Migrant Smuggling

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Abstract

We analyze the migrant smuggling market where smugglers differ in their capacities to exploit their clients' labor in the destination. We show that when exploitation capacities are private information, the equilibrium may be characterized by adverse selection. In such a case, policies that diminish the availability of smuggling services to potential migrants inevitably raise the mean exploitation of smuggled labor.

Key words: migrant smuggling, migrant exploitation

JEL classifications: F22, J61, D82, L15, K42

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1 Introduction

This paper presents an analytical model of the migrant smuggling market where smugglers are heterogeneous in terms of the capacity to exploit smuggled migrant labor. We examine the equilibrium number of participants and the equilibrium average exploitation of migrant labor in the market under the assumption that the exploitation capacity is private information. We then conduct comparative statics to investigate the impact of anti-illegal migration measures on the equilibrium. This work thus attempts to highlight a potential link between the fight against assisted clandestine migration and the incidence of the abuse of illegal migrants.

There has been little analysis of the migrant smuggling market in economics so far, even though smuggling and trafficking in migrants[1] have re-

[1]The terms, smuggling and trafficking, have been used interchangeably by some researchers and practioners but with clear distinction by others. A lack of consensus on the use of the terms complicates the analysis of these activities. For instance, Salt and Hogarth discuss this problem in Laczko and Thompson (2000: 18-23). However, recent effort to create legal instruments to fight against human smuggling and trafficking has given a clear distinction between these activities. In December 1998, the General Assembly of the United Nations established an ad hoc committee for the purpose of setting up its Convention against Transnational Organized Crime and supplementing protocols specific to human smuggling and trafficking. As a result, the Protocol against the Smuggling of Migrants (UN, 2000b) entered into force on 28 January 2004, while the Protocol to Prevent, Suppress and Punish Trafficking in Persons (UN, 2000a) did so earlier on the Christmas day of 2003. In this paper, we closely follow these two protocols. Appendix 1 provides the relevant excerpts from these UN protocols. Our working definitions are that a *smuggler* (or non-exploitative smuggler) is an agent who provides illegal border crossing services without exploiting its clients in the post-smuggling period, while a *trafficker* (or exploitative smuggler) is an agent who also provides the same border crossing services but with exploitation of its clients after successful smuggling. Whether exploitation of migrants is involved or not is often taken as a distinguishing criterion between trafficking and smuggling, eg, Kelly and Regan (2000: 3), Salt (2000: 33-4) and Interpol (www.interpol.int). We define *exploitation* as that of labor of a smuggled client, and we ignore for the sake of economic analysis elements of intimidation and violence that seem often involved in both trafficking and smuggling. These working definitions of ours will become clear when we describe our analytical framework in Section 3.

cently become one of the major international concerns.[2] Friebel and Guriev (2006) theoretically examined the interaction between migrants and smuggling agents. In their model, not all potential migrants are able to pay for smuggling services upfront. A worker may therefore enter into a debt contract with a smuggler if migrating and must then pay back the debt through work in the destination. Their analysis shows, while stricter border enforcement discourages both financially constrained and unconstrained workers to migrate illegally, better detection in the formal employment sector not only discourages the illegal entry of the latter type but encourages that of the former, biasing the composition of illegal immigrants towards the poorer end. In their model, while smugglers face a risk that migrants may default debt repayments, migrants do not face a risk of being exploited by their smugglers.[3]

Dessy and Pallage (2006) theoretically argue the risk of child trafficking serves as a deterrent to parents who send their children to labor markets. The effort to reduce the incidence of child trafficking therefore increases the parental supply of child labor. Their analysis concentrates on the household utility maximization with respect to the supply of child labor, and traffickers are not modeled explicitly. Dessy, Mbiekop and Pallage (2005) present

[2]For instance, a recent report by the Global Commission on International Migration (2005) touches on the related problems throughout the text. At the same time, its acknowledgment section on page 88 indicates that economists' contributions to the report were scarce.

[3]Guzman, Haslag and Orrenius (2002) model migrant smuggling explicitly, but their analysis in a two-country dynamic general equilibrium framework treats smugglers as suppliers of cost-saving border crossing services, and migrants do not face a risk of exploitation. It belongs to the theoretical macroeconomic literature on illegal immigration and border enforcement that began with Ethier (1986), Djajić (1987) and Bond and Chen (1987) but does not attempt to provide microeconomic analysis of interactions between migrants and smugglers.

a general equilibrium model with producers who choose between the legal sector and child trafficking.[4] They emphasize the importance of demand for trafficked children in influencing the incidence of child trafficking. These two studies address the issue of abuse, but children are treated as commodities and do not make any decision. Hence these do not cover the problem we examine in this paper.

