC_B C_{BS})) \quad (\text{A. 4. f})$$

Table 2 indicates the signs of the partial comparative statics of B^{opt} and e^{opt} under the condition that the respective other variable is equal to zero.

Table 2: Partial comparative statics

$\frac{dB^{opt}(g)}{dg} > 0$	$\frac{de^{opt}(g)}{dg} < 0$
$\frac{dB^{opt}(q)}{dq} > 0$	$\frac{de^{opt}(q)}{dq} < 0$
$\frac{dB^{opt}(\sigma)}{d\sigma} \leq 0$	$\frac{de^{opt}(\sigma)}{d\sigma} > 0$

²⁵ $D \equiv -qC_{BB}m''\sigma(\pi - qC_{SS}) - (qC_{BS}m')^2$ and $C_{BB} \cdot C_{SS} - C_{BS}^2 > 0$, thus $D > 0$.

3 Essay 2: Modern Slavery, Corruption, and Hysteresis²⁶

Abstract

We develop a model where firms profit from coercing workers into employment under conditions violating national law and international conventions and where corrupt public servants prosecuting violations of the rules are willing to turn cases down if bribed. Firms and public servants are heterogeneous. Firms benefit differently from the use of coerced labour whereas public servants have differing intrinsic motivations to behave honestly. Moreover, there is a socially determined warm-glow effect: honest public servants 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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3.1 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, forced labour, or both 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. Akee et al. (2010) use the ‘rule of law’ index from Kaufmann, Kraay, and Zoido-Lobaton (1999b, 1999a) as a proxy for corruption and governance. They find that “higher corruption levels and weaker governance structures in poorer countries are likely to lead to these countries becoming origins for trafficked victims” (Akee et al. 2010, p. 13). Cho, Dreher, and Neumayer (2013) use the ‘control of corruption index’ from Kaufmann, Kraay, and Mastruzzi (2009). They find that “the quality of a country’s anti-trafficking policy improves with the perceived absence of corruption and a more democratic regime” (Cho, Dreher, and Neumayer 2013, p. 15). In addition, they show that “compliance with anti-trafficking policies significantly decreases with corruption and is higher

in countries that also respect the rights of women” (Cho, Dreher, and Neumayer 2013, p. 16). Fletcher, Bales, and Stover (2005, p. 75) state that victims of modern slavery “are usually reluctant to approach local police because they fear retribution from their traffickers or ‘employers’. This fear often stems from their experiences with corrupt law enforcement personnel in their countries of origin”. This statement is based on an interview with Luis Rivera, an organizer of the California Rural Legal Assistance, who confirms, that “abused workers in the U.S. are reluctant to call the police because they don’t trust them” (Fletcher, Bales, and Stover 2005, p. 75). A study of the NGO Verité, Inc. (2013) indicates that “government officials are instrumental in greasing the wheels of labor trafficking” (Verité, Inc. 2013, p.2). They state that “government officials from the Philippines Overseas Employment Administration and three labor brokers were charged with trafficking 100 Filipino workers and violation of the Anti-Graft and Corrupt Practices Act in 2011. The criminal complaint alleged that the government officials accepted kick-backs for turning a blind eye to the brokers’ operations and expired licenses.” (Verité, Inc. 2013, p.5). Given that corruption is not a measurable market activity, the reported evidence is presumably 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" (International Labour Organization 1930, No. 29). 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 of 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 the profitability of slavery-like practices 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 forced 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 commodities produced under conditions that violate basic principles of human dignity such as modern slavery and child labour are increasingly difficult to be sold on global markets. Consumers have become aware of the poor working conditions prevailing in other countries and of their own responsibility 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 (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. This will be addressed in Section 3.4 of the paper. A particular question to be asked is whether there may be undesired side effects of well-intended foreign interventions such as trade bans or

anti-slavery product standards. Can there be leakage effects that aggravate the slavery problem in other sectors of the economy which are not subject to international attention and if so, what determines their magnitude?

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 1997; 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 (2021) 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 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 2013a; 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 (2007) 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 World 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 computed by 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 (2006) 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 Van 1998), respectively. Multiple equilibria in corruption and taxation have been found by Alesina and Angeletos (2005a) in a model, where corruption increases inequality and inequality raises the demand for taxation correcting this inequality. In Alesina

and Angeletos (2005b), voters derive utility from social justice. Multiple equilibria, interpreted as a US and an EU tax equilibrium, arise from the fact that higher taxes may "reduce the fair component of income more than the unfair component" (Alesina and Angeletos 2005b, p. 970). 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. It has been shown by Bénabou and Tirole (2006) in a general framework that social rewards generate strategic complementarity in the sense that individual willingness to respect a social norm is reinforced by the general obedience to the norm and that this complementarity is a major driving force responsible for multiple equilibria.²⁷ A special application is the tax-evasion model of Myles and Naylor (1996), and we will use their approach to model the social reward derived from being honest in a non-corrupt environment.²⁸ 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 also generates a strategic complementarity in our model.

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 an important ingredient of the model that will drive some of the results. 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 3.3 determines the general equilibrium, in

²⁷ If individual and group behaviour are strategic substitutes, multiple equilibria occur. Substitutability prevails if individual behaviour is driven by a pursuit of social distinction or if the individual feels less inclined to behave well in an environment where everyone else follows the social norm: "My own corruption matters less if everyone else is honest" (Bénabou and Tirole 2006, footnote 11).

²⁸ Several authors attempted to measure the importance of social rewards of public servants: Brewer and Selden (2000) show that bureaucrats care about the societal welfare and that organizational culture has a powerful impact on federal agents. Wittmer (1991) finds that bureaucrats attribute a higher value than persons employed in the private sector to perform work that is helpful to others (service ethic). However, it is also found that co-worker and peer attitudes and behaviour influence individual behaviour. Fisman and Miguel (2007) show that diplomats from high-corruption countries are more likely to violate the host country's parking rules than diplomats from low-corruption countries. For a survey of empirical evidence concerning the influence on social norms on corruption, including experimental studies (Lindner 2014).

particular the shares of corruption of 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 3.4, we extend the model of the aggregate economy by introducing a second sector of the economy and foreign trade to capture trade-related process-standards that curb coerced labour. Some final remarks in Section 3.5 conclude the paper.

3.2 The Model

Let us consider an economy with three types of individuals: workers, employers, and public servants. Workers are either employed legally in the official labour market or work as slaves under conditions of illicit labour. There are firms employing legal labour and others employing slaves. Finally, there are public servants, who inspect the firms. If they find a perpetrator, they decide whether to report the violation of the rule such that the perpetrator is punished or to remain silent and accept a bribe. Assume for simplicity that each firm will be inspected only once. Multiple inspections are excluded. Bribery is modelled as a two-stage game. In the first stage, bureaucrats decide whether or not they will be corrupt and firms decide whether or not to use slave labour. In the second stage, inspections take place. If the inspector is honest, firms that are detected using coerced labour pay a fine. If the inspector is corrupt, a bribe is determined in a Nash bargaining game between her/him and the delinquent firm. 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 in the economy.

3.2.1 Workers and the Labour Market

There are two types of workers. Besides individuals employed in the official labour market, there is a reserve army of rural and urban proletariats living on subsistence income. They can be hired as slaves at a very low wage slightly above the subsistence income, which is normalised to 1. Thus, the supply of slave labour is perfectly elastic. Legal labour is supplied via an increasing labour supply function, $N(w)$, with $N'(w) > 0$, and $N(1) = 0$. An individual firm's demand for legal labour is $L(w)$, with $L'(w) < 0$. The market for legal labour is in equilibrium if $(1 - s)L(w) = N(w)$, where s is the share of firms holding slaves. Total differentiation yields $\frac{dw}{ds} < 0$. An increase in slavery reduces the demand for legal labour and, consequently, the wage rate.

3.2.2 Firms

There is a continuum of firms of mass 1. Firms decide whether to employ slaves or legal labour. The case that firms use legal and illegal labour at the same time is excluded. A firm using legal labour makes a profit $\tilde{\pi}(w)$, $\tilde{\pi}'(.) < 0$. A firm using slave labour makes a profit π , which is firm-specific and may be negative. The profitability of slave labour depends on characteristics of the firm (size, geographical location, the goods produced etc.), but also on the attitude of its owner towards forced labour. On the one hand, there are employers who are pure profit maximisers and, *ceteris paribus*, have large values of π . On the other hand, owners of other firms may feel socially responsible and derive disutility from using coerced labour. The larger π the less socially responsible is the employer. Let the density function be $f(\pi)$ with $F(\pi)$ as the cumulative density. 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 β , an individual firm will use slave labour if

$$\pi - (\beta B + (1 - \beta)P)q > \tilde{\pi}(w) \quad (1)$$

and the share of firms holding slaves is

$$s = 1 - F(\tilde{\pi}(w) + (\beta B + (1 - \beta)P)q). \quad (2)$$

3.2.3 Bureaucrats

There is a continuum of inspectors of mass 1. 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.²⁹ Thus, the expected income of a corrupt bureaucrat is $Y + sqB - p(sqB)V$, where Y is the legal income, i.e. the official salary, sqB is the expected illegal income based on bribes and s is the share of slaveholders. 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 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

²⁹ 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.

preferences of taxpayers 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.³⁰ Thus, a bureaucrat will be corrupt if

$$Y + sqB - p(sqB)V > Y + \gamma + a(1 - \beta) \quad (3)$$

and the share of corrupt bureaucrats will be

$$\beta = G(sqB - p(sqB)V - a(1 - \beta)). \quad (4)$$

3.2.4 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 paid by the firm is determined in a Nash bargaining process.³¹ 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 bargains yield the

³⁰ Of course, intrinsic motivation and social warm glow may interact in reality, e.g. individuals with high intrinsic motivation often being more susceptible to social rewards (Cameron and Pierce 1994). However, there may also be intrinsically motivated persons who do not rely on social rewards to behave well, which would imply a negative correlation. We neglect these interactions for analytical reasons and assume that intrinsic motivation and social rewards can be strictly separated. Given that the main results of the paper are ambiguous anyway, this simplification seems justifiable.

³¹ In what follows, we employ the classical Nash bargaining model satisfying the symmetry axiom (Nash 1950). Therefore, we use the unweighted Nash product as the solution concept. Extensions with different weights representing asymmetric negotiation skills are straightforward, but do not yield major additional insights.

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 (3), 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

$$(P - B^*)(1 - sqVp') - (B^* - pV) = 0, \quad (5)$$

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

$$\Delta = -2(1 - sqVp') - (P - B^*)(sq)^2Vp'' < 0. \quad (6)$$

It should be noted that Δ 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 (6). The first-order condition, (5), can be rewritten as:

$$B^* = \frac{1 - sqVp'}{2 - sqVp'}(P + pV). \quad (5')$$

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 (5):

$$\frac{dB^*}{dP} = -(1 - sqVp')\Delta^{-1} > 0 \quad (7a)$$

$$\frac{dB^*}{dV} = ((P - B^*)sqp' - p)\Delta^{-1} \lesseqgtr 0 \quad (7b)$$

$$\frac{dB^*}{dq} = ((P - 2B^*)p' + (P - B^*)sqB^*p'')sV\Delta^{-1} \lesseqgtr 0 \quad (7c)$$

$$\frac{dB^*}{ds} = ((P - 2B^*)p' + (P - B^*)sqB^*p'')qV\Delta^{-1} \lesseqgtr 0 \quad (7d)$$

$$\frac{dB^*}{d\beta} = 0 \quad (7e)$$

The results (7a-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 (7c) and (7d). 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.

3.3 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 $\beta = 0$, $\beta = 1$, $s = 0$, and $s = 1$. 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.

3.3.1 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 (5') 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 β 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 (2) that $s = 1 - F(\tilde{\pi}(w) + Pq)$.
- b) If all bureaucrats are corrupt ($\beta = 1$), $s = 1 - F(\tilde{\pi}(w) + B^*q)$. 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 (4). 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 (7a), 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 π^{max} such that $f(\pi) = 0$ for all $\pi \geq \pi^{max}$ and $\pi^{max} \leq \tilde{\pi}(w) + (\beta B^* + (1 - \beta)P)q$. As $B^* < P$, this is possible for small β and large P .
- f) All firms employ illicit labour ($s = 1$) if there is a π^{min} such that $f(\pi) = 0$ for all $\pi \leq \pi^{min}$ and $\pi^{min} \geq \tilde{\pi}(w) + (\beta B^* + (1 - \beta)P)q$. This is possible for large β 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 γ^{max} such that $g(\gamma) = 0$ 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.

3.3.2 Equilibrium Conditions and Comparative Statics

In the equilibrium, s and β are determined by

$$s^* = 1 - F(\tilde{\pi}(w^*) + (\beta^* B^* + (1 - \beta^*)P)q) \quad (2')$$

and

$$\beta^* = G(s^* q B^* - p(sq B^*)V - a(1 - \beta^*)), \quad (4')$$

where asterisks denote equilibrium values of the endogenous variables. By computing the total derivative, we can identify the impacts of the punishment of corruption, V , the punishment of slavery, P , the detection probabilities, p and q ,³² and the strength of the warm-glow effect, a , on slavery and corruption in the equilibrium. Although the latter is not a policy variable, the impact of the social warm glow within the public sector as behavioural parameter on the equilibrium is worthwhile mentioning. Appendix A3.1 provides the general result and it is seen that the impacts of the parameters on the equilibrium are ambiguous. One reason for this is that the impacts of the share of slavery, s , and some of the parameters on B^* are ambiguous. Thus, let us consider the simple bargaining model where bureaucrats in bilateral bargaining with a single perpetrator ignore the fact that increased bribe income raises the probability of being detected and fined. Then $B^* = \frac{1}{2}P$ and the comparative statics are determined by

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

³² Note that p is a function, not a parameter. We will denote by dp an increase in the probability of corruption being detected for a given value of its argument, sqB^* . Note that this can be done only if B^* does not depend on p and p' , i.e. in the simplified bargaining case, where $B^* = \frac{1}{2}P$.

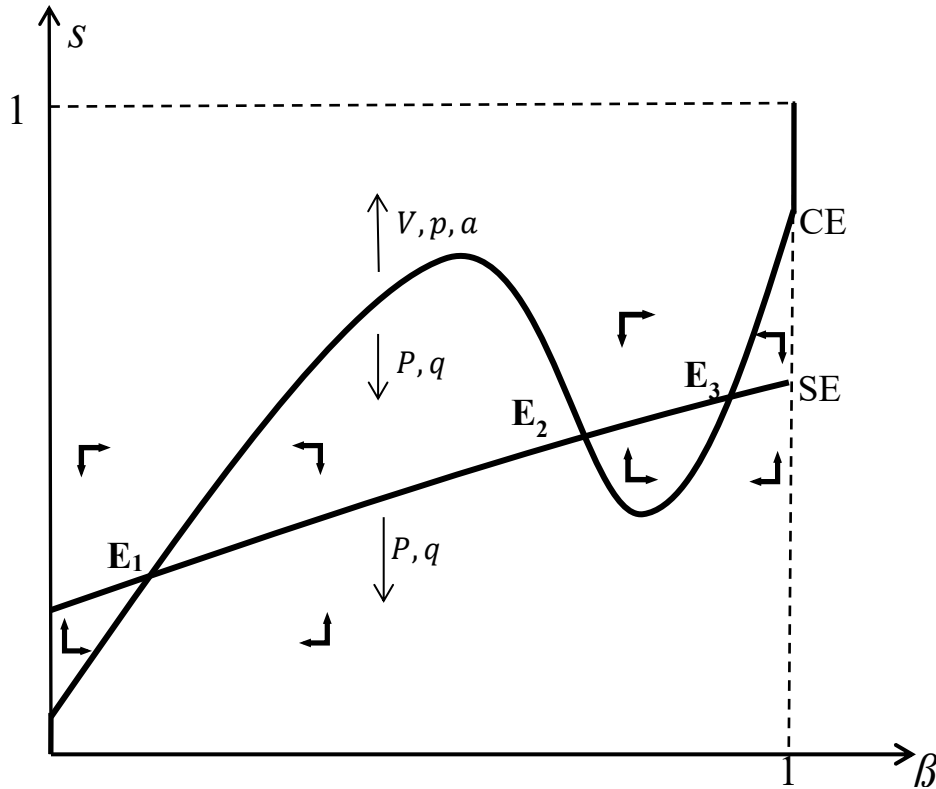
where we used Hotelling's lemma, $\tilde{\pi}'(w) = -L$, in the first-row, first-column element of the matrix on the left-hand side. As the elements $(1 - ag)$ and $(1 - p'V)$ in this matrix can be positive or negative, implying that all comparative-static results are still ambiguous, we use a graphical approach to investigate the impacts of the parameters. In the next section, we will look at $(1 - ag)$ representing the warm-glow effect; afterwards $(1 - p'V)$ will be considered. Note that the following exercise assumes that there is at least one interior equilibrium with $0 < s < 1$ and $0 < \beta < 1$. If such an equilibrium does not exist, there will be boundary solutions, which are discussed in Appendix A3.2.

3.3.3 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 (2') defines the share of slavery as a function of corruption, which we will term the slavery equilibrium, SE. Correspondingly, equation (4') constitutes the corruption equilibrium, CE. Both equilibrium conditions will be drawn into a (β, s) diagram (see Figure 6). 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 β . 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 Subsection 3.3.1. Figure 6 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 6. The comparative statics are shown by arrows shifting the curves up or down.