In the migrant smuggling market, there is no legally enforceable contract between the providers and the consumers of the illicit services. Therefore, migrants can neither ensure no exploitation nor compensation in the case of exploitation. In addition, as explained in the next section, the consumption of smuggling services requires a loss of the consumers' control over the assets they carry with them—their bodies and labor—once the provision of smuggling services is implemented. Smuggled migrants are thus vulnerable to the abuse by smugglers.

In our model, each smuggler's decision on whether it exploits its clients after successful smuggling is endogenous in the workers' expectation of exploitation in the destination, and a weakened position of a migrant vis-a-vis the smuggler does not necessarily result in exploitation.[5] We assume smugglers exogenously differ in their capacities to exploit their clients in the destination and make two decisions at a given smuggling fee: enter the market or not, and exploit or not if smuggling. The exploitation decision depends on the workers' expectation of exploitation in the destination which determines

[4]They model a small open source country in the sense that the price per child sold abroad is exogenously given.

[5]This paper thus provides a solution to one of Väyrynen's (2003: 3) criticisms about economic approaches to migrant smuggling, ie, inadequate attention paid to exploitative aspects.

the smuggling fee. Note that the way we endogenise the quality of a smuggling service is different from Kim's (1985) adaptation of Akerlof (1970). In his model, the quality of a secondhand car depends on the level of maintenance by the owner, and car owners exogenously differ in their marginal utility gains from the car quality. A car owner chooses the level of maintenance and also decides whether she/he sells or keeps the car. In this paper, the exploitation decision of a smuggler depends on the fee that cannot be chosen by the smuggler when exploitation capacities are private information.

We find, when workers cannot distinguish between heterogeneous smugglers, the equilibrium may be characterized by adverse selection: only exploitative smugglers provide border crossing services even though workers are willing to pay a higher fee to hire non-exploitative smugglers. In such a case, we show that policies that reduce the number of active smuggling agents inevitably raise the mean exploitation in the market. Policymakers would then face a dilemma of whether to improve the welfare of smuggled migrants or to diminish the availability of smuggling services.

We also find that when the equilibrium is not characterized by adverse selection, different policy instruments have different effects on the number of active smuggling agents and the mean exploitation. We will discuss a possibility that different effects may offset each other, making the instruments appear ineffective.

In Section 2, we gather stylized facts about the migrant smuggling market from descriptive, non-economic studies. The reason for this section is that there has been little work on this topic in economics. However, readers who are familiar with stylized facts about this market can skip this section.

Section 3 presents a benchmark model where information is symmetric between smugglers and migrants. In Section 4, we assume different exploitation capacities are private information and characterize the market equilibrium. Section 5 investigates the impact of anti-illegal migration measures on the equilibrium number of participants and the equilibrium average exploitation. Section 6 concludes with policy implications.

2 Stylized facts

Several non-economic studies have made crude estimates of the scales of smuggling and trafficking in migrants, based on apprehension data, court cases, survey questionnaires, interviews and best guesses. Salt (2003: Table 20) gathers and compares such estimated figures and suggests the annual total number of either smuggled or trafficked migrants is approximately 4 million in the world in the second half of the 1990s. According to the US government (USDS, 2004: 23), approximately 600,000 to 800,000 persons were trafficked across international borders worldwide in 2003. Although these figures are not comparable, the incidence of trafficking appears to be lower than that of smuggling.[6]

This section does not provide a thorough collection of stylized facts about migrant smuggling and trafficking but only a selection of them that are relevant to our analysis.[7] Note, while increasingly available surveys of smuggled

[6]We should remain skeptical of these estimates, for the nature of both smuggling and trafficking in migrants is clandestine. However, the UK government (IND, 2001: 75) also expressed the same view that trafficking takes place less frequently than smuggling, concerning illegal immigration in the country. See also IOM (2002a) for Armenia and Budapest Group (1999: 15).

[7]Salt and Hogarth provide a descriptive empirical literature review in Laczko and

and trafficked migrants reveal the demand side of the market, its interaction with the supply side and the consequences, they do not inform us of much about the supply side, ie, smugglers and traffickers. Studies of smugglers and traffickers describe their characteristics and activities by referring to mass media reports or quoting what was told by police officers, crime investigators, immigration officers, charity personnel and smuggled and trafficked migrants, but hardly by smugglers and traffickers themselves. This implies that our knowledge of the supply side of the market is rather limited.

Motives for migration Existing surveys of smuggled migrants, victims of trafficking and the like indicate, although economic reasons are not the only factors that influence migration decision making, these seem to be the major factors.[8] They can be devided into two: economic hardship, such as unemployment and poverty, at home countries and better economic prospects at destination countries. The former is the so-called economic push, and the latter the economic pull.

Economic hardship was found to be the most common reason for migration among smuggled or trafficked migrants in Armenia (IOM, 2002a: 16), Georgia (IOM, 2001: 14), Ukraine (Uehling, 2004: 90-1) and Southeastern Europe (CTRCP, 2003).[9] In Azerbaijan, Bickley (2001: 27) found the same, but IOM (2002b: 16-7, 21) suggests both push and pull factors influence an individual's migration decision simultaneously. This is natural because, if economic prospects are not thought to be any better overseas than at home,

Thompson (2000).

[8] Noneconomic reasons include civil wars, ethnic conflicts, political prosecutions, family/relationship problems at home, family reunions and desires for adventure.

[9] See also IOM (1996).

there would not be an incentive to leave his/her country. However, there also seem to be those whose migration decisions are influenced purely by the economic pull. Pieke (2002: 32) and Chin (1999: 14, referred by Skeldon, 2000b: 17) found such individuals are more common in China. Lăzăroiu and Alexandru (2003: 34-7) found females with higher aspiration are more vulnerable to trafficking in Romania, suggesting the economic pull is important.

In this paper, we take a traditional economic approach to migration decision making and assume the migration decision positively depends on the income gap between the origin and the destination. More specifically, we assume each worker can earn zero income at home, ie, no employment prospect at home, while she/he is employed with certainty at the destination.[10]

Demand for smuggling services A number of authors have argued restrictive immigration policies of destination countries increase the number of migrants who choose to resort to clandestine border crossing and smugglers who can organize it, eg, Ghosh (1998: 148), Budapest Group (1999: 15-6), Schloenhardt (1999: 212), Kelly and Regan (2000: 5), Skeldon (2000a), Andreas in Kyle and Koslowski (2001: 116), Cornelius (2001: 668), Marshall (2001), ILO (2002: 4), Gallagher (2002: 28), Taran and Chammartin (2003: 5-6), Väyrynen (2003: 3) and NCIS (2003: 37), although there is no firm statistical evidence to prove this.[11] Futo and Jundl (2004: 78, 151-2,

[10] Accordingly, we will focus on migrants whose decisions are affected by both push and pull factors. Our analysis can be generalized by introducing a range of income levels at home among potential migrants.

[11] Donato, Durand and Massey (1992: 153) found weak evidence with a small sample, while Singer and Massey (1997: Table 4) found a significant positive relation between the number of US linewatch hours and the use of smugglers in Mexico. On the other hand,

158) report recently apprehended illegal immigrants in Hungary, Turkey and Ukraine have increasingly relied on smugglers. The UK government (IND, 2001: 76) estimates smugglers and traffickers are involved in approximately 75 percent of detected cases of illigal border crossing. Koser's (2000: 102-3) survey found some asylum seekers in the sample turning to smugglers because of restrictive policies against them.[12,13]

However, a host country's government is unlikely to take a tolerant immigration policy because, while it may reduce the dependence of irregular migrants on smuggling agents and their vulnerability to traffickers, the number of illegal immigrants is likely to increase. For instance, according to the European Commission (2004: 9), the Belgian regularization program of 1999 that allowed illegal residents in the country to submit asylum applications seem to have encouraged illegal immigration subsequently.

In this paper, we simply assume individuals need to hire smugglers if they wish to migrate. We thus assume the host country has restrictive immigration policies so that migrating individuals cannot enter the destination legitimately. Our analysis is limited in the sense that migrants do not choose between illegal entries by themselves and entires arranged by smugglers.

Gathmann (2004: Table 6b) found the direct effect of strengthened border enforcement on the demand for a smuggler is little.

[12] See Morrison and Crosland (2001: 27-39) who explain the restrictive nature of European immigration policies against asylum seekers.