Figure 6: Equilibrium and comparative statics if p' is small and a is large

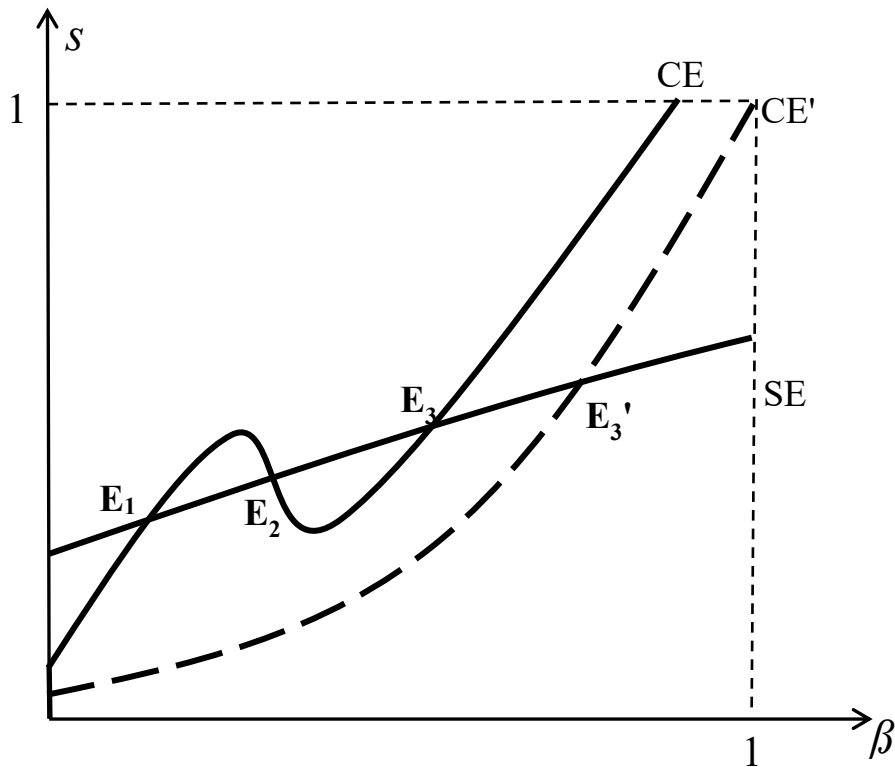


Although this is a static model, we can think of adjustment dynamics. They are depicted by bold arrows in the diagram. Inequality (1) in Subsection 3.2.2 implies that, everything equal, the expected profit from slavery is increased if β is larger than in the equilibrium and, thus, slavery is increasing. Below the SE line, s will rise, to above the SE line, s will shrink. The adjustment dynamics of β follow from (3). Everything else being equal, an increase in slavery will increase the profitability of corruption. Thus, above the CE 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:

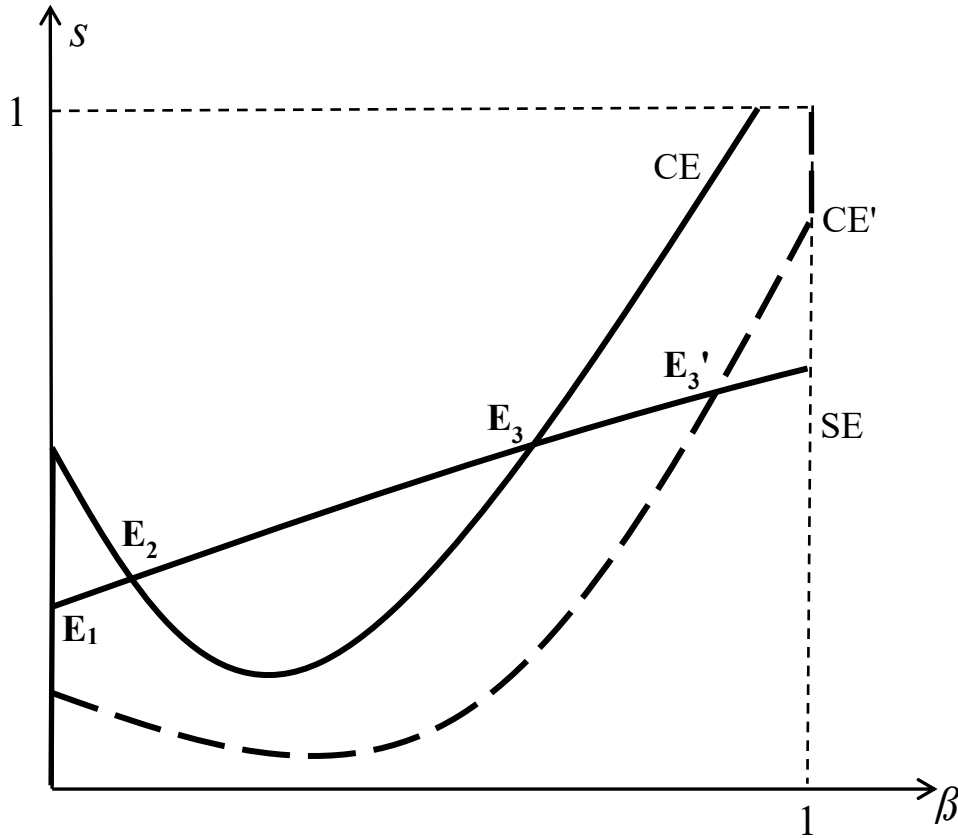
- An increase in the punishment and the detection probability of corruption (V and p , respectively) and an increase in the warm glow of being an honest employee (a) in an honest team unambiguously reduce corruption as well as slavery.
- An increase in the punishment and in the detection of employment of slave labour (P and q , respectively) 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 7).

Figure 7: The effect of a reduction in parameter 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'³³. Figure 8 shows the impact of a reduction in V if the CE line is U-shaped. 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 .

³³ Catastrophe theory deals with qualitative changes of dynamic systems in response to parameter changes. A fold catastrophe (or a fold bifurcation) occurs when a stable equilibrium and the neighbouring unstable equilibrium converge into one point and then vanish if an exogenous parameter is changed beyond a critical value, see Castrigiano and Hayes (2004, Chapter 2).

Figure 8: The effect of a reduction in V if the CE line is U-shaped

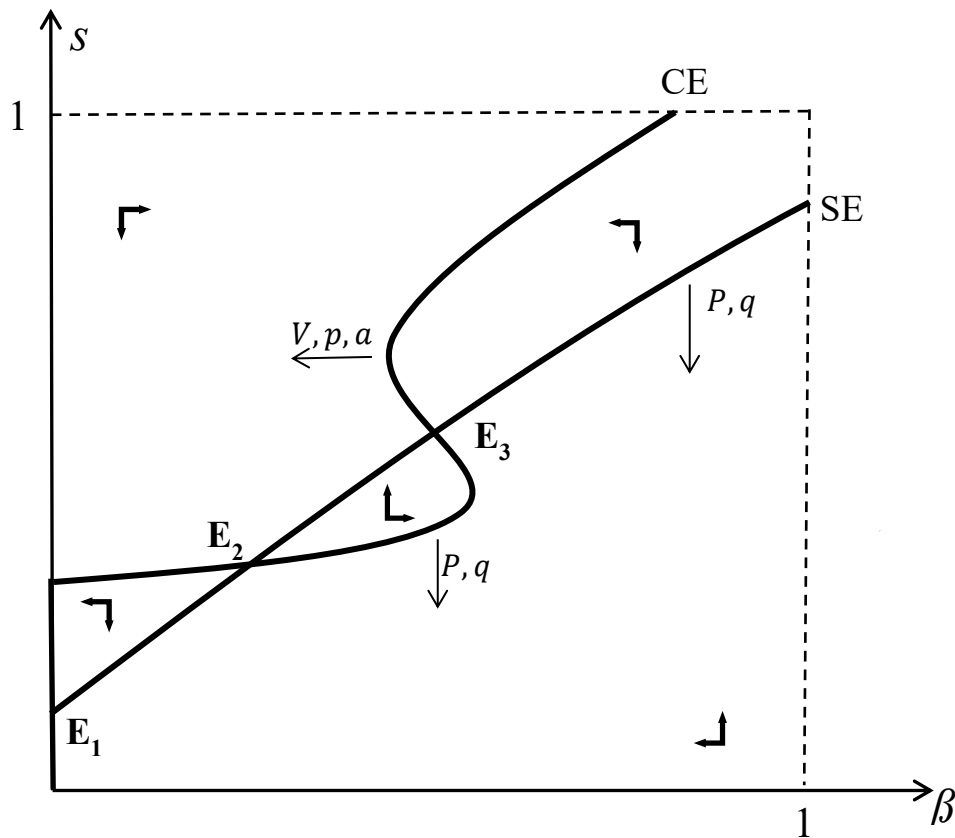
Of course, one can easily construct the opposite scenario, where the economy is in a ‘bad’ equilibrium initially and is moved to a ‘good’ equilibrium by a drastic change in one of the parameters.

3.3.4 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. We neglect the impact of the warm glow discussed in the previous section, i.e. we assume that a is sufficiently small. $p(sqB)$ 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 resembles 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 9 shows this in the (β, s) space.

Figure 9: 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 (a) and in the detection and punishment of bureaucratic corruption (p and V , respectively) reduce both slavery and corruption. However, increases in the detection probability and the punishment of slavery (q and P , respectively) have ambiguous impacts on corruption since corrupt public servants can negotiate higher bribes. Changes in the exogenous

parameters can shift the curves such that either E_1 and E_2 or E_2 and E_3 vanish. In the first case, this can yield a catastrophic system change from a low-slavery, low-corruption to a high-slavery, high-corruption equilibrium. In the latter case, there can be a system shift from the bad to the good equilibrium. In both cases, we have hysteresis: E_1 and E_3 are locally stable. Note that the existence of multiple equilibria does not hinge on the S-shape of the SE curve. What is essential is the small positive slope of this curve, i.e. $p'V \ll 1$. In this case, the individual incentive to accept bribes is increasing substantially in slavery, a result in accordance with the notion that strategic complementarity promotes multiple equilibria (Bénabou and Tirole 2006).

3.4 Trade-Related Process Standards, Slavery, and Leakage

In the preceding sections, we considered a one-good model of the economy and at the impact of policy parameters determined within this economy like the detection probability and the punishment of illegal activities, but also the importance of a social norm of honesty within in the public sector. In countries with weak institutions, additional measures can be implemented from abroad. Foreign firms and governments restrict imports of goods that embody illicit labour in order to force the exporting country to comply with international labour standards. Even if successful, such measures may have the undesired side effect of shifting slavery from the export industry to other sectors of the economy, such as local services, where foreign intervention is ineffective. We will look into the issue by extending the model to two goods and two sectors while keeping all the other assumptions unchanged.

There are two sectors, the export industry indicated by X , which is affected by foreign measures, and the remainder of the economy, indicated by M , consisting of the import-competing industry and, possibly, a non-tradeable services sector. Labour is mobile across the sectors, whereas the

number of firms is given in each sector, μ in the M sector and $(1-\mu)$ in the X sector³⁴. Restrictions on the use of illicit labour in the export industry spill over to the remainder of the economy via the labour market. Again, we distinguish slaves, S^i , and workers hired via ‘proper’ employment contracts, $L^i(w)$ with $i = M, X$ being the labour demand function of a firm. Individual firms decide whether or not to become slaveholders according to (1). The shares of slave-holding firms in the import-competing and export industries are s^M and s^X , respectively. In this section, 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

$$\mu(1 - s^M)L^M(w) + (1 - \mu)(1 - s^X)L^X(w) = N(w). \quad (9)$$

Total differentiation yields

$$-\mu L^M ds^M - (1 - \mu)L^X ds^X = (\varepsilon - \eta) \frac{N}{w} dw, \quad (10)$$

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

The share of import-competing firms employing workers under conditions of forced labour and modern slavery is determined in the same fashion as in Subsection 3.2.2.

³⁴ Thus, 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), where firms are sector-specific and legal labour is intersectorally mobile. The only difference is that labour supply is elastic in our model.

Applying condition (2) to this sector yields

$$s^M = 1 - F(\tilde{\pi}^M(w) + (\beta B + (1 - \beta)P)q), \quad (11)$$

where $\tilde{\pi}^M(w)$ denotes the profits of a non-exporting firm that employs legal labour. From (9) and (11) and using (10), we can determine the impact of a change in s^X on s^M and w for given β and B :

$$\begin{pmatrix} (\varepsilon - \eta)\frac{N}{w} & \mu L^M \\ -fL^M & 1 \end{pmatrix} \begin{pmatrix} dw \\ ds^M \end{pmatrix} = \begin{pmatrix} -(1 - \mu)L^X \\ 0 \end{pmatrix} ds^X, \quad (12)$$

where again Hotelling's lemma has been used to substitute for $\frac{d\tilde{\pi}^M}{dw}$. (12) implies that a foreign trade restriction, resulting in a reduction in s^X , leads to an increase in the formal labour market wage rate, w , and to an increase in slavery in the sectors of the economy not affected by the trade restriction, s^M . Given the structure of the model, this is an expected result. 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

$$\frac{ds}{ds^X} = (1 - \mu) \frac{(\varepsilon - \eta)\frac{N}{w} + \mu(L^M - L^X)fL^M}{(\varepsilon - \eta)\frac{N}{w} + \mu f(L^M)^2}. \quad (13)$$

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

Equation (13) determines the change in the SE curve. It is shifted down if the reduction of slavery in the exporting industry reduces overall slavery, $\frac{ds}{ds^X} > 0$, and up if $\frac{ds}{ds^X} < 0$. As both the SE and the CE curves are increasing in a stable interior equilibrium (see Figure 6 and Figure 8), corruption is reduced in the first case and increased in the second³⁵. The effect on the equilibrium number of slaveholders depends on the slopes of the SE and CE curves, denoted SE' and CE' , respectively:

$$\frac{ds^*}{ds^X} = \frac{CE'}{CE' - SE'} \frac{ds}{ds^X}. \quad (14)$$

where $CE' > SE' > 0$ since the SE curve is intersected by the CE curve from below in an interior equilibrium. Thus, the fraction on the right-hand side is larger than 1 and there is an amplification effect³⁶. 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

³⁵ In the case of Figure 9, where the SE curve is negatively sloped in the stable interior equilibrium, the effects on slavery and corruption go into opposite directions.

³⁶ Using (8) to substitute for CE' and SE' does not yield further insights.

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.

3.5 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 turn a blind eye to slavery if they are bribed adequately. 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 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 due to the marginal risk of corruption being detected. In both cases, there are strategic complementarities (Bénabou and Tirole 2006). The warm glow raises the inclination of the individual to behave honestly if others behave honestly. The individual incentive to be corrupt is increasing in slavery.
- 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. In this case, these policy changes may make it more attractive for public servants to extract additional rent income by blackmailing perpetrators.

- In an open economy, modelled in a Ricardo-Viner framework, restrictions on the use of coerced labour have undesired leakage effects. If these restrictions are effective in curbing slavery in the export industry, slavery increases in the reminder of the economy. Under particular parameter constellations, the leakage effects may dominate the direct effect of the policy and slavery. It is possible that corruption increases economy-wide as well.

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, counterfeit commodities, trade in endangered species and products made of them. Certainly, various extensions of the model are possible. 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.

The implications of our theoretical model are basically testable, provided reliable data are available. As bribes that are negotiated bilaterally between corrupt public servants and perpetrators are unobservable, the impact of the parameters such as fines and detection probabilities on bargaining outcomes will probably remain unknown. The comparative-static

results regarding locally stable equilibria can be verified provided that country-level data on corruption, forced labour and regulatory parameters are can be found. In order to identify the SE and CE curves and to find multiple equilibria, one could employ panel data comprising countries that are sufficiently different regarding public-sector corruption and the extent of illicit labour, i.e. countries that are in a low-corruption, low-slavery equilibrium and others in which corruption and slavery are significant. Drastic system changes from a ‘good’ to a ‘bad’ equilibrium or vice versa will be rare and singular events and, therefore, might be observed (if at all) only on a case-by-case basis. Leakage effects of trade restrictions can be quantified if data on the use of illicit labour in different sectors of the economy is available.

Beyond testing the implications of our theoretical model, one can raise other – even more fundamental – questions that demand further research: Why do coercive relationships persist? How does coercive production affect international trade? How are political decision-making, institutional environment and coercive-labour practices interlinked in practice? In order to answer such questions and to address the implications of our model empirically, more information on corruption and modern slavery as well as on the institutions dealing with such misconduct is needed. Although some information on corruption exists, e.g. in the Transparency International database, acquiring good data on modern slavery is even more difficult. Due to the illegality of the matter, it is hard to measure and thus only incomplete and fragmentary data are available, e.g. the Global Slavery Index published by the Minderoo Foundation Limited (2016). Nevertheless, we hope that our theoretical work is a starting point for future research into these directions.

A3.1 Appendix – Comparative Statics of the Equilibrium

From (1') and (2'), the comparative statics are

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

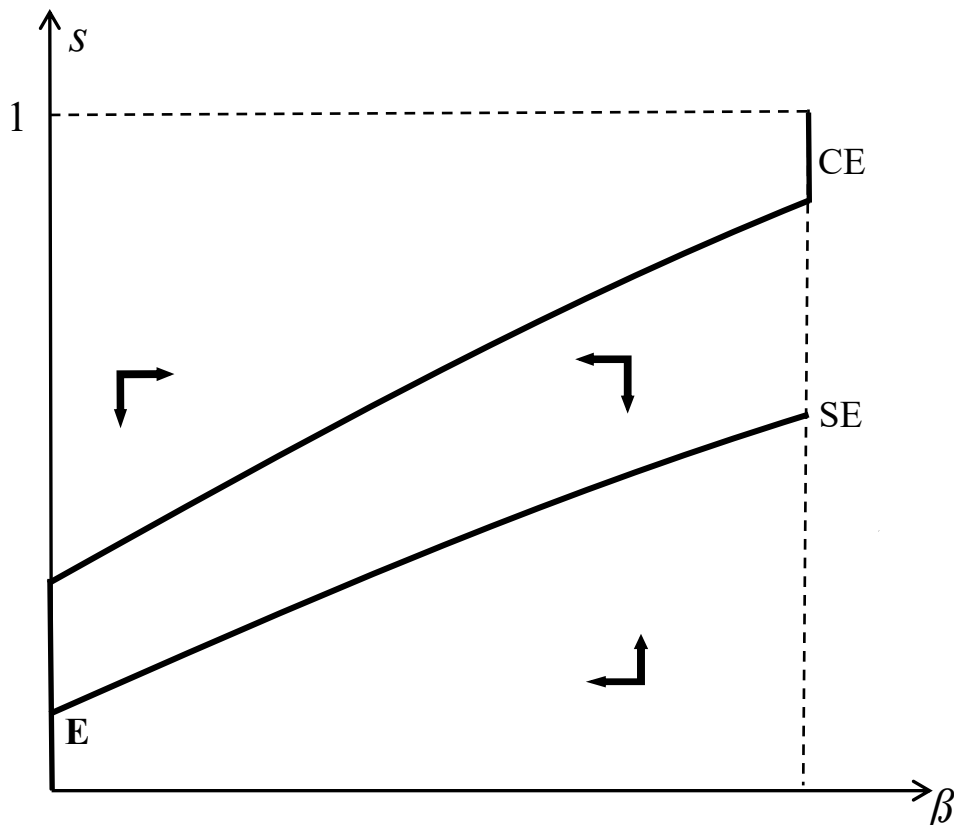
$$\begin{pmatrix} -\beta^*q \frac{dB^*}{dV} f & -\left((1 - \beta^*)q + \beta^*q \frac{dB^*}{dP} \right) f & -\left(\beta^*B^* + (1 - \beta^*)P + \beta^*q \frac{dB^*}{dq} \right) f & 0 \\ \left(s^*q(1 - p'V) \frac{dB^*}{dV} - p \right) g & s^*q(1 - p'V) \frac{dB^*}{dP} g & (1 - p'V)s^* \left(B^* + q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

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.

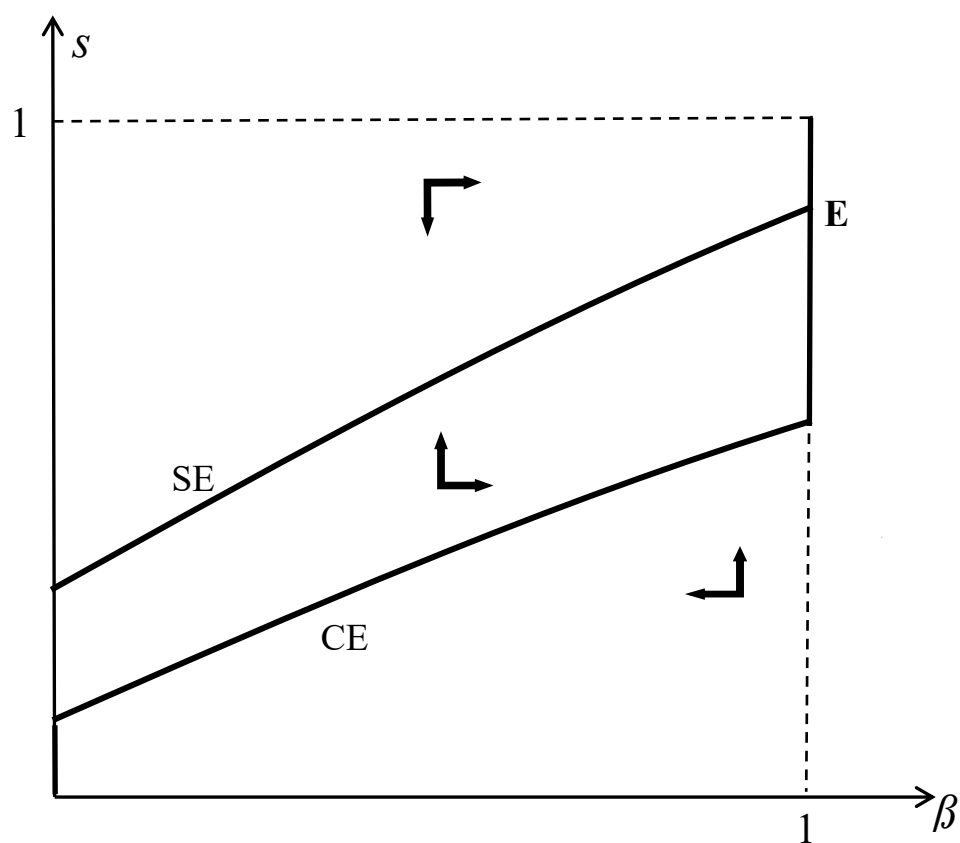
A3.2 Appendix – Boundary Equilibria

In case the SE and CE curves, derived in Subsection 3.3.2, have no intersection points, boundary equilibria occur. If the CE curve is located above the SE curve like in Figure 10, there is only one equilibrium, E , with zero corruption and low or zero slavery, which is stable. 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 10: 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 11 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 11: A boundary equilibrium with 100% corruption

4 Essay 3: Modern Slavery – An Empirical Analysis

Abstract

Contemporarily, modern slavery represents one of the most serious human rights violations. Although most countries officially abolished slavery and ratified the 1926 Slavery Convention of the League of Nations, slavery and slave-like practices still exist in various forms throughout the world. This paper addresses why coercive relationships persist today and investigates how political decision-making, institutional environment and coercive labor practices are interlinked. Moreover, we investigate the interplay between domestic anti-slavery laws and the extent of modern slavery. This paper identifies social and economic determinants of modern slavery using a novel dataset. The panel data contain information on 144 countries and territories from 2002 – 2016 for various types of exploitation of adults and children. We study determinants of modern slavery using cluster analysis and fit a fixed effects model to explain which factors drive exploitation. We find that different types of exploitation are driven by different factors. In addition, we show that slave-sending and slave-receiving countries differ significantly. We study transnational human trafficking and identify which social and economic factors determine this specialization. Moreover, we fit a model using Poisson regression to study why some countries detect victims, originating from more countries, than others do.