[13] Another reason to hire a smuggler might be cost minimisation. Skeldon (2000a: 9-10) speculates that the use of smuggling services is often less costly than that of official channels because the latter involves a significant amount of time and bribes. However, bribery is rife in the process of both smuggling and trafficking, and hence its costs are likely to be included in smuggling fees.

Charges for smuggling services Charges for smuggling services as well as payment methods vary widely, and known figures and methods are based on individual cases. Therefore, we do not list these here.[14] However, there appears to be a common observation in this market. Namely, non-exploitative smugglers charge their clients for border crossing services, while traffickers may or may not explicitly charge their prey for smuggling.[15] For instance, an IOM study of trafficked women in Belgium found, while most of them did not have to pay a fee to the traffickers, they found themselves indebted on arrival.[16]

Provided the exploitation of smuggled persons at the destination is sufficiently profitable, it is understandable that some traffickers need not charge them for border crossing. In addition, traffickers are better off pretending they are non-exploitative if migrants are capable of paying for smuggling services. In our model, traffickers can mimic the fee chargeable by non-exploitative smugglers because the shut-down fee is lower for the former than the latter.[17] In other words, signalling is not available for the latter under asymmetric information.

We assume migrants pay the smuggling fee only after successful border crossing. Since there are cases where migrants must pay the smuggling fee

[14] IOM (2003: Table 17.21) lists ranges of smuggling fees by origin and destination. See also Ghosh (1998: 31-2).

[15] Traffickers make an excuse when exploiting smuggled migrants that they became heavily indebted while being smuggled, so they charge for smuggling implicitly through exploitation. In this paper, we concentrate on commercial smugglers and do not deal with non-exploitative smugglers who do not charge migrants at all. An example is someone who assists an asylum seeker to cross a border on a humanitarian basis.

[16] Referred by Ghosh (1998: 22)

[17] A smuggler's shut-down fee is the fee at or below which it does not supply a smuggling service and becomes inactive in the market.

upfront, or where they pay it by instalments, our analysis is not comprehensive. In our model, migrants are rational: paying the fee upfront could give a smuggler an incentive to default on the provision of border crossing services, and the migrants should therefore condition the fee payment on successful smuggling. According to Donato, Durand and Massey (1992: 151) for Mexico, Içduygu and Toktas (2002: 38-9) for the Middle East and Futo and Jandl (2004: 18) for Central and Eastern Europe, it is not uncommon that the fee payment is made only after the client is smuggled as promised.

We also assume migrants are able to pay for the fee without being indebted to smugglers. Hence we do not examine the case where a migrant enters a debt contract with a smuggler.[18] This is analyzed by Friebel and Guriev (2006) without allowing smugglers to exploit their clients.

Exploitation Migrants become vulnerable once they depart their countries of origin. They are often deprived of their true identities in the form of passport in order to enter the destination clandestinely. Subject to legal prosecution under the immigration laws of destination countries and devoid of financial means, smuggled migrants often find their freedom of movement severely curtailed, eg, IOM (2001: 32). Victims of trafficking often become aware that they are duped during their journeys or on arrival at the destination planned by traffickers. There are two ways of exploiting smuggled migrants. One is by using them directly, and the other by selling them.

The sex industry can illustrate the financial gain from the coercive use

[18]A financially constrained person does not necessarily enter a debt contract with a smuggler to finance clandestine migration if there is an alternative source of credit such as family members' credit. See Genicot and Senesky (2004: Tables 4 and 5) for some empirical evidence.

of smuggled migrants. Leskinen (2003) reports detailed figures from the seized bookkeeping of an exposed case in which 5 to 8 Estonian females were working as prostitutes in 5 apartments under a criminal leader of the same nationality with Finish pimps in Helsinki in 2001. A 20-minute visit to one of these apartments cost 300 markaa, which are divided into 200 for the pimps and 100 for the female worker.[19] The bookkeeping showed the number of clients was about 1,000 per month, which implies the monthly revenue of 200,000 markaa to the pimps. The estimated profit to the criminal group after deducting the costs of running the business was at least 100,000 markaa per month, ie, almost 17,000 euros.[20]

Smugglers who are not employers of their clients can still exploit the migrants simply by selling them. Home Office (2004: 77) for example reports that the price of a Thai female sold to brothel organizers operating in the United Kingdom was 6,000 pounds sterling in the case uncovered by Operation Horsley.[21] The money paid to the smugglers seem to become debts that the females are forced to repay. In such a case, they receive little money from their work, eg, Hughes (2000: 633-4).