Keywords: modern slavery, human trafficking, exploitation, human rights

JEL classification: J47, K42, O15

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4.1 Introduction

Human trafficking is an umbrella term for various types of exploitation. It can be defined as “the recruitment, transportation, [...] or receipt of persons, by means of threat or use of force or other forms of coercion” (United Nations 2004, p. 42). In addition, abduction, fraud, deception or the abuse of power to “achieve [...] a person having control over another person, for the purpose of exploitation” might be used (United Nations 2004, p. 42). Modern slavery includes “sexual exploitation, forced labor or services, slavery or practices similar to slavery, servitude or the removal of organs” (United Nations 2004, p. 42). The elements to define who is a slave are threefold: First, it is impossible to walk away from exploitation. Second, remuneration is absent or at most in the form of a subsistence wage. Third, violence or the prospect of violence are involved (Bales 2000).

In 2016, 40.3 million people were victims of modern slavery. Of those, 25 million people were victims of forced labor. Worldwide, about 0.6 percent of all adults were exploited in 2016. About 77 percent of those were exploited in their home country (International Labour Organization and Walk Free Foundation 2017, p.5). The field of modern slavery is still under-researched, although some attempts have been made to investigate this phenomenon.

Scant attention has been paid to modern slavery of adults in the theoretical literature. Acemoglu and Wolitzky (2011) model an environment where forced labor is achieved through punishment. Willert (2021) develops a matching model to examine by which means a slaveholder is able to force individuals to work and how many slaves can be acquired. Rauscher and Willert (2020) develop a model where firms coerce workers into employment if corrupt bureaucrats are accomplices upon accepting bribes. However, many theoretical studies focus on child labor. Basu and Van (1998) focus on parental decisions leading to child labor. Dessy and Pallage (2005) model transnational child trafficking. Rogers and Swinnerton (2008) compare different types of child labor.

Although the literature on modern slavery is still sparse, some empirical work on human trafficking is available. Akee et al. (2010) provide evidence that ethnic fragmentation, conflict, displacement and trafficking are interlinked. Their findings reveal that fragmentation and conflicts predict displacement, which in turn amplifies trafficking. Simmons and Lloyd (2010) investigate transnational crime and human trafficking. Akee et al. (2014) focus on illegal activities and migration. Estimation results from a gravity model show that illegal activities in both domestic and foreign markets reinforce one another and thus the probability of trafficking (Akee et al. 2014). Cho (2013) investigates how human trafficking, women's rights and globalization are interlinked. Her findings reveal increased human trafficking inflows with regard to cultural proximity and increased migration between countries.

A number of studies focus on the determinants of human trafficking. In her analysis, Cho (2015) tests the robustness of various push and pull factors of human trafficking. She concludes that crime, inequality, migration and institutional quality significantly affect exploitation. Hernandez and Rudolph (2015) use a gravity-type model, where country size and vicinity are major explanatory variables to explain human trafficking in Europe. They conclude that victims are more likely to be exploited in countries with weak institutions and open borders, but find no effect of prostitution laws. Frank and Simmons (2013) investigate whether domestic- and international laws affect human trafficking. They show that trafficking is reduced where enforcement is strong and demonstrate the possibility of transnational negative externalities.

In addition to laws, several papers have studied the effect of specific anti-trafficking measures such as prosecutions against traffickers, protection of victims and trafficking-prevention policies. Cho and Vadlamannati (2012) examine several anti-trafficking measures and find that the ratification of anti-trafficking protocols has the strongest effect on crime prevention policies. Cho, Dreher, and Neumayer (2014) develop an index to capture governmental anti-

trafficking measures and find that corruption decreases compliance. Potrafke (2016) examines how countries differ in their anti-trafficking policies by developing a new index.

Particular attention is given to transnational trafficking for the purpose of sexual exploitation. Literature on prostitution laws and international sex slavery includes e.g. Jakobsson and Kotsadam (2013), Aghatise (2004), Cho, Dreher, and Neumayer (2013). Danailova-Trainor and Belser (2006) investigate what determines supply and demand for trans-national sex trafficking.

The availability of data on illicit activities is limited and therefore research on slavery is challenging. Nevertheless, some attempts have been made to quantify the extent of human trafficking. Since 2004, the Walk Free Foundation (2018) calculate a ‘Slavery Index’ where countries are ranked according to the estimated number of victims. The United Nations Office on Drugs and Crime (2020) reports a yearly index on a scale from zero to six to describe the incidence of trafficking. Frank (2013a) has generated categorical variables capturing different types of trafficking and governmental efforts to prevent human trafficking. Belser, Cock, and Mehran (2005) create, in cooperation with the International Labor Organization, a cross-sectional dataset, which contains the number of human trafficking cases for 74 countries.

The main findings of previous studies are that migration flows, quality of institutions, legal framework and crime prevalence influence human trafficking. We build on the existing literature by extending the analysis to 144 countries and territories and using a novel dataset consisting of the estimated number of victims per year per country. This panel dataset was constructed by the author and is based on the Human Trafficking Reports of the U.S. Department of State, 2001–16.

The aim of this paper is to confirm determinants of modern slavery from the previous literature as well as to identify additional factors with the aforementioned new dataset. We want to focus particularly on the role of laws combating modern slavery and their enforcement. To the best of our knowledge, the actual enforcement of existing laws has not been studied previously in

the economics literature. In contrast to other studies, we do not focus on the trafficking process itself, but investigate the following issues: Which factors drive the exploitation of adults already present in a certain country? Are forced prostitution and forced labor affected by the same causes? Which factors drive the exploitation of children? What are the differences between adult slave labor and child slavery? How do source and destination countries differ? Why does the number of countries where victims originate from, differ significantly across exploiting countries?

Our results regarding GDP and development are consistent with the literature. We find that wealthy, highly developed or corrupt economies attract exploitation. Our findings support the hypothesis that source and destination countries differ significantly regarding political regimes and socio-economic factors. Both abundance and enforcement of the law lead to increased detection rates of modern slavery. These findings suggest that our results are partly driven by distortions caused by the data generation process. Hence, the main effects in our data are strongly correlated with our control variables. Unfortunately, we could not find a way to examine these effects separately with the data at hand.

In this paper, the terms human trafficking and modern slavery are used synonymously and refer to all phases of the exploitation process. This process starts with the initial recruitment or the abduction of the victim. We refer to forms of exploitation that involve the crossing of international borders as transnational human trafficking.

The remainder of the paper is organized as follows. Section 4.2 gives an overview of modern slavery. Section 4.3 introduces pull and push factors of modern slavery. Section 4.4 covers the Principal Component Analysis. Section 4.5 describes the data collection process and provides descriptions of the relevant variables. Section 4.6 outlines the empirical framework and discusses the results. Our conclusions are drawn in the final section followed by potential future research questions.

4.2 Modern Slavery – An Overview

Modern slavery is a complex and universal issue. In order to understand its complexity, this section gives an overview about the various types of exploitation, the identification of victims, and the conviction of perpetrators.

4.2.1 Types of Exploitation

There are various forms of exploitation. According to O'Connell Davidson (2010), slavery ranges along a “continuum of exploitation, shading off into servitude and other forms of exploitation, rather than existing as a wholly distinct, isolated phenomenon” (O'Connell Davidson 2010, p. 246). Most forms of adult exploitation involve some form of forced labor³⁷ or forced prostitution (Koettl 2009). “Labor contracts with substantial advances and high interest rates increase indebtedness towards the employer or landlord, who then assumes control over the labor of the indebted family³⁸. Truck systems³⁹, overcharging for food and accommodation, underpayment of labor, and low financial and numerical literacy of victims sustain the dependency of victims on the exploiter” (Koettl 2009, p. 13). According to Steinfeld (2001), slavery is not predominantly exacted through overpowering by physical force, but “by forcing slaves to choose between very unpleasant alternatives, such as death, torture and endless confinement on the one hand, or back-breaking physical labor on the other” (Steinfeld 2001, p. 14). However, the abuse of power, poor housing conditions, and the confiscation of passports or identity documents convert the threat of physical violence into an omnipresent danger (Weissbrodt and Anti-Slavery International 2002). In addition, migrants might perceive the risk of deportation as a substantially powerful threat to endure ill-treatment (International Labour

³⁷ In this paper forced labor includes forced work in agriculture, mining, brick making, fish processing, gem cutting, carpet weaving, forced work in sweatshops, forced domestic labor and forced begging.

³⁸ Genicot (2002) develops a model where individuals choose between bonded labor and casual labor while landlords and credit institutions compete on the credit market. Lilienfeld-Toal and Mookherjee (2010) develop a general equilibrium model of debt bondage.

³⁹ In truck systems, individuals are paid in goods, services or vouchers and not in any currency (Koettl 2009).

Organization 2017). In addition, we examine the exploitation of children. We want to find out if child labor is driven by the same variables as adult forced labor.

The United Nations (2004) define the exploitation of children as „the recruitment, transportation, transfer, harbouring or receipt of a child for the purpose of exploitation” (United Nations 2004, p.43). A considerable amount of literature has focused on the exploitation of children. Several papers focused especially on the influence of parents on child labor (Ranjan 2001; Weinberg 2001; Basu and Chau 2004; Dessy, Mbiekop, and Pallage 2005; Rogers and Swinnerton 2008; Strulik 2008). Dinopoulos and Zhao (2007) identified child labor as substitute to low-skilled labor. Noteworthy studies of child trafficking were carried out by Beber and Blattman (2010) and Kudlac (2015). Basu (1999) examines how international labor laws and child labor are interconnected.

In this paper, we do not consider other forms of exploitation, such as the forced organ removal, forced marriages, forced prison work and forced military. Moreover, we do not examine trafficking channels or by which means victims are enslaved. For research on these topics see i.e. Aronowitz (2001), Simmons and Lloyd (2010) and Willert (2021).

4.2.2 Identifying Victims

Data on exploitation is scarce. As most illicit behavior happens in legal gray areas, only estimates of the number of victims exist. Moreover, institutions such as the UN or the ILO as well as national legislations provide no standard guidelines on the definition and classification of victims. “The degree of deceit, the type and degree of force, or the type of threats that must be present for a person to qualify as a victim” remain unclear (O'Connell Davidson 2010, p. 252). This discordance may results in the “very small number of people who are actually identified and assisted [...] in any given country” (O'Connell Davidson 2010, p.252).

Most estimations of the number of victims are based on assistance programs in the origin or destination country/region of the victim (U.S. Department of State 2019). In addition to the

unavailability of such programs in some areas, not all victims are eligible for assistance. Selection criteria differ across aid agencies and countries. Besides, not all victims are prepared to accept assistance (Brunovskis and Surtees 2007). Other sources for information concerning victims are executive authorities or the judiciary (in the respective origin and destination countries or regions). Again, the identification and granting of a ‘victim status’ differ among the respective authorities. In addition, some victims are unwilling to testify i.e. due to fear of stigmatization or even retaliation (U.S. Department of State 2019).

The U.S. Department of State (2001-16) estimates the total number of victims based on the victims identified via assistance programs (i.e. shelters, various NGOs), the police or the legal system. Moreover, these estimates include repatriates, who were abused abroad and recognized as victims in their country/region of origin (U.S. Department of State 2001-16).

4.2.3 Evidence on Convictions

Successful prosecutions of perpetrators are rare, as it is difficult for law enforcement officials to gather sufficient evidence in order to obtain a conviction (Organization for Security and Co-operation in Europe 1999). Investigations and judicial proceedings are often too slow to catch perpetrators. Even more difficulties arise if victims and offenders come from different countries, as effective international cooperation is scarce (Monzini 2004). In addition, convictions do not necessarily occur in the same year as the committed crime (U.S. Department of State 2019).

There are reports of victims who are sentenced and thus among the convictions represented in the dataset. This can happen for example, in countries where prostitution is illegal and victims of forced prostitution can be imprisoned. Unfortunately, cases of convicted victims and perpetrators cannot be distinguished (U.S. Department of State 2019).

4.3 Pull and Push Factors of Modern Slavery

A vast amount of possible pull and push factors regarding modern slavery are discussed in the existing literature. The terms pull and push factors refer to determinants of demand and supply of victims, respectively. The following subsections give a general overview of the identified variables.

4.3.1 Institutional Quality and Laws

Jakobsson and Kotsadam (2013) and Aghatise (2004) emphasize the importance of institutional strength and the corresponding legal framework to combat illegal activities. Laws as well as their enforcement are an important indicator of the simplicity of setting up and executing criminal activities. As mentioned by Hernandez and Rudolph (2015), illicit activities flourish where legal institutions are weak and probability of detection and conviction is low. Thus, implementation of anti-slavery laws is as important as their actual enforcement. Moreover, Friedman et al. (2000) show that illegal activities are connected with large informal economies and high corruption.

We expect that better domestic laws against exploitation and their enforcement decreases slavery. Corruption is expected to increase exploitation.

4.3.2 Market Attractiveness and Migration

Danailova-Trainor and Belser (2006) claim that modern slavery is prevalent in countries with bigger markets i.e. higher GDP per capita and a larger population. A high income-gap between regions encourages migration as migrants expect to be better off after moving. Harris and Todaro (1970) show that an employment opportunity does not necessarily lead to a welfare improvement, but may increase unemployment for migrants as well as locals. Thus, potential jobs for migrants are not necessarily in the legal economy. If migrants attracted by

advantageous economic conditions and social welfare are in a precarious situation, they become vulnerable to exploitation (Belser, Cock, and Mehran 2005).

The motives for migration (pull factors) and stimulating emigration (push factors) and thus, their effect on exploitation are quite different. Regarding victim attraction, O'Connell (2011) finds that high-income countries have a significant demand for cheap labor in the informal sector (e.g. domestic work, dirty and dangerous manual work, and prostitution). Due to the lack of alternatives, these jobs are often carried out by illegal immigrants or by coerced labor (Akee et al. 2010). Circumstances impelling emigration are caused by different factors. Hernandez and Rudolph (2015) show that a large population and thus, a substantial share of potential migrants are advantageous for criminal activities. Regarding transnational trafficking, Jakobsson and Kotsadam (2013) argue that legal migration to a country reduces the costs of trafficking for the criminal. In other words, if potential victims are already on-site, transnational trafficking routes are unnecessary.

We expect that population size and GDP per capita increase the number of slaves. In addition, we expect that migration inflows and unemployment increase exploitation, as the pool of potential slaves increases.

4.3.3 Vulnerability of potential Victims

Di Nicola et al. (2005) and Danailova-Trainor and Belser (2006) discovered that poverty and a high illiteracy rate increase the vulnerability of potential victims. In addition, natural disasters and conflicts were identified as “significant disruptions in socio-economic conditions” (Danailova-Trainor and Belser 2006, p.9). Moreover, differences in socioeconomic development are related to exploitation. In the literature, various measures of inequality are discussed: Clawson, Layne, and Small (2006) use the Gini index as measure for inequality and identify a connection between inequality and human trafficking. Mahmoud and Trebesch (2010) and Bales (2007) study the effect of infant mortality on human trafficking. Laczko and

Danailova-Trainor (2009) find that low or medium developed countries (measured by their Human Development Indices) are more likely to become source countries for human trafficking. According to Akee et al. (2010) and Cho (2015), refugees are one of the most vulnerable groups regarding exploitation. According to Akee et al. (2010) local and transnational human trafficking cases are regularly identified among the refugee population. Regarding the attractiveness of transnational trafficking and exploitation, high income differences between origin and destination⁴⁰ countries were identified as important factors.

We therefore expect that inequalities and conflicts increase exploitation.

4.3.4 Crime

Many attempts have been made to find evidence for the link between crime and human trafficking (Akee et al. 2010; Cho, Dreher, and Neumayer 2013; Jakobsson and Kotsadam 2013; Hernandez and Rudolph 2015). There is no consensus on the effect of crime, as the results have been inconclusive. Following the argument of Cho (2015), we will use homicide rates as a proxy for criminal activities. Homicide rates have comparatively high detection rates compared to other crimes and are well documented (Hernandez and Rudolph 2015). Arguably, the homicide rate might be an indicator for the malfunctioning of legal institutions.

Following Hernandez and Rudolph (2015) and Jakobsson and Kotsadam (2013) we assume that criminal activities increase exploitation.

4.4 Principal Component Analysis and Hypotheses

In order to identify determinants of modern slavery, we focus on country characteristics that have been discussed in other papers (see i.e. Mahmoud and Trebesch (2010); Jakobsson and

⁴⁰ In the literature, destination countries are classified as countries where foreign victims are identified (Danailova-Trainor and Belser 2006).

Kotsadam (2013); Cho (2015); Hernandez and Rudolph (2015)). The original dataset consists of 180 control variables, some of which are highly correlated. As some control variables measure almost the same facts, the set of variables is reduced accordingly.

In order to reduce the data set and identify patterns of association across variables, Principal Component Analysis (PCA) is used. PCA is a method that captures the maximum possible variation from the original variables by summarizing the data in sufficiently few components. In contrast to PCA, Factor Analysis assumes that a few common factors drive the variation in the data. As we do not wish to make such assumptions, PCA is used⁴¹. Moreover, at this stage, we are more concerned about data reduction than latent variables. Thus, PCA is used to find reasonable variable groupings.

For PCA, the data need to be pooled, as a constant covariance of the included variables over time is assumed. (For the fixed effects models estimated in Section 4.6 we do not use pooled OLS but dummy variable fixed effects models.) In addition, the values of all input variables were centered and scaled to ensure that the resulting components capture the maximum variance and not the mean of the data. In order to identify patterns of association in the underlying structure of the data, we need to inspect the eigenvectors. Based on the results of the PCA, the number of control variables can be reduced to 20. Following the Kaiser rule⁴², we find that most variables load on four components. We group these factors affecting exploitation in the following categories: institutional quality and laws, (labor) market attractiveness and migration, vulnerability of potential victims, and crime. These groups are in line with the categories established by Cho (2015), Hernandez and Rudolph (2015), and Danailova-Trainor and Belser (2006).

⁴¹ Both methods yield similar results. For more details about the Principal Component Analysis and the Factor Analysis see the complementary technical discussion in Appendix A4.2.

⁴² The Kaiser rule recommends focusing only on components where eigenvalues exceed one. Thus, the component captures the same variation as the original variable (Kaiser 1960).

4.5 Empirical Analysis

In our dataset, we have information on 144 countries and territories from 2002 to 2016⁴³. The following subsections describe the data collection and provide descriptions of the variables. Descriptive statistics are presented in A4.1 Appendix A4.1. The empirical strategy will be discussed in Section 4.6.

4.5.1 Data Collection

Data on modern slavery is scarce (Frank 2013a; Cho 2015), thus it was challenging to find reliable information on the subject. Since 2001, the US Department of State has been releasing its annual “Trafficking in Persons Report”, revealing countries and territories that have a significant number of exploitation cases⁴⁴ (U.S. Department of State 2019). All information is only available in the form of text, but due to its standardized nature, it is possible to transcribe it into an operational dataset.

Hence, we were able to gather information on various forms of exploitation in 144 countries⁴⁵ and territories from 2002 to 2016⁴⁶. The countries are ranked according to their effort on combating exploitation. Information on the following types of abuse of adults is available: forced prostitution, forced labor in agriculture and sweatshops, forced domestic work and forced begging. In addition, information on child labor is available. This research focuses on the exploitation of persons in the legal sector. Victims of illegal activities such as drug trafficking or forced conscription into terrorist groups are excluded. For a detailed description of the generation of the data, see Appendix A4.2.

⁴³ Due to the availability of some of the control variables, the number of countries and years varies for the following regressions. Most regressions contain 144 countries and encompass the period from 2002 to 2016.

⁴⁴ The US Department of State only reports countries and territories with at least 100 (assumed) victims per year.

⁴⁵ All countries and territories are listed in Appendix A4.1.

⁴⁶ Note that information for every country or territory may not be available for each year. Moreover, not every type of exploitation is recorded in each country or year. In the case of modern slavery, missing information does not prove its inexistence, but rather indicates no detection or reporting of the incidence.

4.5.2 Variable Description

Victims. The dependent variable of interest, *Slavery*, captures the estimated number of adult victims per year in the reporting/exploiting country⁴⁷. Adult exploitation includes victims of forced industrial labor, forced domestic labor and forced prostitution. The number of estimated child victims is available as well (per country and year).

Convictions. Number of reported convictions per year in the reporting country. The number of reported convictions per purpose (type of exploitation⁴⁸) is available as well. The US Department of State only reports convictions directly linked to modern slavery. Convictions do not necessarily occur in the same year as the crime. Thus, the number of convictions is assumed to ‘lag behind’ the number of victims. Reports indicate that sometimes victims are sentenced and thus among the convictions represented in the dataset⁴⁹. Unfortunately, we cannot distinguish between convicted victims and perpetrators. Spikes in reported convictions may be due to successful organized raids or the consequential arrest of a trafficking ring.

Number of slave origins in slave importing countries. Although the number of victims per origin country is unknown, we know the composition of source countries for each exploiting country per year and per purpose. To put it differently, we know the number of (different) origin countries of victims for each exploiting country. We also know whether a reporting country abuses its own citizens or not (in contrast to, for example, only exploiting foreigners). This evidence is available per year and purpose as well.

Number of slave exporting destinations. Unfortunately, we do not know the number of victims a country ‘exports’ per year. However, we can identify the number of exploiting destinations per source country. In other words, the variable *Slave Exporting Destinations* indicates the

⁴⁷ The U.S. Department of State defines victimization in accordance with the *Victims of Trafficking and Violence Protection Act of 2000* (U.S. Department of State 2001-16).

⁴⁸ We can distinguish between convictions regarding adult forced prostitution, adult forced labor and child labor.

⁴⁹ This can happen for example, in countries where prostitution is illegal and victims of forced prostitution can be imprisoned.

expected number of countries, in which individuals of a certain nationality are enslaved (in a certain year).

Enslavement of the domestic population. As information about the origin countries of the victims is available for each country, we calculate a dummy variable. It indicates whether victims identified in a country are of its own population.

Domestic laws and enforcement. The variable *Domestic Laws* captures to which extent domestic laws combatting modern slavery have been passed in a certain country. It is a categorical variable ranging from 0 to 2, where 2 indicates, “that comprehensive laws prohibiting all forms of trafficking have been passed and come into force” (Frank 2013b, p.14). The parameter is encoded ‘1’ if a country passed only some laws. A value is classified ‘0’ if a country has no laws prohibiting trafficking. The variable *Enforcement* indicates, if the domestic law is actually executed. It is encoded in the same way (0,1,2) as the variable *Domestic Laws* (Frank 2013b).

GDP and population. In order to capture market characteristics, we control for GDP per capita and population. GDP per capita is measured in constant 2010 USD (World Bank 2020a). The World Bank reports population annually as “all residents regardless of legal status or citizenship” (World Bank 2019c, p.1).

Rule of law and homicide rate. Laws are enforced as well as followed to different degrees in different countries. Therefore, we include *Rule of Law* and *Homicide Rate* as control variables. The rule of law measure used in this paper is from the ‘World Bank Aggregate Governance Indicators’ and is available from 2002 to 2016. It ranges from -2.5 to 2.5 with higher values corresponding to better rule of law outcomes (World Bank 2020f).

The United Nations Office on Drugs and Crime provides data regarding the victims of intentional homicide per 100,000 population (United Nations Office on Drugs and Crime - DATAUNODC 2021).

Corruption. We use data from the World Bank indicating corruption. The variable *Control of Corruption* „captures [...] the extent to which public power is exercised for private gain, including both petty and grand forms of corruption“ (World Bank 2020e, p.1). Data is available from 2002 to 2016 and ranges from -2.5 to 2.5, with higher values corresponding to better outcome, i.e. less corruption.

Source, transit or destination of trafficking. The respective binary variable is encoded as ‘1’ if a country is primarily mentioned as a source, transit or destination country for any type of exploitation and zero otherwise (Frank 2013b). The same information and encoding is available for various types of exploitation (including forced labor and prostitution of adults, debt bondage and child labor) as well.

Immigration. This variable captures the total inflows of foreign population by nationality from the OECD and the International Organization of Migration (2020). Information on immigration is only available for 53 countries, as “the number of countries reporting flow data is limited and the data are often not harmonized” (OECD Data 2020, p.1).

Unemployment. The variable *Unemployment* “refers to the share of the labor force that is without work but available for and seeking employment” (World Bank 2020d, p.1). The total unemployment rate is calculated as percentage of the total labor force. Information on female and male unemployment is available as well from the World Bank (2020d) and defined accordingly.

Infant mortality and adult literacy. In order to account for vulnerability we use *Infant Mortality Rate* and *Adult Literacy Rate*. The infant mortality rate is defined as “the number of infants dying before reaching one year of age, per 1,000 live births in a given year” (World Bank 2019b, p.1). “Adult literacy rate is the percentage of people ages 15 and above who can both read and write with understanding a short simple statement about their everyday life” (World Bank 2020b, p.1). Female and male literacy rate are available as well and defined accordingly.

Autocracy. In order to control for the political regime, we use the autocracy index calculated by the Center for Systemic Peace (2020). *Autocracy* is scaled from 0 to 10, with 10 indicating full autocracy.

Human development index (HDI). In order to capture inequality we use the HDI provided by the United Nations Development Programme (2019). The HDI is scaled on the interval [0, 1], with higher values indicating a higher level of human development. The index is composed of three dimensions: life expectancy at birth, education including years of expected schooling and the gross national income per capita in constant 2011 purchasing power parity terms (United Nations Development Programme 2019).

Refugees. In order to control for vulnerability, we use information on refugee inflows and outflows for each country. Refugees include “people granted refugee-like humanitarian status, and people provided temporary protection” (World Bank 2020c, p.1). Asylum seekers are excluded.

By controlling for legal institutions, attractiveness of economies, vulnerability, and crime, we are confident that we capture the main determinants of modern slavery across countries.

Summary statistics for the variables of interest are presented Table 11 in in the Appendix.

4.6 Empirical Framework and Results

Based on the theoretical foundations and PCA (see Sections 4.4 and 0), regression models to determinate modern slavery can be built. Our panel dataset is strongly balanced. We use country fixed effects and thus, can control for factors that differ across countries but are constant over time⁵⁰. Due to limited availability of some of the control variables, the following regression is estimated for 144 countries from 2002 to 2016.

$$\text{Slavery}_{it} = \beta_0 + \beta_1 \text{DomesticLaws}_{it} + \beta_2 \mathbf{X}_{it} + \varepsilon_{it} \quad (1)$$

Slavery indicates the log of adult slavery victims per capita in country i in year t . *Domestic Laws* is a categorical variable ranging von 0 to 2. Higher values indicate more comprehensive domestic laws prohibiting all forms of trafficking. Passing a law does not necessarily mean that it is enforced as well (Frank 2013b). The vector \mathbf{X} is composed of control variables including population size, GDP per capita, refugee population, homicide rate, corruption, HDI, infant mortality rate and a measure of the rule of law. The error term ε is normally distributed.

⁵⁰ As expected, a Hausman-test recommends the use of a fixed effects model.

Table 3: Estimation results 1

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Domestic Laws (some = base)						
No	-1.084*** (0.637)	-1.519** (0.637)	-2.,61*** (0.719)	-1.362** (0.679)	-1.631** (0.706)	-0.696 (0.793)
Comprehensive	0.926*** (0.153)	0.394** (0.170)	0.849*** (0.163)	0.924*** (0.154)	0.051 (0.178)	0.592*** (0.166)
Rule of Law		0.357 (0.439)	0.428 (0.485)	0.968** (0.449)	-0.873 (0.477)	
Homicide Rate (log)						-0.444** (0.216)
Corruption Control		1.039** (0.406)	1.059** (0.445)	1.000** (0.410)	1.297*** (0.433)	1.859*** (0.415)
GDP per Capita (in 1,0000; in 2010 USD)			0.082** (0.038)	0.045 (0.033)		
Population (in Mio.)		-0.002 (0.001)	0.013 (0.007)	0.013 (0.008)		
Refugees Inflows (in Mio)			-0.302 (0.528)		-0.888* (0.498)	-0.321 (0.493)
Unemployment (%)			0.035 (0.033)			
Infant Mortality Rate		-2.650*** (0.393)				
HDI					0.262*** (0.026)	
Conviction Rate (log)						0.320*** (0.039)
Obs.	2,160	2,160	2,160	2,160	2,160	2,160
R ² (overall)	0.556	0.552	0.569	0.552	0.583	0,604
Country FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: The dependent variable is the log of adult slaves per capita.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ (standard errors in parentheses)

Contrary to our expectations (see Subsection 4.3.1), the results in Table 3 reveal a positive connection between comprehensive domestic laws and slavery, whereas the absence of domestic laws has a significant negative effect on slavery. The result is surprising, as the intention of stricter laws is a reduction in slavery. Therefore, we propose the following alternative explanation: *Domestic Laws* does not only measure the effectiveness of the implementation of a law but also the effectiveness of legal institutions. We believe that, based on the available data, the second effect dominates our results. Thus, sound institutions imply

higher numbers of detected victims. However, it is possible that stricter laws lead to increased exploitation. Unfortunately, we cannot detangle and identify the two effects with the available dataset⁵¹.

The effect of corruption on slavery is as expected. Regarding homicide rate, we assumed that criminal activities increase exploitation (see Subsection 4.3.4). In fact, we observe a negative relationship. The positive sign of corruption control and the negative sign of homicide rate indicate that countries with more resources and sound legal systems might detect more slavery. These results are in line with Clawson, Layne, and Small (2006) and Cho (2015), who argue that higher corruption and homicide rates are an indication for organized crime syndicates, which also operate in human trafficking.

In addition, abidance of the law (captured by *Rule of Law*) and increased conviction rates of slavery-related crimes have a significant positive effect on modern slavery. Thus, *Domestic Laws* captures detection rates whereas the role of law enforcement needs to be tested explicitly. This will be addressed below (see Table 4).

We can confirm our hypothesis that GDP per capita has a significant positive effect on slavery. This is consistent with the findings of Hernandez and Rudolph (2015), Akee et al. (2010) and Belser, Cock, and Mehran (2005). In addition, we find a significant positive effect for the human development index (HDI). Conducting a two-sample t-test shows that on average destination countries have both a significantly higher GDP per capita and HDI than source countries. Thus, as argued in the literature, we identify a higher GDP per capita and HDI in destination countries as dominant ‘pull factors⁵²’ of human trafficking (Cho 2013; Cho, Dreher, and Neumayer 2013).

⁵¹ Different identification strategies, robustness checks and varying selection of control variables are presented in the subsequent paragraphs of Section 4.6.

⁵² Lower GDP per capita and HDI in the origin countries of the victims are push factors, respectively.

We find a significant negative effect for infant mortality rate. This result is in line with Mahmoud and Trebesch (2010), who find evidence that regions with higher infant mortality⁵³ report less trafficking incidents. Thus, we argue that in remote areas with limited access to governmental institutions and shelters for victims, fewer trafficking incidents are reported.

Moreover, higher levels of refugees result in lower slavery. A possible explanation is that refugees will try to flee to ‘safe’ countries.

In contrast to our expectations, literacy rate has no significant effect on the amount of slaves, thus we do not show the results. Moreover, no significant effects of population size or unemployment⁵⁴ were revealed. Executing the regressions with and without the country fixed effects reveals that unemployment is captured by fixed effects⁵⁵. In this setting, we find a significant positive relationship between unemployment in the origin country and slavery. This result is consistent with Danailova-Trainor and Belser (2006), who find that unemployment fuels the supply of trafficking victims.

All results are robust when we exclude each country separately for each regression. This indicates that the results are not driven by a single country. If we drop each continent separately, results remain robust as well.

Since the existence of laws does not necessarily reflect their enforcement, we use the following regression to examine the effect of law enforcement:

$$Slavery_{it} = \beta_0 + \beta_1 Law_{it} * Enforcement_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad (2)$$

⁵³ Mahmoud and Trebesch (2010) argue that regions with high infant mortality are mostly remote regions with limited access to healthcare.

⁵⁴ A two-sided t-test revealed no significant difference in the unemployment rates of source and destination countries.

⁵⁵ All other results are robust regarding the inclusion/exclusion of country fixed effects in the respective regressions.

Slavery indicates the log of adult slavery victims per capita in country i in year t . *Domestic Laws* indicates if laws to combat exploitation were passed. *Enforcement* is a categorical variable ranging von 0 to 2 indicating if and to what extend laws are enforced. Higher values indicate stricter enforcement. The vector X is composed of control variables including rule of law, homicide rate, GDP per Capita, population and refugee population. The error term ε is normally distributed.

Table 4: Estimation results 2

Variable	Coef.	p-value
Domestic Laws (No = base)		
Some	0.081	0.930
Comprehensive	-2.489*	0.040
Enforcement (No = base)		
Some	3.167***	0.000
Strong	3.097***	0.000
DomesticLaws#Enforcement (No#No = base) ⁵⁶		
Some#Some	-3.255***	0.000
Some#Strong	-2.927***	0.001
Corruption Control	1.684***	0.000
Homicide Rate (log)	-0.285	0.211
Conviction Rate (log)	0.324***	0.000
Rule of Law	0.658	0.221
GDP per Capita (in 1,000)	0.077*	0.031
Population (in Mio)	0.007	0.308
Refugee Inflows (in Mio)	-0.288	0.573
Obs.	2,160	
R-squared (overall)	0.611	
Country FE	Yes	

Note: The dependent variable is the log of adult slaves per capita

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

The results of Table 4 indicate a significant negative effect of comprehensive domestic laws on slavery, when we control for law enforcement. The active enforcement of laws increases slavery. We believe that law enforcement is another measure of effective institutions and thus

⁵⁶ Theoretically, more combinations of the various categories of *Domestic Laws* and *Enforcement* are possible. However, some cases are not available, as nonexistent laws cannot be enforced. Other combinations are omitted due to collinearity.

indicates the enhanced detection of victims. We find significant negative interaction effects of law enforcement and domestic laws⁵⁷. The predictive margins are outlined in Table 5, below. As expected, the coefficients of corruption control, conviction rate and GDP per capita are positive and significant. These results are in line with the findings of Di Tommaso et al. (2009) and Akee et al. (2014).

For robustness, we calculated the regressions dropping each country separately, to see if the effects are driven by a single country. The analysis did not reveal any country driving the results unilaterally. All results remain robust if we control for each continent separately.

Table 5: Predictive margins

Slavery (log)	Margin	Std.Err.	z
DomesticLaws#Enforcement			
No#No (base)			
Some#No	0.081	0.918	0.09
Some#Some	-0.058	0.322	-0.18
Some#Strong	0.170	0.349	0.49
Comprehensive#No	-2.489**	1.211	-2.06
Comprehensive#Some	3.167***	0.822	3.85
Comprehensive#Strong	3.097***	0.842	3.68

Note: Enforcement without the respective laws is not possible.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

As we include an interaction term between *Domestic Laws* and *Enforcement*, we cannot interpret their effect independently (see Table 4). As the signs of the variables partly differ from the sign of their interaction term, we are interested if the positive or negative effect on slavery prevails. Thus, we examine that the predictive margins⁵⁸ in Table 5 show a positive effect in

⁵⁷ Using the number of actual convictions as proxy for law enforcement leads to similar results. Hence both law enforcement and the number of slavery-related convictions are an indicator for the soundness of governmental institutions.

⁵⁸ Predictive margins are called estimated marginal means, as we examine balanced data. This statistic is based on the respective fitted model where the values of covariates are fixed (Williams 2012). Note that the interaction effects cannot be accounted for explicitly, but we can examine the predictions of all possible combinations of *Domestic Laws* and *Enforcement*.

most cases. The sole significant exception is the existence of profound laws with absence of its enforcement. If laws are comprehensive but not enforced, our model predicts a 90% decrease in *Slavery* (compared to no laws and no enforcement). In our view, this result emphasizes that law enforcement measures institutional efficiency. We do not believe that comprehensive laws by themselves are deterring perpetrators from committing crimes. However, if comprehensive laws are implemented, the extent of slavery is smaller with strong enforcement compared to only some enforcement. These results correspond with the findings of Hernandez and Rudolph (2015) and Jakobsson and Kotsadam (2013).

Alternative slavery weighting. For robustness, we also estimated Equation 2 using alternative weights for our dependent variable. To account for the ‘overall performance’ of institutions, we weigh the number of slaves with the number of convictions⁵⁹ and with the homicides per 100,000 population, respectively. The results are still statistically significant and the signs of the estimates are consistent with what we found in Table 4 (not reported). We present the marginal results in Table 6. Again, we observe that comprehensive *Domestic Laws* and strong *Enforcement* yield more slavery (detection) than the reference category (not significant). The significant results for *Slaves per Homicide* suggest that high levels of crime might lead to decreased detection rates induced by e.g. corruption (Clawson, Layne, and Small 2006; Cho 2015). However, if homicide clearance is an indicator for sound institutions, perpetrators might abstain from exploitation if laws are installed and enforced. We believe this argument is plausible and substantiates our claim, as using Slaves per Convictions yields similar results. In other words, laws and their enforcement lead to fewer slaves.

⁵⁹ The number of convictions is measured as the total number of convictions in connection with the exploitation of adults.

Table 6: Predictive margins for alternative dependent variables

	Slaves per Convictions (log)		Slaves per Homicide (per 100,000)	
	Margin	Std.Err.	Margin	Std.Err.
DomesticLaws#Enforcement				
No#No (base)				
Some#No	-0.852	1.961	-0.419	0.735
Some#Some	-1.329**	0.568	-0.154	0.258
Some#Strong	-1.582***	0.588	-0.016	0.279
Comprehensive#No	-4.100	2.313	-2.331**	0.969
Comprehensive#Some	1.993	1.356	2.335***	0.658
Comprehensive#Strong	1.938	1.368	2.252***	0.674

Note: Enforcement without the respective laws is not possible.

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Figure 12: Heat map of exploitation



Source: Own calculations of country specific effects.

We also examined the fixed effects in detail. Figure 12 shows countries exploiting less (gray) or more (black) slaves than the average country (countries without information are left blank).

Studying the predicted fixed effects for countries deviating from the average country, we find that countries in North America, Western Europe and Oceania have less slaves than the average country. Countries in Central Asia have, on average, more slaves than the average country⁶⁰.