Females managed by exploitative smugglers can be repeatedly traded during the smuggling process. IOM and ICMC's (2002: 7-10) report suggests, in Yugoslavia, the existence of trading houses was identified where females for exploitation were exhibited and purchased before border crossing, and higher prices seem to be paid to those who bring younger females to the

[19] 100 markaa $\simeq$ 16.82 euros, according to the report.

[20] The extent of economic and sexual exploitation by coercive pimps might be similar among native and migrant prostitutes. See May, Harocopos and Hough (2000) for the British case.

[21] See Metropolitan Police (2003: 32) for the details of this police operation.

market. Pobortscha (2002) suggests similar quasi-slave trading in Moldova, and Erder and Kaska (2003: 63) in Turkey.

In our model, exploitation is defined as the use of labor without remuneration, thus ignoring the case where trafficked migrants are sold in the destination. Smugglers are exogenously endowed with different exploitation capacities. As a result, not all smugglers exploit their clients, and traffickers exploit migrants at various levels, which appears realistic, eg, IOM (2001: 33-4).

3 Benchmark

We now set up a two-country model with a fixed number of identical workers and a fixed number of heterogeneous smugglers. All the workers legally reside in one of the two countries, and we call it the home. The other country is called the destination to which they may attempt to migrate. Economic prospects for the workers are better in the destination than in the home in the sense that the exogenously given earnings per unit of labor are higher in the former than in the latter.

We assume that a worker has no means to migrate from the home to the destination except hiring a smuggler. A smuggler is capable of delivering such a worker from the home to the destination. Migrants would pay for smuggling services only if border crossing were successful. With this payment method, a smuggler cannot have an incentive to default on the provision of smuggling services after receiving a fee, though it does not solve the incentive problem of exploitative smugglers.

Let us normalize the total measure of the smugglers to 1, and each of them has the capacity of supplying 1 unit of border crossing services. That is, it can be hired by at most one worker. The total measure of the workers is $m \gg 1$. All the agents are risk-neutral.

Let $\beta_j \in (0,1)$ denote the given probability of apprehension at the border for $j \in \{M, S\}$ where M denotes migrant and S smuggler. Let $\lambda_j \in (0,1)$ denote that of apprehension inland. We distinguish between β and λ, for they usually differ from each other and $\lambda_j < \beta_j$ in many countries.[22] It also becomes useful to distinguish between the probabilities for migrants and smugglers when we conduct comparative statics. We commonly observe $\beta_M > \beta_S$ and $\lambda_M > \lambda_S$ in the real world. Smugglers are often able to abandon their clients in order to evade capture. Also, for example, the driver might be apprehended at the border, but it is often difficult to uncover the whole operation and organization.[23]