The role of migration. According to Mahmoud and Trebesch (2010), modern slavery is associated with migration. Since information on annual immigration is only available for 53 countries⁶¹, we examined the effect of immigration separately. However, contrary to our expectations, we were not able to identify a significant effect of immigration. Even if we lag the variable, as it might take some time to deceive potential victims, we do not find significant results. A possible explanation might be that official data on immigration reflects “legal, documented migration, while human trafficking is more closely associated with illegal migration” (Cho 2013, p. 687). As worldwide data on e.g. the total number of migrants is only available in five-year-intervals, the use of this data results in an insufficient number of observations⁶².

The role of conflicts. As suggested in the literature, we also controlled for external and internal conflicts. In accordance with Rao and Presenti (2012), our results are insignificant and thus not presented in the paper.

Differences in source and destination countries. Addressing the question if source and destination countries differ, we start by estimating Equation (2) for source and destination countries separately. However, these regressions yield the same results as shown in Table 4. Our calculations of the marginal effects indicate that destination countries identify more victims than source countries, but this difference is not statistically significant. Further distinctions regarding source and destination countries are examined in Subsection 4.6.2.

⁶⁰ Countries that have significantly more or fewer slaves than the average country are consistent over time.

⁶¹ Data on immigration provided by the OECD and IOM reflects mainly countries in Europe and the Americas.

⁶² As this study considers modern slavery from 2002 to 2016, migration data is only available for the years 2005, 2010 and 2015 (International Organization of Migration 2020).

Inclusion of lagged slavery. Random effects and fixed effects panel data models are static and do not allow us to include information from previous periods. Since the assumption that current slavery may be a function of past exploitation, we examine a dynamic panel data model. We follow Wooldridge (2005) and Fenske and Kala (2013) using the Arellano–Bond estimator. Due to insufficient variation over time of several control variables, the respective variables are omitted⁶³. The remaining variables are statistically insignificant, thus we do not show these results.

4.6.1 Domestic Laws and their Enforcement combatting different Types of Exploitation

In this section, we want to study different types of exploitation. Specifically, we are interested in differences between forced prostitution, forced labor⁶⁴ and child labor. Thus, we estimate the following regressions:

$$ForcedProstitution_{it} = \beta_0 + \beta_1 Law_{it} * Enforcement_{it} + \beta_2 X_{it} + \varepsilon_{it}, \quad (2a)$$

$$ForcedLabor_{it} = \beta_0 + \beta_1 Law_{it} * Enforcement_{it} + \beta_2 X_{it} + \varepsilon_{it}, \quad (2b)$$

$$ChildLabor_{it} = \beta_0 + \beta_1 Law_{it} * Enforcement_{it} + \beta_2 X_{it} + \varepsilon_{it}. \quad (2c)$$

The vector X is composed of control variables including rule of law, homicide rate, GDP per capita, population and refugee population. The error term ε is normally distributed. All regressions include country fixed effects.

⁶³ These variables include *Domestic Laws*, *Enforcement*, *Corruption Control*, *Rule of Law* and *Refugee Inflows*.

⁶⁴ Forced labor includes forced labor of adults in sweatshops, agriculture, domestic work and forced begging.

Table 7: Estimation results 3

Variable	Forced Prostitution	Forced Labor	Child Labor
Domestic Laws (no = base)			
Some	0.696 (0.846)	0.231 (1.008)	-0.433 (0.924)
Comprehensive	-0.782 (1.117)	-0.078 (1.331)	-0.949 (1.219)
Enforcement (no = base)			
Some	1.722* (0.758)	1.383 (0.903)	0.946 (0.828)
Strong	1.921* (0.776)	1.246 (0.925)	1.194 (0.848)
DomesticLaws#Enforcement (no#no = base)			
Some#Some	-1.820* (0.795)	-1.680 (0.947)	-1.170 (0.868)
Some#Strong	-1.672* (0.816)	-1.958* (0.973)	-1.703 (0.892)
Corruption Control	0.819 (0.428)	-0.066 (0.510)	-0.908 (0.467)
Homicide Rate (log)	-0.321 (0.210)	-0.480 (0.250)	-1.063*** (0.229)
Conviction Rate (log)	0.273*** (0.036)	0.355*** (0.043)	3.284*** (0.331)
Rule of Law	1.210* (0.496)	0.592 (0.591)	0.840 (0.542)
GDP per Capita (in 1,000)	0.023 (0.033)	0.163*** (0.039)	0.159*** (0.036)
Population (in Mio)	0.006 (0.007)	0.020** (0.008)	0.025*** (0.007)
Refugee Inflows (in Mio)	0.233 (0.472)	-0.050 (0.562)	-0.346 (0.515)
Obs.	1557	1557	1557
R-squared (overall)	0.663	0.530	0.489
Country FE	Yes	Yes	Yes

*Note: The dependent variable is the log of adult forced prostitutes, forced labor and child labor, respectively. The variable conviction rate refers to convictions involving adult victims or child victims as share of total convictions. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ (standard errors in parentheses)*

Law enforcement and the abidance of the law (rule of law) lead to increased detection of forced prostitution (see Table 7). The interaction terms of domestic laws and enforcement are negative and significant. The predicted margins (not shown) indicate that the positive effect dominates

the negative effect (similar to the discussion of the results in Table 5). The positive effect of the conviction rate is significant for all types of exploitation. Again, we argue that more convictions indicate a sound legal system and thus higher slave detection rates.

A high GDP per capita and a large population increase both forced labor and child labor. As hypothesized, GDP and population are indicators for market attractiveness. This is consistent with the findings of Hernandez and Rudolph (2015), Akee et al. (2010) and Belser, Cock, and Mehran (2005). The effect of the homicide rate is negative and only significant for child labor. This indicates that a higher homicide clearance rate is associated with sound institutions, which in turn leads to fewer child labor victims.

4.6.2 Destination versus Source Countries

We also test for differences between source and destination countries. As the variables *source* and *destination* are binary, a probit model is necessary. Moreover, panel data require the use of a conditional random effects probit model⁶⁵ (Wooldridge 2002, p.500-502). We follow the findings of Hahn and Soyer (2005) that logit models should only be preferred if one particular variable determines whether the dependent variable is zero or one. Examining the variables negates the existence of ‘extreme independent variables’ as no particularly large (or small) value overrides the effects of the other variables. For a formal description see Hahn and Soyer (2005, p.4).

⁶⁵ All regressions were tested with a panel logit approach and if applicable, with fixed effects. According to the likelihood value, a probit estimation is preferred over logit. In addition, a *Hausman-test* indicates that random effects must be used.

In order to understand which factors determine source or destination countries, we estimate the following models:

$$Pr(source_{it} = 1|X_{it}) = \Phi(\beta X_{it} + v_i) \quad (3)$$

and

$$Pr(destination_{it} = 1|X_{it}) = \Phi(\beta X_{it} + v_i). \quad (4)$$

We fit the random effects v_i , which are independent and identically distributed⁶⁶ for country i in year t , via maximum likelihood. Φ is the standard normal cumulative distribution function. Standard errors are clustered at the country level, as observations for the same country in different years can be interdependent.

⁶⁶ Underlying is the variance components model $source_{it} = 1 \Leftrightarrow X_{it}\beta + v_i + \epsilon_{it} > 0$, where ϵ_{it} are i.i.d. Gaussian distributed with mean zero and variance $\sigma_\epsilon^2 = 1$, independently of v_i (the same holds for *destination*) (Wooldridge 2002, p.500-502).

Table 8: Random effects probit regression for source and destination countries

	source	p-value	destination	p-value
Adult Literacy Rate	0.085*	0.013	-0.049**	0.004
Infant Mortality Rate	0.076*	0.050	-0.009	0.499
Autocracy	-0.172	0.083	-0.018	0.366
Corruption Control	-0.189	0.742	-0.710	0.109
Autocracy#CorruptionControl	-0.099	0.219	-0.002	0.924
GDP per Capita (in 2010 USD, in 1,000)	-0.158***	0.000	0.275***	0.000
Unemployment Rate	0.016	0.605	0.054	0.055
Homicide Rate (log)	-0.188	0.471	0.001	0.995
Domestic Laws (No = base)				
Some	1.621	0.063	0.259	0.854
Comprehensive	3.186*	0.021	-0.263	0.863
Enforcement (No = base)				
Some	-0.969	0.382	0.973	0.122
Strong	-0.575	0.617	0.599	0.367
DomesticLaws#Enforcement (No#No = base)				
Some#Some	0.815	0.466	-1.173	0.084
Some#Strong	0.619	0.598	-0.707	0.328
Rule of Law	0.236	0.766	0.494	0.471
Rule of Law#Homicide Rate (log)	0.064	0.815	0.042	0.872
Constant	-6.088	0.083	3.701**	0.088
rho	0.819		0.718	
Obs.	1,046		1,046	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ (standard errors in parentheses)

We find that a higher literacy rate decreases the probability for a country to be a destination country⁶⁷. Also, a high GDP per capita indicates an attractive slave destination which is in line with the findings of Jakobsson and Kotsadam (2013).

Comprehensive domestic laws increase the probability of being a source country. As the country cares about victim protection within its borders, exploitation takes place somewhere else (transnational trafficking). Surprisingly, a higher adult literacy rate increases the

⁶⁷ Results do not change if we control for female literacy rate only.

probability to be a source country. This result is in line with Di Tommaso et al. (2009), who argue that more educated victims are more likely to seek help and report their perpetrators. Alternatively, literacy rate may act as a measure of income disparities, since we identify a strong (negative and significant) correlation between literacy rate and inequality⁶⁸. Moreover, an increased infant mortality rate, and thus a lower health status, increases vulnerability (Di Tommaso et al. 2009).

Crime and enforcement of domestic laws have no significant effect on the distinction of source and destination countries, which is in line with the findings of Jakobsson and Kotsadam (2013) and Cho, Dreher, and Neumayer (2013). Furthermore, we controlled for an impact of external and internal conflicts, but did not find significant effects for source countries. This result corresponds to the findings of Rao and Presenti (2012). By contrast, we identify a positive effect for destination countries (not shown). This result can be attributed to ‘internal’ human trafficking caused by conflicts (Akee et al. 2010).

We do not find a significant effect of the political regime (indicated by the variable *Autocracy*). We expected that restricted movement within autocratic regimes or just low detection rates would lead to a negative relationship. In this context, Cho, Dreher, and Neumayer (2013) find that detection rates of victims are higher in democracies. Although autocratic regimes vary considerably regarding their corruptibility, they face, on average, higher levels of corruption than democracies (Chang and Golden 2010). Thus, we introduce an interaction term between (autocratic) regime and corruption. In contrast to our expectation, that less corrupt autocracies are less likely source countries of modern slavery, the results are insignificant.

If we use the human development index (HDI) instead of *Literacy Rate*, *Infant Mortality Rate* and *GDP per Capita*, all coefficients for *source* are insignificant (not reported). Regarding *destination*, HDI and *Rule of Law* are positive and significant. A possible explanation may be

⁶⁸ As a measure of inequality we use the Gini index provided by the World Bank (2019a).

the demand for cheap labor in developed countries (see Subsection 4.3.2). This confirms previous findings in the literature regarding vulnerability (Clawson, Layne, and Small 2006; Di Tommaso et al. 2009). However, the positive effects of HDI and rule of law may indicate efficient victim detection in destination countries.

Values of ρ ⁶⁹ unequal to zero indicate that the extent of intra-panel correlation cannot be ignored. Moreover, following Butler and Moffitt (1982), we find that the quadrature technique⁷⁰ of our models is numerically stable.

4.6.3 Destination versus Source Countries for different Types of Exploitation

In this section, we study if source and destination countries differ if we examine adult forced prostitution, adult forced labor⁷¹ and child labor separately. Thus, we estimate Equations (3) and (4) for different types of exploitations. The latent dependent variable of the probit regressions is again *destination* or *source*. The variable is set to one if a country is classified a destination or source country, respectively, and zero otherwise. As described in Subsection 4.6.2, we fit random effects, which are independent and identically distributed for country i in year t , via maximum likelihood. Standard errors are clustered at the country level.

⁶⁹ The proportion of the total variance contributed by the panel-level variance component is labeled ρ with $\rho = \frac{\sigma_v^2}{\sigma_v^2 + 1}$, where σ_v is the standard deviation (Wooldridge 2002, p.176, 257-261).

⁷⁰ We fit the model for different numbers of quadrature points and thus can compare the accuracy of each approximation. Since the coefficients of our model do not change by more than 0.01%, we can interpret them confidently (Butler and Moffitt 1982).

⁷¹ Forced labor includes exploitation of adults in sweatshops, agriculture, domestic service and forced begging.

Table 9: Random effects probit regression for source and destination countries for different types of exploitation

	Forced Prostitution		Forced Labor		Child Labor	
	source	destination	source	destination	source	destination
Adult Literacy Rate	-0.191 (0.034)	-0.033* (0.014)	0.008 (0.015)	-0.033* (0.015)	-0.011 (0.014)	-0.048** (0.015)
Infant Mortality Rate	-0.494*** (0.031)	-0.027* (0.012)	-0.003 (0.013)	-0.027 (0.014)	0.015 (0.012)	-0.042** (0.014)
Autocracy	-0.304* (0.128)	-0.048 (0.039)	-0.154* (0.063)	-0.019 (0.019)	-0.121* (0.048)	-0.094* (0.040)
Corruption Control	-1.997** (0.617)	-0.694 (0.392)	-0.908* (0.384)	-0.902* (0.412)	-0.939** (0.372)	-1.461*** (0.375)
Autocracy#CorruptionControl	-0.245* (0.105)	-0.029 (0.036)	-0.099* (0.047)	0.001 (0.025)	-0.101** (0.039)	-0.081* (0.035)
GDP per Capita (in 2010 USD, in 1,000)	-0.218*** (0.061)	0.052* (0.023)	-0.092** (0.029)	0.126** (0.042)	-0.080** (0.027)	0.055** (0.021)
Unemployment Rate	0.024 (0.032)	0.030 (0.025)	-0.026 (0.019)	-0.001 (0.021)	-0.024 (0.018)	0.022 (0.019)
Homicide Rate (log)	-1.704*** (0.400)	0.081 (0.142)	-0.413* (0.176)	-0.294 (0.170)	-0.282 (0.146)	-0.028 (0.137)
Domestic Laws (No = base) Some	-1.699*** (0.399)	0.304 (0.874)	1.004 (0.707)	1.374 (0.983)	-0.849 (0.752)	0.318 (0.643)
Comprehensive		-0.534 (1.042)	1.422 (1.041)	0.765 (1.134)		-0.456 (0.930)
Enforcement (No = base) Some	0.611 (0.567)	1.279* (0.605)	0.739 (0.781)	1.051 (0.607)	0.508 (0.719)	1.796* (0.697)
Strong	-0.492 (0.520)	1.057* (0.634)	0.064 (0.797)	0.049 (0.633)	-0.351 (0.734)	0.894 (0.713)
DomesticLaws#Enforcement (No#No = base) Some#Some	-0.576 (0.372)	-1.489* (0.642)	-0.759 (0.810)	-1.551* (0.643)	-0.733 (0.755)	-2.034** (0.724)
Some#Strong		-1.238 (0.681)	-0.510 (0.832)	-1.061 (0.672)	-0.253 (0.777)	-1.484* (0.746)
Rule of Law	2.191* (1.058)	0.733 (0.531)	0.817 (0.531)	1.079 (0.589)	0.662 (0.514)	0.820 (0.462)
Rule of Law#Homicide Rate (log)	-0.340 (0.377)	0.032 (0.182)	-0.224 (0.188)	-0.382 (0.215)	-0.079 (0.174)	0.052 (0.154)
Constant	18.001*** (3.667)	3.699* (1.672)	0.707 (1.707)	2.687 (1.881)	3.924* (1.673)	4.425* (1.675)
rho	0.993	0.714	0.673	0.764	0.617	0.715
Obs.	1,030	1,046	1,046	1,046	1,039	1,046

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ (standard errors in parentheses)

A high adult literacy rate decreases the probability to be a destination country for all types of exploitation (see Table 9).

We find a negative relationship between infant mortality rate and the probability to be a source country for forced prostitution. This result corresponds to Mahmoud and Trebesch (2010), who

argue that high infant mortality rate and thus a lack in healthcare leads to fewer reports of human trafficking. Moreover, we find that a high infant mortality rate decreases the probability to be a destination country for forced prostitution and child labor. In this context, Bales (2007) finds that a high infant mortality is a significant push factor regarding human trafficking. Thus, countries with inadequate healthcare (and low wealth in general) are unattractive destinations. In addition, Kudlac (2015) finds that a high infant mortality rate is an indicator for internal human trafficking.

More autocratic countries are less likely to be source countries for exploitation. Surprisingly, the autocracy coefficient for *destination* is only significant for child labor. Less corrupt countries are less likely to be source countries for all types of exploitation. Although autocratic regimes vary considerably regarding their corruptibility, they face higher levels of corruption than democracies (Chang and Golden 2010). Thus, we introduce an interaction term between (autocratic) regime and corruption. We find that less corrupt autocracies are less likely source countries of modern slavery and less likely a destination for child labor.

Wealthy countries are less likely to be source and more likely to be destination countries for all types of exploitation. Countries with high GDP are attractive destination countries for exploitation and arguably superior in the detection of victims (due to better-equipped institutions). This result corresponds with Akee et al. (2010), Cho, Dreher, and Neumayer (2013), Jakobsson and Kotsadam (2013) and Akee et al. (2014).

The coefficients for homicide rate are only significant for source countries of forced prostitution and forced labor. *Domestic Laws* negatively affect the probability to be a source country for forced prostitution. A possible explanation is that laws and their enforcement shift illicit activities to other countries (transnational human trafficking). *Enforcement* is positive and statistically significant for destination countries of forced prostitution and child labor. *Law Enforcement* and *Rule of Law* might be indicators for the efficiency in victim detection.

Therefore, we introduce an interaction term between *Rule of Law* and *Homicide Rate*, since functioning institutions are associated with higher crime detection rates. However, the interaction is not significant. Contrary to our expectation, no significant effect of unemployment was identified.

Using HDI instead of literacy rate, infant mortality rate and GDP per Capita does not change any results (not reported). Controlling for political rights or regime transition does not change results. However, contrary to the literature (i.e. Akee et al. 2014) the respective coefficients for political rights and regime transition are insignificant (not reported).

In addition, we tested if cultural proximity⁷² or geographical distance⁷³ affect the probability to be a source or destination country. Including these variables does not change any results. The coefficients for all cultural proximity or geographical distance measures are insignificant in all settings (not reported).

4.6.4 Exports and Imports

Although the number of victims for each nationality is unknown, we know the number of countries in which victims from a certain origin were identified. In addition, we also know how many different nationalities were identified in each destination country. We refer to these variables as number of slave exporting destinations (SED) and number of slave origins in slave importing countries (SID), respectively. In this section, we examine how exporting and importing countries differ. As we have count panel data, we assume a Poisson distribution (Greene 2012, p.855-858). Countries with zero exports/imports are not considered, as we do

⁷² In order to capture cultural proximity, we use the number of countries that have the same official language or countries where at least 9 percent of the population speak the same language from the CPII (Mayer and Zignago 2011).

⁷³ In order to capture geographical distance, we use information from the CPII (Mayer and Zignago 2011). We capture if a country is landlocked, the number of neighboring countries and how many capitals are within the radius of 1000 kilometers of a country's own capital.

not know if the value is truly zero or unobserved. Due to its robust properties, we control for unobserved heterogeneity with a conditional fixed effects Poisson model⁷⁴.

We estimate the following fixed effects Poisson models:

$$E(\text{SlaveExportingDestinations}_{it} | X_{it}, \alpha_i) = \alpha_i \exp(\beta X'_{it}), \quad (5)$$

and

$$E(\text{SlaveImportingCountries}_{it} | X_{it}, \alpha_i) = \alpha_i \exp(\beta X'_{it}), \quad (6)$$

where E is the expected number of different countries victims are sent to or received from, respectively. X_{it} is a vector composed of control variables, α_i is the individual specific effect. The conditional mean of the Poisson distribution is $\lambda_{it} = \exp(\beta X'_{it})$. In models with multiplicative effects the conditional likelihood is conditioned on the sum of the outcomes in the panel, thus α_i cancels out in the conditional log likelihood (Cameron and Trivedi 2013, p. 335-357).

⁷⁴ We do not estimate a random effects model, because random effects may be correlated with regressors, which leads to inconsistent coefficient estimates (Cameron and Trivedi 2013, p.364-365). Moreover, fixed effects models produce smaller log likelihoods and thus a better fit for our models. We also tested for overdispersion (Cameron and Trivedi 2013, p.209-214). As we did not identify overdispersion there is no need to fit a conditional fixed effects overdispersion model in the form of a negative binomial model (Cameron and Trivedi 2013, p.357).

Table 10: Conditional fixed effects Poisson regression for exports and imports (measured in number of countries)

Variable	exports (number of countries)	p-value	imports (number of countries)	p-value
DomesticLaws (base = Some)	1		1	
No	0.794	0.511	1.204	0.249
Comprehensive	1.309***	0.000	1.101*	0.010
Enforcement (base = Some)	1		1	
No	1.211***	0.001	0.993	0.908
Strong	0.941	0.084	0.951	0.141
DomesticLaws#Enforcement (base = Some#Some)	1		1	
Comprehensive#No	0.414**	0.010	1.094	0.669
Comprehensive#Strong	1.142**	0.007	1.119*	0.015
Corruption Control	0.769**	0.010	0.933	0.377
Enslavement of own	1.116*	0.017	1.171***	0.000
Population (SOP)= 1				
SOP#CorruptionControl	0.905	0.107	1.006	0.377
Homicide Rate (log)	1.142**	0.002	1.052	0.255
Rule of Law	1.109	0.416	1.182	0.111
Homicide Rate#Rule of Law	0.894*	0.011	0.946	0.100
Population (in Mio.)	1.007***	0.000	1.003*	0.013
Refugee Inflows (in Mio.)	0.669**	0.001	0.798***	0.000
GDP per Capita (in constant 2010 USD, in 1000)	0.997	0.859	0.998	0.616
Infant Mortality Rate (log)	0.619***	0.000	0.490***	0.000
Obs.	1,112		1,493	

Note: Coefficients are reported as exponentiated coefficients e^b rather than coefficients b and thus interpreted as incidence-rate ratios. (Coefficients with values < 1 (>1) refer to negative (positive) coefficient signs.)

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

The number of countries where victims are exported to is 1.3 times higher for countries with comprehensive laws and 1.2 times higher with no law enforcement. In the presence of strict laws, slave exports increase with increasing strength of law enforcement (see Table 10). These results indicate that exploitation is relocated to other countries with fewer laws, weaker law enforcement, or both. The rate of import destinations for victims is 1.2 or 1.1 times higher if a country has comprehensive laws and strong law enforcement, respectively. Also, in exporting countries the general abundance of the law (represented by homicide rate, rule of law and their interaction) has a negative effect on the number of exporting destinations.

As expected, individuals of less corrupt states are exported to fewer exploitation destinations. Countries exploiting their residents are exporting to and importing from an increased number of locations. A bigger population increases the number of potential victims and thus the number

of trafficking destinations. For importing countries, a bigger population might increase the demand for cheap labor from abroad.

A high infant mortality rate has a negative effect on the number of export and import countries. Regarding the number of export destinations, it is possible that lower health discourages individuals from migrating or decreases the ‘attractiveness’ for traffickers. Concerning imports, a country with low health standards might be less wealthy and therefore not be an attractive destination country.

We find a negative relationship between *Refugee Inflows*, the number of slave origins and slave destinations, respectively. A possible explanation is that refugees will in general try to flee to ‘safe’ countries.

4.7 Discussion and Conclusion

This paper adds to the literature of modern slavery. Using panel data over the 2002-2016 period for 144 countries, we investigated social and economic determinants of modern slavery. We examined the effects on the expected number of victims and studied the differences between source and destination countries. Furthermore, we outlined possible mechanisms influencing how many different nationalities are exploited in a certain country. The evidence from this study suggests that effective policies against modern slavery require sound institutions, implementation of relevant laws and their enforcement. Moreover, the findings of this study support the idea that law abundance in general is an important factor.

In addition to the existing literature, we have confirmed that a high GDP and conviction rate increase slavery. Additional results imply that highly developed or corrupt countries are attractive locations for exploitation. We have demonstrated that political regime, literacy rate, health and conflicts affect source and destination countries differently. Moreover, we find that

the number of refugees has a negative effect on exploitation. We believe this result is driven by the desire to take refuge in a safe country. We also examined the areas of migration and unemployment. However, these results were not significant. We investigated how our results vary for different types of exploitation by discussing differences in forced prostitution, adult forced labor and child labor.

We are aware that the relationship of victim identification and quality of institutions is problematic. On the one hand, well-organized institutions per se reduce the number of slaves. On the other hand, efficient institutions detect more victims due to improved tracking and analytical statistics. The victim data we use are collected by the US Department of State. As a result, the observations of the United States indicate that consistent data acquisition leads to increased numbers of detected victims. Unfortunately, it has not been possible to locate suitable identifying strategies to address this potential endogeneity.

Another important limitation lies in the lack of data on exploitation. Consensus on data collection and consistent and well-documented data-gathering methodologies is needed. Identifying victims is important to combat modern slavery as personal information about, i.e., age or gender of the victims would generate further insights. Moreover, differentiation between current and former trafficking victims is impossible. In order to discuss policy measures regarding the prevention of human trafficking, research concerning persons at risk is necessary. The picture is still incomplete, but this study has gone some way towards enhancing our understanding of modern slavery.

Future research is already planned. Our data suggests that in different countries different types of exploitation are predominant. Thus, there is a need to enhance our knowledge on country specific differences that drive exploitation. To further our research, the existing dataset will be expanded to a pairwise dataset in order to capture bilateral ‘exploitation relationships’.

A4.1 Appendix – Summary Statistics and List of observed Countries

Table 11 presents the summary statistics for the variables of interest.

Table 11: Summary statistics

Variable	Mean	Std. Dev.	Min	Max
Adult Slaves per Capita (log)	-7.197	4.465	-18.123	-1.605
Domestic Laws	1.39	.509	0	2
Law Enforcement	1.184	.626	0	2
Rule of Law	-.095	.996	-2.606	2.1
Homicide Rate	7.69	11.919	0	105.231
GDP per Capita in 2010 USD (in 1,000)	12.714	18.018	.195	111.968
Population in Mio.	36.196	134.823	.018	1378.665
Immigration in Mio. ⁷⁵	0.140	0.234	0.001	2.016
Unemployment Rate in %	7.896	6.08	.15	37.25
Refugee Inflows (in Mio.)	105.354	320.221	.005	2869.419
Refugee Outflows (in Mio.)	63.302	292.812	.005	5524.511
Infant Mortality Rate	29.686	26.843	1.7	136.9
HDI	.672	.163	.259	.951
Autocracy Index	-1.301	15.547	-88	10
Destination Dummy	.782	.413	0	1
Transit Dummy	.627	.484	0	1
Source Dummy	.754	.431	0	1
Adult Literacy Rate	82.606	19.616	14.376	99.999
Female Literacy Rate	79.437	22.942	9.399	99.998
Corruption	-.079	1.004	-1.869	2.47
Convictions for Slavery-related Crimes (log)	1.299	1.808	0	12.612
Slave Imports (# of Countries)	6.394	6.015	1	39
Slave Exports (# of Countries)	8.051	8.75	1	71
Enslavement of own Population	.627	.484	0	1
Observations	2378			

Please see Subsection 4.5.2 for sources.

⁷⁵ Annual information on immigration is only available for 53 countries (see Subsection 4.6.1).

Information on modern slavery is available for the following countries and territories:

Afghanistan	Guatemala	Pakistan
Albania	Guinea-Bissau	Panama
Algeria	Guyana	Papua New Guinea
Angola	Haiti	Paraguay
Argentina	Honduras	Peru
Armenia	Hong Kong	Philippines
Australia	Hungary	Poland
Austria	Iceland	Portugal
Azerbaijan	India	Qatar
Bahamas	Indonesia	Romania
Bahrain	Iran	Russian Federation
Bangladesh	Iraq	Rwanda
Belarus	Ireland	Saudi Arabia
Belgium	Israel	Senegal
Belize	Italy	Serbia
Bolivia	Jamaica	Sierra Leone
Bosnia and Herzegovina	Japan	Singapore
Botswana	Jordan	Slovakia
Brazil	Kazakhstan	Slovenia
Bulgaria	Kenya	South Africa
Burkina Faso	Kuwait	South Korea
Burundi	Kyrgyzstan	South Sudan
Cambodia	Latvia	Spain
Cameroon	Lebanon	Sri Lanka
Canada	Lesotho	St. Lucia
Central African Republic	Liberia	Sudan
Chile	Lithuania	Swaziland
China	Luxembourg	Sweden
Colombia	Macedonia	Switzerland
Costa Rica	Malawi	Tajikistan
Croatia	Malaysia	Tanzania
Cuba	Malta	Thailand
Cyprus	Mexico	Trinidad & Tobago
Czech Republic	Moldova	Tunisia
Denmark	Mongolia	Turkey
Dominican Republic	Montenegro	Turkmenistan
Ecuador	Morocco	Uganda
Egypt	Mozambique	Ukraine
El Salvador	Namibia	United Arab Emirates
Estonia	Nepal	United Kingdom
Ethiopia	Netherlands Antilles	United States of America
Fiji	Netherlands	Uruguay
Finland	New Zealand	Uzbekistan
France	Nicaragua	Venezuela
Georgia	Niger	Vietnam
Germany	Nigeria	Yemen
Ghana	Norway	Zambia
Greece	Oman	Zimbabwe

A4.2 Appendix – Data Work and Data Selection

In order to measure modern slavery, we code information about the number of adult victims and child victims as well as the corresponding convictions for 144 countries from 2002 to 2016. These data capture various types of exploitation of adults as well as the number of reported victim's nationalities and are based on the Trafficking in Persons Reports (TIP) of the U.S. Department of State (2001-16). In order to complete our dataset we also continue the work of Frank (2013a) using the respective method described in the corresponding Codebook (Frank 2013b).

4.7.1 Data Work

From various “Trafficking in Persons Reports” of the U.S. Department of State (2001-16) we generate variables capturing modern slavery for each available country from 2001 to 2016:

Number of adult victims. The Trafficking in Persons Reports indicate how many adult victims of modern slavery are ‘identified’, ‘estimated’, ‘trafficked’ or ‘exploited’ in various types of exploitation. If the purpose of exploitation is explicitly mentioned, we can generate the variables ‘forced prostitution’, ‘forced labor’, ‘forced domestic work’, and ‘forced begging’, respectively. We also generate the category ‘Not Known’ if the exact purpose is not mentioned. For each country, we sum up the number of adult victims associated to the same year. At times, some victims are not mentioned in the corresponding report but in a subsequent one. In these cases, we added the victims to the year stated in the report. The reports are organized in ‘country narratives’ where each country is discussed separately. Sometimes, some victim numbers of a country are not indicated in the corresponding narrative but in that of another country. In these cases, we add the numbers to the country where the victims have been detected. In Subsection 4.7.2, we show how we generate our variables using an example from the “Trafficking in Persons Report” for Canada in 2005.

Number of child victims. This variable captures how many child victims were ‘identified’, ‘estimated’, ‘trafficked’ or ‘exploited’ in each country per year. Here, we do not distinguish between different forms of exploitation. If victims are not mentioned in the corresponding report but in a subsequent one or are not mentioned in the respective ‘country narrative’ we proceed as mentioned above (see collecting ‘the numbers of adult victims’).

Number of convictions regarding adult exploitation. This variable captures the number of actual convictions regarding the exploitation of adults for each country and year. At times, convictions are not mentioned in the corresponding report but in a subsequent one. In these cases, we added the number of convictions to the year stated in the report.

Number of convictions regarding child exploitation. This variable captures the number of actual convictions regarding the exploitation of children for each country and year. At times, convictions are not mentioned in the corresponding report but in a subsequent one. In these cases, we added the number of convictions to the year stated in the report.

Enslavement of a country’s citizens. This is a binary variable, which is encoded ‘yes’ if the report explicitly mentions that victims with a citizenship matching the destination country were detected, ‘no’ otherwise.

Number of slave origins. The U.S. Department of State (2001-16) explicitly mentions the nationalities of victims (but not their numbers) identified in each country. We count how many different nationalities of victims are identified in each country and year. Thus, the respective count variable is generated.

Number of slave destinations. The U.S. Department of State (2001-16) explicitly mentions the nationalities of victims (but not their numbers) identified in each country. We count the number of countries where victims of a certain nationality are identified and thus create the respective count variable.

Based on the Trafficking in Persons Reports of the U.S. Department of State (2001-16), we complete the existing dataset of Frank (2013b) for the years 2012-2016 regarding the following variables:

Source, destination or transit country. A country is classified as source, destination or transit country if the text mentions one or more of the aforementioned categories as the primary context of exploitation. Moreover, we differentiate between source, destination or transit countries regarding the exploitation of children or adults. Concerning adult slavery, we differentiate between forced labor and forced prostitution.

Domestic laws. This continuous variable has three categories ranging from 0 to 2. Zero indicates the absence of laws combating human trafficking. If some laws outlawing at least some forms of exploitation are present, the variable is encoded 'some' (or '1'). If the laws prohibit all forms of slavery the variable is encoded 'comprehensive' (or '2').

Law enforcement. This continuous variable has three categories ranging from 0 to 2. This variable is encoded zero if a country shows 'no efforts', 'negligible efforts' or the 'government failed to demonstrate any notable law enforcement efforts' according to the U.S. Department of State (2001-16). The variable is encoded 'some' (or '1') if law enforcement is described as 'limited', 'weak', 'some', 'minimal', 'insufficient' or 'poor'. Enforcement efforts are encoded 'strong' (or '2') if the text mentions 'strong', 'significant' or 'substantial' law enforcement efforts.

4.7.2 Data Generation Example

In order to illustrate the data-generation let us consider the following paragraphs from the 2005

“Trafficking in Persons Report” for Canada:

„Canada is primarily a destination and transit country for women trafficked for the purposes of labor and sexual exploitation. Women and children are trafficked from Central and South America, Eastern Europe, and Asia for sexual exploitation. To a lesser extent, men, women, and children are trafficked for forced labor. There is internal trafficking of Canadians for the sex trade. The majority of foreign victims transiting Canada are bound for the United States. Numbers are hard to gauge, but in February 2004, the Royal Canadian Mounted Police (RCMP) estimated that 800 persons are trafficked into Canada annually and that an additional 1,500-2,200 persons are trafficked through Canada into the United States. Some estimate that this number is much higher.

The Government of Canada fully complies with the minimum standards for the elimination of trafficking. The Government of Canada has comprehensive anti-trafficking legislation and has dedicated resources to combat trafficking in persons. Over the year, Canada increased efforts to prosecute and conviction traffickers“ (U.S. Department of State 2005, p.79).

The first paragraph above reveals that Canada is a destination country for forced labor and sexual exploitation of adults. Moreover, it is a destination for child exploitation. In addition, victims are trafficked internally. In 2004, the number of estimated victims is 800, although the type of exploitation is ‘Not Known’. The report for Canada also mentions 1,500-2,200 victims in the United States, whose type of exploitation is unknown as well. Thus, an average of 1850 victims is attributed to the United States in 2004.

The second paragraph shows that „Canada fully complies with the minimum standards“ (U.S. Department of State 2005, p.79). Therefore, the variable *Domestic Laws* is encoded ‘strong’. *Enforcement* is encoded ‘strong’ as well.

4.7.3 Data Selection

We use a comprehensive dataset that covers demographic, economic and political characteristics of 144 countries from 2002 to 2016. During the data-gathering process, it is not possible to determine which variables will be relevant for the model. In order to extract meaningful variables from the noise in the dataset we apply Principal Component Analysis (PCA).

PCA is a linear transformation of p original variables $x = [x_1, x_2, \dots, x_p]$. Thus, the components $z = [z_1, z_2, \dots, z_p]$ are a linear combination of the eigenvectors $u = [u_1, u_2, \dots, u_p]$ of the original variables⁷⁶. The components are orthogonal and the combination of all z comprehend the same information as the original variables. The first component, z_1 , accounts for the maximum possible variance. Thus, no component can have a higher variability than the first one. The second component, z_2 , accounts for the maximum possible variance which is uncorrelated with the first component⁷⁷ (Johnson and Wichern 2002, p.426-427). The subsequent principal components are calculated accordingly. They capture the remaining variation and are uncorrelated with previous components⁷⁸.

We use PCA as a data reduction technique to reduce multivariate data through a series of uncorrelated linear combinations of the original variables that account for the greatest variance of the original data. Thus, we want to identify a number of components $n < p$, which capture the most variation in the original data. Moreover, we can inspect the eigenvectors from the PCA to identify patterns of association in the underlying structure of the data. Before the start of the analysis we have to find out if our data is suitable for PCA. Thus, we compute the *Kaiser-*

⁷⁶ The number of components equals the number of original variables.

⁷⁷ Each component z contains more information than the subsequent, where z_p has the smallest variance. The total sum of squares of the loadings is *constrained* to unity.

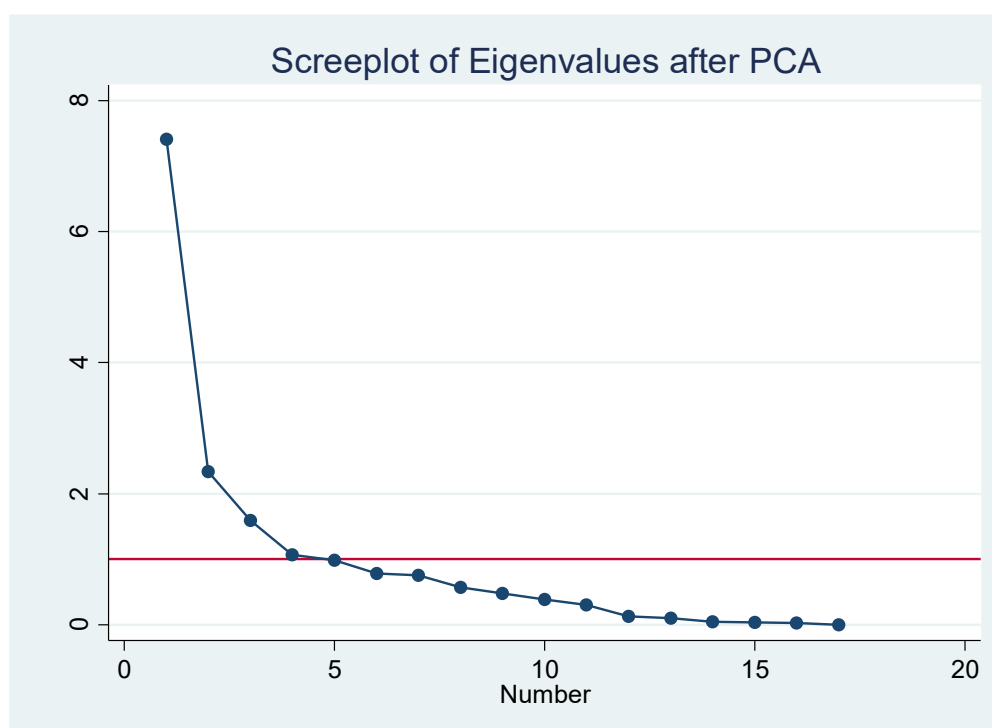
⁷⁸ If p equals the number of retained components, n , all variation in the data is explained.

Meyer-Olkin measure of sampling adequacy (Kaiser and Rice 1974). The result (not reported) indicates that our variables have enough in common to justify our analysis (Kaiser 1970).