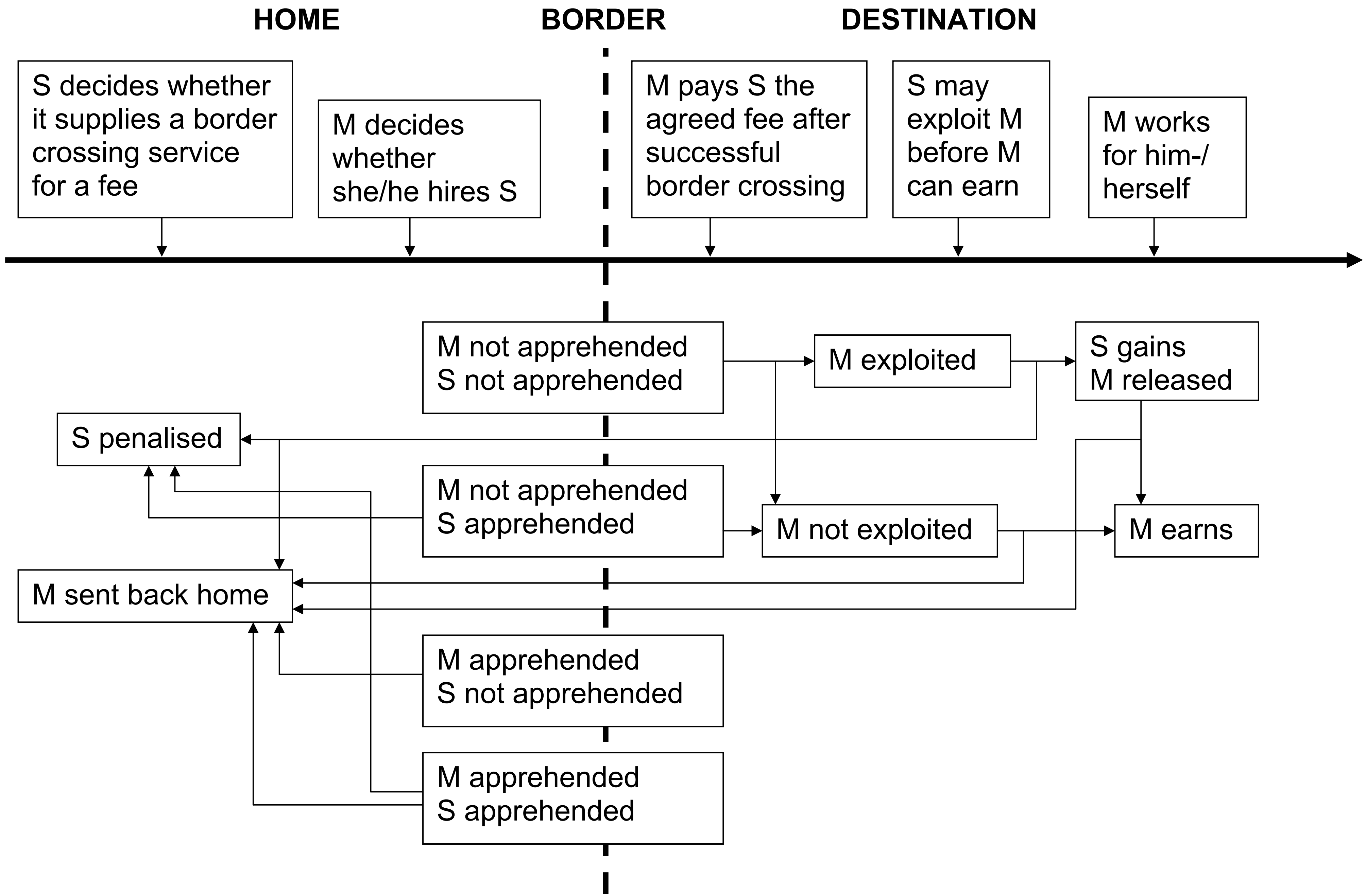
[INSERT CHART: THE ORDER OF EVENTS]

3.1 Smugglers

We assume a smuggler's decision to exploit its client depends on its capacity to do so which determines the profitability of exploitation. Exploitation

[22] See for instance Miller in Kyle and Koslowski (2001: Chapter 12).

[23] Aronowitz (2001: 169) notes forced prostitutes are likely to have more contacts with those other than traffickers than non-sexual forced laborers. In order to minimize the risk of apprehension, victims are often rotated geographically. Raviv and Andreani (2004) found human trafficking operations have become increasingly invisible in the Balkan region.



HOME
BORDER
DESTINATION
S decides whether it supplies a border crossing service for a fee
M decides whether she/he hires S
M pays S the agreed fee after successful border crossing
S may exploit M before M can earn
M works for him-/herself
M not apprehended S not apprehended
M exploited
S gains M released
S penalised
M not apprehended S apprehended
M not exploited
M earns
M sent back home
M apprehended S not apprehended
M apprehended S apprehended

of smuggled migrants in the destination requires relevant facilities to conduct illicit business, evade capture and restrict the freedom of the exploited. Criminal syndicates are likely to be well endowed with such facilities.

Smugglers exogenously differ in their capacities to exploit their smuggled clients in the destination. We define exploitation as the use of labor without remuneration. Let $k \in [0,1]$ denote the given capacity of a smuggler to exploit its migrated client's labor net of exploitation costs.

We suppose each worker is endowed with one unit of labor that can generate $y > 0$ in the destination. Therefore, if exploitation takes place, the smuggler's gain per migrant is ky while the client's earnings are reduced from y to $(1-k)\,y$.

Let $\Phi(k)$ be a distribution function, and $\phi(k) > 0 \;\forall\; k \in [0,1]$ is the corresponding density function. Hence $\Phi(\cdot)$ is nondegenerate.