PCA is scale dependent, and thus, the eigenvalues and eigenvectors of a covariance differ from those of a correlation matrix. Since we cannot express all variables in the same units, we have to standardize our data by centering the values of all of the input variables⁷⁹. Thus we use the correlation matrix to construct our components (Johnson and Wichern 2002, p.433-435). The solution is obtained by performing an eigenvalue decomposition of the correlation matrix, where the eigenvalues represent the variances of the associated components.

Following Kaiser (1960) the first four components explain at least as much variation as the original variables (eigenvalues above 1, see Figure 13).

Figure 13: Screeplot of eigenvalues after PCA (excerpt)



Source: Author's Calculation.

⁷⁹ The mean of each variable is now equal to zero and the standard deviation equals one. If we do not standardize our data, we face large factor loadings for variables with high variance (Johnson and Wichern 2002, p. 445-447).

Table 12 shows the component loadings, which are equivalent to the correlation between the components and the original variable. We depict only correlations higher than 0.3. Column 6 indicates the percentage of unexplained variation for each variable when we use four components. As discussed in the literature and in Section 4.3, the four components can be attributed to the categories: institutional quality and laws, market attractiveness and migration, vulnerability of potential victims, and crime.

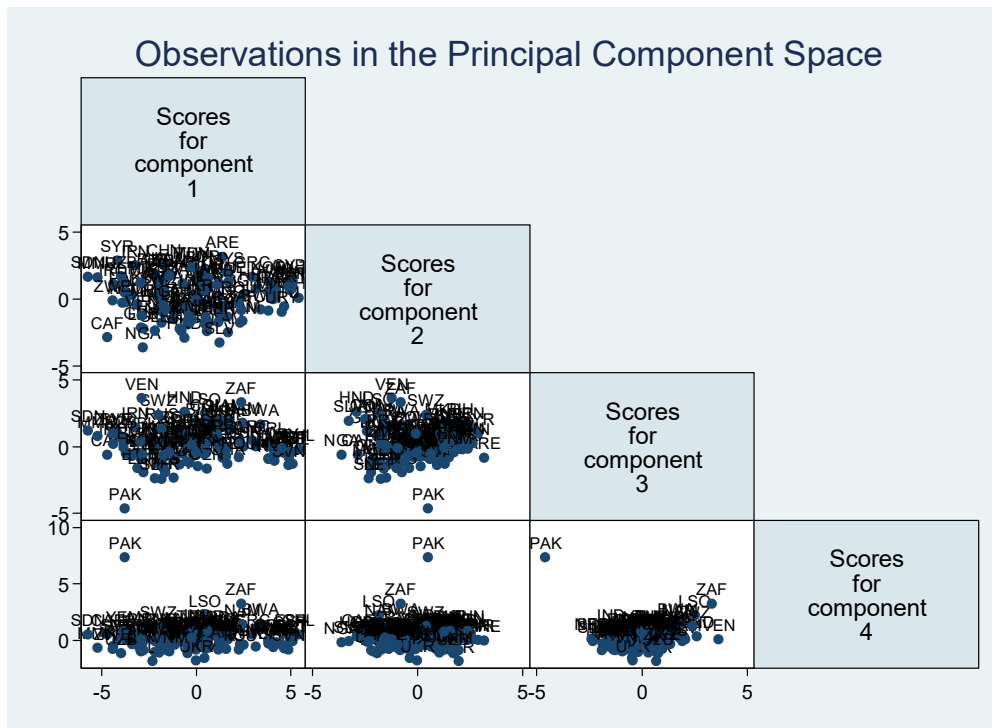
Table 12: Component loadings (excerpt)

Variable (excerpt)	Comp1	Comp2	Comp3	Comp4	Unexplained
Convictions				0.675	0.367
Corruption Control	0.328				0.154
Government Effectiveness	0.332				0.096
GDP per Capita					0.187
Regulatory Quality	0.341				0.113
Rule of Law	0.338				0.070
Literacy Rate			0.373		0.282
Gini Index		-0.392	0.400		0.295
Migration		0.482			0.244
Domestic Laws	-0.343				0.498
Victim Punishment		0.397		0.363	0.434
Political Rights	-0.314				0.138
Civil Liberties	-0.333				0.1054
Infant Mortality		-0.301			0.227
Unemployment			0.453		0.487
Homicide Rate		-0.382	0.463		0.284

Source: Author's Calculation.

Figure 14 shows the location of the countries in the dataset in the principal component space. Apparently, some countries are outliers for certain components. However, testing the robustness of our regressions by dropping each country separately indicates that no country drives any of the results.

Figure 14: Plot of principal component scores.



Source: Author's Calculation.

4.7.4 Factor Analysis

In addition to the PCA, we also report our results of the Factor Analysis (FA). Johnson and Wichern (2002) state that FA “can be considered an extension of principal component analysis” (Johnson and Wichern 2002, p. 478). Similar to PCA, FA is a statistical data reduction method which describes linear combinations of the variables containing the most information (Spearman 1904). In contrast to the PCA, “the primary question in factor analysis is whether the data are consistent with a prescribed structure” (Johnson and Wichern 2002, p. 478). Like PCA, FA identifies q common factors that linearly reconstruct p original variables:

$$y_{ij} = l_{i1}F_{1j} + l_{i2}F_{2j} + \dots + l_{iq}F_{2q} + e_{ij},$$

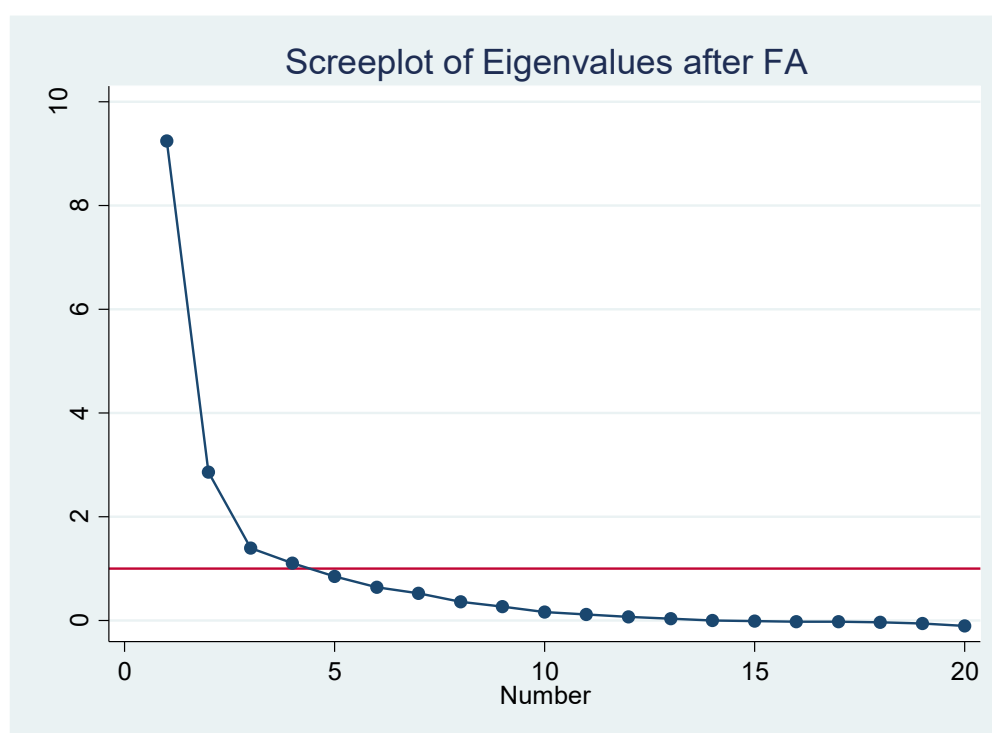
where y_{ij} represents the value of the observation i of variable j . F_1, F_2, \dots, F_m are the common factors, while the coefficient l_{kj} represents the loading of variable j on factor k . In contrast to the common factors, the error term e is called the specific factor. In order to determine a solution

the following assumptions are made: First, common factors are uncorrelated with each other. Second, specific factors are uncorrelated with each other. Third, common and specific factors are uncorrelated (Johnson and Wichern 2002, p. 478-484).

Before we execute the FA, we calculate the *Bartlett test of sphericity* in order to find out if our data are suitable for structure detection. As our p-value is smaller than 0.05 (not reported) we find that we can factor our correlation matrix (Bartlett 1937).

If we consider only eigenvalues that exceed one, we identify four factors⁸⁰.

Figure 15: Screeplot of eigenvalues after factor analysis (excerpt)



Source: Author's calculation.

Table 13 shows the factor loadings with correlations higher than 0.3. The column 'uniqueness' indicates the percentage of variance that is not explained by a factor for a given variable⁸¹.

⁸⁰ The majority of eigenvalues associated with our factors are negative and thus cannot be retained (Rencher and Christensen 2012, p. 450). Thus, as an alternative approach we also computed 'principal-component factors' (Johnson and Wichern 2002, p. 492-495). The obtained results do not change; hence, we do not show them here.

⁸¹ Variables with lower 'uniqueness' are well explained by the common factors.

Similar to the PCA we obtain factors capturing institutional quality and vulnerability, market attractiveness, crimes and laws.

Table 13: Factor loadings (excerpt)

Variable (excerpt)	Factor1	Factor2	Factor3	Factor4	Uniqueness
Convictions		0.525	0.442	0.367	0.381
Corruption Control	0.903				0.155
Government Effectiveness	0.952				0.073
GDP per Capita	0.879	0.382			0.074
Regulatory Quality	0.873				0.185
Rule of Law	0.973				0.036
Literacy Rate	0.760				0.319
Gini Index	-0.791				0.284
Migration		0.743			0.370
Domestic Laws		-0.427		0.451	0.608
Victim Punishment		0.642	-0.362		0.363
Political Rights	-0.794	0.409			0.172
Civil Liberties	-0.859	0.324			0.108
Infant Mortality	-0.891				0.145
Unemployment	0.560				0.551
Homicide Rate	-0.667		0.443		0.285
Political Regime		0.310		-0.623	0.455
Population		0.758	0.327		0.296

Source: Author's calculations.

Figure 16 shows how the original variables of each country load in the factor space. As mentioned before, outliers do not drive any regression results. However, the two ‘clusters’ of countries clearly visible in Column 1 can be attributed to source (left cluster) and destination countries (right cluster).

5 References

- Acemoglu, Daron, and Thierry Verdier.** 1998. “Property Rights, Corruption and the Allocation of Talent. A General Equilibrium Approach.” *The Economic Journal*, 108(450): 1381–403.
- Acemoglu, Daron, and Alexander Wolitzky.** 2011. “The Economics of Labor Coercion.” *Econometrica*, 79(2): 555–600.
- Aghatise, Esohe.** 2004. “Trafficking for Prostitution in Italy: Possible Effects of Government Proposals for Legalization of Brothels.” *Violence Against Women*, 10(10): 1126–55.
- Akee, Randall, Arnab K. Basu, Arjun Bedi, and Nancy H. Chau.** 2014. “Transnational Trafficking, Law Enforcement, and Victim Protection: A Middleman Trafficker’s Perspective.” 57(2): 349–86.
- Akee, Randall K. Q., Arnab K. Basu, Nancy H. Chau, and Melanie Khamis.** 2010. “Ethnic Fragmentation, Conflict, Displaced Persons and Human Trafficking: An Empirical Analysis.” In *Migration and Culture*. 1st ed., ed. Gil S. Epstein, and Ira N. Gang, 691–717. (Frontiers of Economics and Globalization Vol. 8). United Kingdom: Emerald Group Publishing Limited.
- Alesina, Alberto, and George-Marios Angeletos.** 2005a. “Corruption, Inequality, and Fairness.” *Journal of Monetary Economics*, 52(7): 1227–44.
- Alesina, Alberto, and George-Marios Angeletos.** 2005b. “Fairness and Redistribution.” *American Economic Review*, 95(4): 960–80.
- Aronowitz, Alexis A.** 2001. “Smuggling and Trafficking in Human Beings: The Phenomenon, the Markets that drive it and the Organisations that promote it.” *European Journal on Criminal Policy and Research*, 9(2): 163–95.

- Bales, Kevin.** 2000. *Disposable people. New slavery in the global economy*. 1st ed. Berkeley, California: University of California Press.
- Bales, Kevin.** 2007. "What Predicts Human Trafficking?" *International Journal of Comparative and Applied Criminal Justice*, 31(2): 269–79.
- Bartlett, Christopher A., Vincent M. Dessain, and Andres Sjoman.** 2006. "IKEA's Global Sourcing Challenge: Indian Rugs and Child Labor (A)." *Harvard Business School*, Boston, MA: 906-415.
- Bartlett, M. S.** 1937. "The Statistical Conception of Mental Factors." *British Journal of Psychology. General Section*, 28(1): 97–104.
- Basu, Arnab K., and Nancy H. Chau.** 2004. "Exploitation of Child Labor and the Dynamics of Debt Bondage." *Journal of Economic Growth*, 9(2): 209–38.
- Basu, Kaushik.** 1999. "Child Labor. Cause, Consequence, and Cure, with Remarks on International Labor Standards." *Journal of Economic Literature*, 37(3): 1083–119.
- Basu, Kaushik, and Pham Hoang Van.** 1998. "The Economics of Child Labor." *American Economic Review*, 88(3): 412–27.
- Beber, Bernd, and Christopher Blattman.** 2010. "The Industrial Organization of Rebellion: The Logic of Forced Labor and Child Soldiering." *HiCN Working Papers*, No. 72, NYU and Yale University.
- Belser, Patrick.** 2005. *Forced Labour and Human Trafficking. Estimating the Profits*. (Programme on Promoting the Declaration on Fundamental Principles and Rights at Work). Geneva: International Labour Office.
- Belser, Patrick, Michaelle de Cock, and Farhad Mehran.** 2005. *ILO Minimum Estimate of Forced Labour in the World*. Geneva: International Labour Office.

- Bénabou, Roland, and Jean Tirole.** 2006. "Incentives and Prosocial Behavior." *American Economic Review*, 96(5): 1652–78.
- Beyrer, Chris, and Julie Stachowiak.** 2003. "Health Consequences of Trafficking of Women and Girls in Southeast Asia." *Brown Journal of World Affairs*, 10(1): 105–17.
- Brewer, G. A., and S. C. Selden.** 2000. "Why Elephants Gallop. Assessing and Predicting Organizational Performance in Federal Agencies." *Journal of Public Administration Research and Theory*, 10(4): 685–712.
- Brunovskis, Anette, and Rebecca Surtees.** 2007. *Fafo-report. 2007:40, Leaving the Past behind. When Victims of Trafficking decline Assistance.* Oslo, Norway: Fafo.
- Butler, J. S., and Robert Moffitt.** 1982. "A Computationally Efficient Quadrature Procedure for the One-Factor Multinomial Probit Model." *Econometrica*, 50(3): 761–64.
- Cameron, Adrian C., and P. K. Trivedi.** 2013. *Regression analysis of Count Data.* (Econometric Society Monographs Vol. 53). 2nd ed. Cambridge: Cambridge University Press.
- Cameron, Judy, and W. D. Pierce.** 1994. "Reinforcement, Reward, and Intrinsic Motivation: A Meta-Analysis." *Review of Educational Research*, 64(3): 363–423.
- Castrigiano, Domenico P. L., and Sandra A. Hayes.** 2004. *Catastrophe Theory.* 2nd ed. (Advanced Book Program). 2nd ed. Boulder, Colorado: Westview Press.
- Center for Systemic Peace.** 2020. Polity 5: Political Regime Characteristics and Transitions, 1800-2018. Dataset Users' Manual. <http://www.systemicpeace.org/inscr/p5manualv2018.pdf> (accessed September 14, 2021).
- Chang, Eric C. C., and Miriam A. Golden.** 2010. "Sources of Corruption in Authoritarian Regimes." *Social Science Quarterly*, 91(1): 1–20.

- Cho, Seo-Young.** 2013. "Integrating Equality: Globalization, Women's Rights, and Human Trafficking." *International Studies Quarterly*, 57(4): 683–97.
- Cho, Seo-Young.** 2015. "Modeling for Determinants of Human Trafficking. An Empirical Analysis." *Social Inclusion*, 3: 2–21.
- Cho, Seo-Young, Axel Dreher, and Eric Neumayer.** 2013. "Does Legalized Prostitution Increase Human Trafficking?" *World Development*, 41: 67–82.
- Cho, Seo-Young, Axel Dreher, and Eric Neumayer.** 2014. "Determinants of Anti-Trafficking Policies: Evidence from a New Index." *The Scandinavian Journal of Economics*, 116(2): 429–54.
- Cho, Seo-Young, and Krishna C. Vadlamannati.** 2012. "Compliance with the Anti-trafficking Protocol." *European Journal of Political Economy*, 28(2): 249–65.
- Chwe, Michael S.-Y.** 1990. "Why Were Workers Whipped? Pain in a Principal-Agent Model." *The Economic Journal*, 100(403): 1109–21.
- Clause, Kristen J., and Kate B. Lawler.** 2013. "The hidden Crime: Human Trafficking." *The Pennsylvania nurse*, 68(2): 18–23.
- Clawson, Heather J., Mary Layne, and Kevonne Small.** 2006. *Estimating Human Trafficking into the United States: Development of a Methodology*. Fairfax, VA: Caliber.
- Cleveland, Sarah H.** 2002. "Human Rghts Sanctions and International Trade. A Theory of Compatibility." *Journal of International Economic Law*, 5(1): 133–89.
- Dal Bo, Ernesto, Pedro Dal Bo, and Rafael Di Tella.** 2006. "Plata o Plomo?: Bribe and Punishment in a Theory of Political Influence." *American Political Science Review*, 100(1): 41–53.

- Danailova-Trainor, Gergana, and Patrick Belser.** 2006. "Globalization and the Illicit Market for Human Trafficking: An Empirical Analysis of Supply and Demand." *ILO Working Papers*, No. 78.
- Deshpande, Neha A., and Nawal M. Nour.** 2013. "Sex trafficking of women and girls." *Reviews in Obstetrics & Gynecology*, 6(1): e22-e27.
- Dessy, Sylvain, Flaubert Mbiekop, and Stéphane Pallage.** 2005. "The Economics of Child Trafficking (Part II)." *CIRPÉE Working Paper*, 5(9).
- Dessy, Sylvain E., and Stéphane Pallage.** 2005. "A Theory of the Worst Forms of Child Labour." *The Economic Journal*, 115(500): 68–87.
- Di Nicola, Andrea, Isabella Orfano, Andrea Cauduro, and Nicoletta Conci.** 2005. "Study on National Legislation on Prostitution and Trafficking in Woman and Children". Transcrime. Joint Research Center on Transnational Crime, European Parliament. <https://www.zora.uzh.ch/id/eprint/80851/> (accessed September 14, 2021).
- Di Tommaso, Maria L., Isilda Shima, Steinar Strøm, and Francesca Bettio.** 2009. "As bad as it gets: Well-Being Deprivation of sexually exploited trafficked Women." *European Journal of Political Economy*, 25(2): 143–62.
- Diep, Hanh.** 2005. "We Pay - The Economic Manipulation of International and Domestic Laws to Sustain Sex Trafficking." *Loyola University Chicago International Law Review*, 2(2): 309–31.
- Dinopoulos, Elias, and Lex Zhao.** 2007. "Child Labor and Globalization." *Journal of Labor Economics*, 25(3): 553–79.
- Edlund, Lena, and Hyejin Ku.** 2013. "The African Slave Trade and the Curious Case of General Polygyny." *MPRA Paper*, No. 52735, University Library of Munich, Germany.