Suppose a smuggling operation resulted in successful border crossing. The migrant then paid a smuggling fee, f. The smuggler's expected profit from the post-smuggling exploitation is

$$\text{(1)} \quad \tilde{\pi} = (1-\lambda_S)\,ky - \lambda_S\,(f + p + kq)$$

where $p > 0$ represents the fixed penalty for smuggling and $q > 0$ the marginal penalty for exploitation in pecuniary terms. The expression assumes the fee payment by a client is seized and forfeited in the case of apprehension.[24] Note, the first term indicates, when exploitation takes place, the smuggled

[24] This is equivalent to assuming the total penalty is increasing in the fee received. This innocent looking assumption is crucial when we endogenize the ratio between smugglers and traffickers.

migrant and the smuggler are always caught together with the apprehension probability of λ_S. We thus assume k takes into account the capacity to reduce λ_M to zero.

Let $e(k) \in \{0,1\}$ be a binary variable that is 1 if a type-k smuggler decides to exploit its client and 0 if it does not. We assume a smuggler exploits its client iff $\tilde{\pi}(k) > 0$, ie,

$$(2) \quad e(k) = \begin{cases} 0 & \text{if } \tilde{\pi}(k) \leq 0 \\ 1 & \text{otherwise.} \end{cases}$$

Since the success of border crossing is uncertain at the pre-smuggling stage, a smuggler's total expected profit from smuggling is

$$(3) \quad \hat{\pi} = (1 - \beta_S)(1 - \beta_M)(f + e\tilde{\pi}) - \beta_S p - c$$

where $c > 0$ denotes the sum of smuggling costs such as expenditures on transportation, hiding places, fraudulent documents and bribes. The first term implies a smuggler does not face a risk of apprehension inland if it decides not to exploit its client.[25] It also assumes a smuggler must deliver its client to the destination in order to receive the fee, f.

Let $\bar{\pi} > 0$ denote the alternative profit available for each smuggler, and we assume $\hat{\pi} > \bar{\pi}$ is both necessary and sufficient for it to supply a border crossing service.

[25] Commonly, apprehended illegal workers are not questioned for the purpose of tracing the smugglers and traffickers who brought them in.

3.2 Workers

Each worker is endowed with one unit of labor which is supplied inelastically in either the home or the destination.[26] Let $y > 0$ denote the earnings per unit of labor in the destination.[27] Let us normalize a worker's alternative income, ie, the earnings in the home, to zero. If apprehended, a worker is sent back to the home without paying a penalty.[28] If the apprehension takes place at the border, the worker need not pay a smuggling fee, either.

Suppose each smuggler's k is known to the workers. Suppose (1), (2) and (3) are also known to them. The expected utility of a successfully smuggled worker at the post-smuggling stage is

$$(4) \quad \tilde{u} = (1 - \lambda_M)(1 - e\lambda_S)(1 - ek)\, y.$$

Note, when a migrant is exploited, λ_S has to be taken into account because there is no chance to expect $(1 - \lambda_M)(1 - k)\, y$ if the smuggler and the migrant are caught together during the exploitation process. We thus assume

[26] We thus ignore the case where a worker supplies a fraction of the labor endowment in the home and the rest in the destination.

[27] We ignore the possibility of smuggled migrants being unemployed in the destination because there appears to be high demand for illegal migrants who are usually willing to accept lower wages than natives. See OECD (2000: Chapter 3) for an overview. Profitability of hiring unauthorized migrants is exemplified by Ghosh (1998: 77): the convicted employers of irregular migrants in the Netherlands in 1991 made a significant financial gain even after paying for penalties and out-of-court settlements. Furthermore, Anderson and O'Connell Davidson (2003: 21, 25) found some features specific to migrants are preferred by consumers.

[28] This assumption may not be reasonable in some cases. Pacurar (2003) points out that, although migrants are not subject to criminal prosecution for being the object of smuggling, they can be prosecuted for holding fraudulent documents or/and directing the third party to smuggle themselves. We assume throghout the paper that migrants are not prosecuted but sent back to the home country without compensation for what the smuggler took from them. This seems to apply to most of the cases.

if exploitation takes place it does before a migrant can make use of any labor being unused by the smuggler.

At the pre-migration stage, a worker's expected total utility from hiring a smuggler is

$$(5) \quad \hat{u} = (1 - \beta_S)(1 - \beta_M)(\tilde{u} - f)$$

which assumes the smuggling fee, f, is paid only if border crossing is successful. We suppose workers are not wealth-constrained in financing assisted clandestine migration.