- Eltis, David, Frank D. Lewis, and David Richardson.** 2005. "Slave Prices, the African Slave Trade, and Productivity in the Caribbean, 1674–1807." *The Economic History Review*, 58(4): 673–700.
- Ergin, Haluk I., and Serdar Sayan.** 1997. "A Microeconomic Analysis of Slavery in Comparison to Free Labor Economies." *Bilkent University Dept. of Economics WP 97-08*.
- Fenske, James E., and Namrata Kala.** 2013. "Climate, Ecosystem Resilience and the Slave Trade." *MPRA Paper*, No. 50816. <https://ssrn.com/abstract=2258918>.
- Field, Elizabeth B.** 1988. "The Relative Efficiency of Slavery Revisited: A Translog Production Function Approach." *The American Economic Review*, 78(3): 543–49.
- Findlay, Ronald.** 1975. "Slavery, Incentives, and Manumission. A Theoretical Model." *Journal of Political Economy*, 83(5): 923–33.
- Fisman, Raymond, and Edward Miguel.** 2007. "Corruption, Norms, and Legal Enforcement: Evidence from Diplomatic Parking Tickets." *Journal of Political Economy*, 115(6): 1020–48.
- Fletcher, Laurel E., Kevin Bales, and Eric Stover.** 2005. "Hidden Slaves: Forced Labor in the United States." *Berkeley Journal of International Law*, 23(1): 47–111.
- Frank, Richard W.** 2013a. "Human Trafficking Indicators, 2000-2011. A New Dataset." *Sydney: University of Sydney*.doi:ssrn.2314157.
- Frank, Richard W.** 2013b. "Human Trafficking Indicators, 2000-2011. Data Codebook." *Sydney: University of Sydney*.doi:ssrn.2314157.
- Frank, Richard W., and Beth A. Simmons.** 2013. "National Law Enforcement in a Globalized World: The Case of Human Trafficking". APSA 2013 Annual Meeting Paper, American Political Science Association 2013 Annual Meeting. <https://ssrn.com/abstract=2299624> (accessed September 14, 2021).

- Freedom United.** 2018. "What is modern slavery?". <https://www.freedomunited.org/freedom-university/what-is-modern-slavery/> (accessed September 14, 2021).
- Friedman, Eric, Simon Johnson, Daniel Kaufmann, and Pablo Zoido-Lobaton.** 2000. "Dodging the grabbing Hand: The Determinants of unofficial Activity in 69 Countries." *Journal of Public Economics*, 76(3): 459–93.
- Genicot, Garance.** 2002. "Bonded Labor and Serfdom: A paradox of voluntary Choice." *Journal of Development Economics*, 67(1): 101–27.
- Greene, William H.** 2012. *Econometric Analysis*. (Pearson Series in Economics). 7th ed. Boston: Pearson.
- Hahn, Eugene, and Refik Soyer.** 2005. "Probit and Logit Models: Differences in the multivariate Realm." *The Journal of the Royal Statistical Society, Series B*: 1–12.
- Harris, John R., and Michael P. Todaro.** 1970. "Migration, Unemployment and Development: a Two-Sector Analysis." *American Economic Review*, 60(1): 126–42.
- Hernandez, Diego, and Alexandra Rudolph.** 2015. "Modern day slavery. What drives human trafficking in Europe?" *European Journal of Political Economy*, 38: 118–39.
- Hornor, Gail.** 2015. "Domestic Minor Sex Trafficking: What the PNP needs to know." *Journal of Pediatric Health Care : Official Publication of National Association of Pediatric Nurse Associates & Practitioners*, 29(1): 88-94.
- International Labour Organization.** 1930. Forced Labor Convention. https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C029 (accessed September 14, 2021).
- International Labour Organization.** 2017. Global Estimates of Modern Slavery: Forced Labour and Forced Marriage. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_575479.pdf (accessed September 14, 2021).

- International Labour Organization.** 2018. Introduction to International Labor Standards. [https://www.ilo.org/global/standards/introduction-to-international-labour-standards/lang--en/index.htm](https://www.ilo.org/global/standards/introduction-to-international-labour-standards/lang-en/index.htm) (accessed September 14, 2021).
- International Labour Organization, and Walk Free Foundation.** 2017. “Global estimates of modern slavery: forced labour and forced marriage.” *Geneva: International Labour Office*.
- International Organization of Migration.** 2020. Migration Data Portal. <https://migrationdataportal.org/themes/international-migration-flows> (accessed September 14, 2021).
- Jakobsson, Niklas, and Andreas Kotsadam.** 2013. “The Law and Economics of International Sex Slavery. Prostitution Laws and Trafficking for Sexual Exploitation.” *European Journal of Law and Economics*, 35(1): 87–107.
- Johnson, Richard A., and Dean W. Wichern.** 2002. *Applied multivariate statistical Analysis*. 5th ed. Upper Saddle River, NJ: Prentice Hall.
- Jones, Ronald W.** 1971. “A Three Factor Model in Theory, Trade and History.” In *Trade, Balance of Payments and Growth*. 2nd ed., ed. Jagdish N. Bhagwati, 3–21. Amsterdam: North-Holland Publishing Company.
- Kaiser, Henry F.** 1960. “The Application of Electronic Computers to Factor Analysis.” *Educational and Psychological Measurement*, 20(1): 141–51.
- Kaiser, Henry F.** 1970. “A second Generation little Jiffy.” *Psychometrika*, 35(4): 401–15.
- Kaiser, Henry F., and John Rice.** 1974. “Little Jiffy, Mark Iv.” *Educational and Psychological Measurement*, 34(1): 111–17.
- Kaufmann, Daniel.** 2005. “Myths and Realities of Governance and Corruption.” *MPRA Paper*, No. 8089, Published in: Global Competitiveness Report 2005-06: 81–98.

- Kaufmann, Daniel, Aart Kraay, and Massimo Mastruzzi.** 2009. "Governance Matters VIII: Aggregate and Individual Governance Indicators 1996-2008." *Policy Research Working Paper Series*, No. 4978, The World Bank, Washington DC.
- Kaufmann, Daniel, Aart Kraay, and Pablo Zoido-Lobaton.** 1999a. "Aggregating Governance Indicators." *World Bank Policy Research Department Working Paper*, No. 2195.
- Kaufmann, Daniel, Aart Kraay, and Pablo Zoido-Lobaton.** 1999b. "Governance Matters." *World Bank Policy Research Department Working Paper*, No. 2196.
- Kelly, Liz, Linda Regan, and Willis, Carole, F.** 2000. *Stopping Traffic. Exploring the Extent of, and Responses to, Trafficking in Women for Sexual Exploitation in the UK*. (Police Research Series Vol. 36). London: Home Office, Policing and Reducing Crime Unit.
- Koettl, Johannes.** 2009. "Human Trafficking, Modern Day Slavery, and Economic Exploitation." *Social Discussion Papers and Notes*, No. 49802, The World Bank.
- Kudlac, Kaitie.** 2015. "Child Labor and Human Trafficking: How Children in Burkina Faso and Ghana Lose Their Childhood." *Global Majority E-Journal*, 6(2): 101–13.
- Laczko, Frank, and Gergana Danailova-Trainor.** 2009. "Trafficking in Persons and Human Development: Towards A More Integrated Policy Response." *MPRA Paper*, No. 19234, University Library of Munich, Germany.
- Lagerlöf, Nils-Petter.** 2009. "Slavery and Other Property Rights." *Review of Economic Studies*, 76(1): 319–42.
- Lilienfeld-Toal, Ulf von, and Dilip Mookherjee.** 2010. "The Political Economy of Debt Bondage." *American Economic Journal: Microeconomics*, 2(3): 44–84.

- Limoncelli, Stephanie A.** 2009. "The trouble with trafficking. Conceptualizing women's sexual labor and economic human rights." *Women's Studies International Forum*, 32(4): 261–69.
- Lindner, Samira.** 2014. Literature Review on Social Norms and Corruption. <https://www.u4.no/publications/literature-review-on-social-norms-and-corruption.pdf> (accessed September 14, 2021).
- Maffei, Alessandro, Nikolai Raabe, and Heinrich W. Ursprung.** 2006. "Political Repression and Child Labour. Theory and Empirical Evidence." *The World Economy*, 29(2): 211–39.
- Mahmoud, Toman, and Christoph Trebesch.** 2010. "The Economics of Human Trafficking and Labour Migration: Micro-Evidence from Eastern Europe." *Journal of Comparative Economics*, 38(2): 173–88.
- Mayer, Thierry, and Soledad Zignago.** 2011. CEPII's distances measures: The GeoDist database. http://www.cepii.fr/cepii/en/bdd_modele/presentation.asp?id=6 (accessed September 15, 2021).
- Melitz, Marc J.** 2003. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity." *Econometrica*, 71(6): 1695–725.
- Minderoo Foundation Limited.** 2016. Global Slavery Index 2016. <https://www.minderoo.org/> (accessed September 21, 2021).
- Monzini, Paola.** 2004. "Trafficking in Women and Girls and the Involvement of Organised Crime in Western and Central Europe." *International Review of Victimology*, 11(1): 73–88.
- Myles, Gareth D., and Robin A. Naylor.** 1996. "A Model of Tax Evasion with Group Conformity and Social Customs." *European Journal of Political Economy*, 12(1): 49–66.
- Nash, John F.** 1950. "The Bargaining Problem." *Econometrica*, 18(2): 155–62.

- Neumayer, Eric, and Indra DeSoysa.** 2005. "Trade Openness, Foreign Direct Investment and Child Labor." *World Development*, 33(1): 43–63.
- Nyborg, Karine, and Mari Rege.** 2003. "On Social Norms. The Evolution of Considerate Smoking Behavior." *Journal of Economic Behavior & Organization*, 52(3): 323–40.
- O'Connell, Michael.** 2011. "How do high-skilled Natives view high-skilled Immigrants? A Test of Trade Theory Predictions." *European Journal of Political Economy*, 27(2): 230–40.
- O'Connell Davidson, Julia.** 2010. "New Slavery, old Binaries: Human Trafficking and the Borders of 'Freedom'." *Global Networks*, 10(2): 244–61.
- OECD Data.** 2020. International Migration Database.
<https://stats.oecd.org/Index.aspx?DataSetCode=MIG> (accessed September 15, 2021).
- Organization for Security and Co-operation in Europe.** 1999. Trafficking in Human Beings: Implications for the OSCE, ODIHR Background Paper 1999/3.
<https://www.osce.org/files/f/documents/3/b/16709.html> (accessed September 15, 2021).
- Potrafke, Niklas.** 2016. "Policies against Human Trafficking: The Role of Religion and political Institutions." *Economics of Governance*, 17(4): 353–86.
- Ranjan, Priya.** 1999. "An economic Analysis of Child Labor." *Economics Letters*, 64(1): 99–105.
- Ranjan, Priya.** 2001. "Credit Constraints and the Phenomenon of Child Labor." *Journal of Development Economics*, 64(1): 81–102.
- Rao, Smriti, and Christina Presenti.** 2012. "Understanding Human Trafficking Origin: A Cross-Country Empirical Analysis." *Feminist Economics*, 18(2): 231–63.
- Rauscher, Michael, and Bianca Willert.** 2020. "Modern Slavery, Corruption, and Hysteresis." *European Journal of Political Economy*, 64: 101917.

- Raymond, Janice G., Jean D'Cunha, Siti Ruhaini Dzuhayatin, H. P. Hynes, Zoraida Ramirez Rodriguez, and Aida Santos.** 2002. *A Comparative Study of Women Trafficked in the Migration Process: Patterns, Profiles and Health Consequences of Sexual Exploitation in Five Countries (Indonesia, the Philippines, Thailand, Venezuela and the United States)*. North Amherst, MA: Coalition Against Trafficking in Women, OCLC 50414499.
- Rencher, Alvin C., and William F. Christensen.** 2012. *Methods of Multivariate Analysis*. 3rd ed. (Wiley Series in Probability and Statistics). Hoboken, N.J.: Wiley.
- Rogers, C. A., and K. A. Swinnerton.** 2008. "A Theory of Exploitative Child Labor." *Oxford Economic Papers*, 60(1): 20–41.
- Ryvkin, Dmitry, and Danila Serra.** 2012. "How Corruptible are You? Bribery under Uncertainty." *Journal of Economic Behavior & Organization*, 81(2): 466–77.
- Samuelson, Paul A.** 1971. "Ohlin Was Right." *The Swedish Journal of Economics*, 73(4): 365–84.
- Scheidel, Walter.** 2012. "Slavery in the Roman Economy." In *The Cambridge Companion to the Roman Economy*, ed. Walter Scheidel, 89–113. (Cambridge Companions to the Ancient World). Cambridge: Cambridge Univ. Press.
- Simmons, Beth A., and Paulette Lloyd.** 2010. "Intersubjective Frames and Rational Choice: Transnational Crime and the Case of Human Trafficking." *Hauser Globalization Colloquium*, Fall 2010.
- Smith, Alastair, and Federico Varese.** 2016. "Payment, Protection and Punishment." *Rationality and Society*, 13(3): 349–93.
- Spearman, Charles.** 1904. "The Proof and Measurement of Association between Two Things." *The American Journal of Psychology*, 15(1): 72–101.

- Srinivasan, Thirukodikaval N.** 1998. "Trade and Human Rights." *Constituent Interests and US Trade Policies*, 1: 225–53.
- Steinfeld, Robert J.** 2001. *Coercion, Contract, and Free Labor in the Nineteenth Century*. (Cambridge Historical Studies in American Law and Society). Cambridge: Cambridge University Press.
- Stephenson, Matthew.** 2016. "It's Time to Abandon the '\$2.6 Trillion/5% of Global GDP' Corruption-Cost Estimate". The Global Anticorruption Blog. <https://globalanticorruptionblog.com/2016/01/05/its-time-to-abandon-the-2-6-trillion5-of-global-gdp-corruption-cost-estimate/> (accessed September 15, 2021).
- Strulik, Holger.** 2008. "The Role of Poverty and Community Norms in Child Labor and Schooling Decisions." *Hannover Economic Papers*, Discussion Paper No. 383.
- Swaminathan, Madhura.** 1998. "Economic Growth and the Persistence of Child Labor. Evidence from an Indian city." *World Development*, 26(8): 1513–28.
- Talleyrand, Isabelle.** 2000. "Military Prostitution: How the Authorities Worldwide Aid and Abet International Trafficking in Women." *Syracuse Journal of International Law and Commerce*, 27: 151–76.
- Tyldum, Guri, Marianne Tveit, and Anette Brunovskis.** 2005. "Taking Stock. A review of the existing research on trafficking for sexual exploitation." *Fafo-report*, No. 493.
- U.S. Department of State.** 2001-16. *Trafficking in Persons Report*. Washington, DC: United States Department of State.
- U.S. Department of State.** 2005. *Trafficking in Persons Report*. Washington, DC: United States Department of State.
- U.S. Department of State.** 2013. *Trafficking in Persons Report*. Washington, DC: United States Department of State.

U.S. Department of State. 2019. Trafficking in Persons Report. Washington, DC: United States Department of State.

United Nations. 2004. "Protocol to Prevent, Suppress and Punish Trafficking in Persons." In *U.N. Documents. A/RES/55/25, United Nations Convention against Transnational Organized Crime and the Protocols thereof*, ed. United Nations Office on Drugs and Crime, 41–53. U.N. General Assembly: <https://www.unodc.org/unodc/en/organized-crime/intro/UNTOC.html>.

United Nations Development Programme. 2019. Technical Notes Human Development Report 2019. "Beyond Income, beyond Averages, beyond Today: Inequalities in human development in the 21st Century". http://hdr.undp.org/sites/default/files/hdr2019_technical_notes.pdf (accessed September 15, 2021).

United Nations Office on Drugs and Crime. 2020. Global Report on Trafficking in Persons 2020. No. E.20.IV3. Vienna, Austria: United Nations Publication. https://www.unodc.org/documents/data-and-analysis/tip/2021/GLOTiP_2020_15jan_web.pdf (accessed September 15, 2021).

United Nations Office on Drugs and Crime - DATAUNODC. 2021. Victims of Intentional Homicide, 1990-2018. <https://dataunodc.un.org/content/data/homicide/homicide-rate> (accessed September 15, 2021).

Verité, Inc. 2013. "Corruption and Labor Trafficking in Global Supply Chains". Amherst, MA: Verité, Inc. <https://www.verite.org/wp-content/uploads/2016/11/WhitePaperCorruptionLaborTrafficking.pdf> (accessed September 15, 2021).

- Walk Free Foundation.** 2018. The Global Slavery Index. Nedlands, Western Australia: The Minderoo Foundation Limited. www.globalslaveryindex.org (accessed September 15, 2021).
- Walker-Rodriguez, Amanda, and Rodney Hill.** 2011. "Human Sex Trafficking". FBI Law Enforcement Bulletin, U.S. Department of Justice. <https://leb.fbi.gov/articles/featured-articles/human-sex-trafficking> (accessed September 15, 2021).
- Weinberg, Bruce A.** 2001. "An Incentive Model of the Effect of Parental Income on Children." *Journal of Political Economy*, 109(2): 266–80.
- Weissbrodt, David, and Anti-Slavery International.** 2002. *"Abolishing Slavery and its Contemporary Forms"*. New York: Office of the United Nations High Commissioner for Human Rights.
- Willert, Bianca.** 2021. "Masters and Slaves: A Matching Approach with Heterogeneous Workers." *CEsifo Economic Studies*, ifab011.
- Williams, Richard.** 2012. "Using the Margins Command to Estimate and Interpret Adjusted Predictions and Marginal Effects." *The Stata Journal: Promoting communications on statistics and Stata*, 12(2): 308–31.
- Wittmer, Dennis.** 1991. "Serving the People or Serving for Pay. Reward Preferences among Government, Hybrid Sector, and Business Managers." *Public Productivity & Management Review*, 14(4): 369–83.
- Wooldridge, Jeffrey M.** 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.
- Wooldridge, Jeffrey M.** 2005. "Simple Solutions to the Initial Conditions Problem in dynamic, nonlinear Panel Data Models with unobserved Heterogeneity." *Journal of Applied Econometrics*, 20(1): 39–54.

World Bank. 2019a. Gini Index. World Bank Estimate.
<https://data.worldbank.org/indicator/SI.POV.GINI?view=map&year=2018> (accessed September 15, 2021).

World Bank. 2019b. Infant Mortality Rate (per 1,000 live births).
<https://data.worldbank.org/indicator/SP.DYN.IMRT.IN> (accessed September 15, 2021).

World Bank. 2019c. Population (total). <https://data.worldbank.org/indicator/SP.POP.TOTL>
 (accessed September 15, 2021).

World Bank. 2020a. GDP per Capita. (constant 2010 USD).
<https://data.worldbank.org/indicator/NY.GDP.PCAP.KD?end=2016&start=2001> (accessed September 15, 2021).

World Bank. 2020b. Literacy Rate. (Adult total, Percentage of people ages 15 and above).
https://data.worldbank.org/indicator/SE.ADT.LITR.ZS?most_recent_year_desc=false
 (accessed September 15, 2021).

World Bank. 2020c. Refugee Population by Country or Territory of Origin.
<https://data.worldbank.org/indicator/SM.POP.REFG.OR> (accessed September 15, 2021).

World Bank. 2020d. Unemployment. Total Unemployment as Percentage of the Total Labor Force (modeled ILO estimate).
<https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS?end=2016&start=2001> (accessed September 15, 2021).

World Bank. 2020e. Worldwide Governance Indicators: Corruption Control.
<http://info.worldbank.org/governance/wgi/Home/downloadFile?fileName=cc.pdf>
 (accessed September 15, 2021).

World Bank. 2020f. Worldwide Governance Indicators: Rule of Law.

<http://info.worldbank.org/governance/wgi/Home/downloadFile?fileName=rl.pdf>

(accessed September 15, 2021).

Zimmerman, C., K. Yun, I. Shvab, Watts, C., Trappolin, L., M. Treppete, F. Bimbi, B.

Adams, S. Jiraporn, L. Beci, and M. Albrecht, et al. 2003. “The Health Risks and Consequences of Trafficking in Women and Adolescents. Findings from a European Study.” *London: London School of Hygiene & Tropical Medicine (LSHTM).*

<https://researchonline.lshtm.ac.uk/id/eprint/10786>.