We assume $\hat{u} \geq 0$ is both necessary and sufficient for a worker to hire a smuggler. (5) implies the following participation constraint under symmetric complete information:

$$(6) \quad f \leq (1 - \lambda_M)(1 - e\lambda_S)(1 - ek)\,y$$

which needs to be met if a worker decides to hire a type-k smuggler.

3.3 Equilibrium

Under symmetric complete information, the workers know the exploitation capacity of each smuggler as well as its exploitation decision rule. Accordingly, (6) and $m \gg 1$ imply there is a competitive equilibrium fee for each exploitation capacity, ie,

$$(7) \quad f(k) = (1 - e\lambda_S)(1 - ek)\,f^{\circ}$$

where $f^\circ \equiv (1-\lambda_M)\, y$ is the maximum fee that a worker is willing to pay for a non-exploitative smuggling service. By substituting (7) into (1) with $e = 1$, the exploitation condition, $\tilde{\pi}(f(k), k) > 0$, can be rewritten as follows:

$$(8) \quad k > \tilde{k} \equiv \frac{\lambda_S (1-\lambda_S) f^\circ + \lambda_S p}{\lambda_S (1-\lambda_S) f^\circ + (1-\lambda_S)\, y - \lambda_S q}$$

Therefore, we can rewrite the exploitation decision rule (2) as follows:

$$(2') \quad e(k) = \begin{cases} 1 & \text{if } k > \tilde{k} \\ 0 & \text{otherwise} \end{cases}$$

If $\tilde{k} \geq 1$, or equivalently $y \leq \frac{\lambda_S}{1-\lambda_S}(p+q)$, no smuggler would exploit its clients because $k \in [0,1]$. All the smugglers are exploitative if $\tilde{k} < 0$ or equivalently $y < \frac{\lambda_S}{1-\lambda_S}\left(\frac{q}{1+\lambda_S(1-\lambda_M)}\right)$, ie, the denominator of $\tilde{k}$ is negative. Accordingly, we need $y > \frac{\lambda_S}{1-\lambda_S}(p+q)$ to have $\tilde{k} \in (0,1)$.

For those who cannot exploit smuggled migrants profitably, ie, $k \leq \tilde{k}$, the participation constraint, $\hat{\pi}(k \leq \tilde{k}) > \bar{\pi}$, can be rewritten as

$$(9) \quad f > \bar{f} \equiv \frac{\beta_S p + c + \bar{\pi}}{(1-\beta_S)(1-\beta_M)}$$

where $\bar{f}$ is the non-exploitative smuggler's shut-down fee at or below which it does not supply a smuggling service.

Exploitative smugglers with $k > \tilde{k}$ may not participate in the market because (7) suggests, the more exploitative a smuggler, the lower the fee it can charge. Their participation constraint, $\hat{\pi}(k > \tilde{k}) > \bar{\pi}$, is equivalent to the following:

$$(10) \quad k > \hat{k} \equiv \frac{\bar{f} + \lambda_S p - (1-\lambda_S)^2 f^\circ}{(1-\lambda_S) y - \lambda_S q - (1-\lambda_S)^2 f^\circ}$$

If $\hat{k} \geq 1$, or equivalently $y \leq \frac{\lambda_S}{1-\lambda_S}(p+q) + \frac{\bar{f}}{1-\lambda_S}$, no trafficker enters the market. All the traffickers are active if $\hat{k} < 0$ or equivalently either (a) a combination of a negative numerator and a positive denominator in the expression for $\hat{k}$, ie, $\bar{f} + \lambda_S p < (1-\lambda_S)^2 f^\circ < (1-\lambda_S) y - \lambda_S q$ or (b) that of a positive numerator and a negative denominator, ie, $\bar{f} + \lambda_S p > (1-\lambda_S)^2 f^\circ > (1-\lambda_S) y - \lambda_S q$. In order to have $\hat{k} \in (0,1)$, we need either

$$(11) \quad (1-\lambda_S) y - \lambda_S q > \bar{f} + \lambda_S p > (1-\lambda_S)^2 f^\circ$$

or $(1-\lambda_S)^2 f^\circ > \bar{f} + \lambda_S p > (1-\lambda_S) y - \lambda_S q$. The former implies both the denominator and the numerator of $\hat{k}$ are positive, while both are negative for the latter. Note $(1-\lambda_S) y - \lambda_S q > \bar{f} + \lambda_S p$ or equivalently $y > \frac{\lambda_S}{1-\lambda_S}(p+q) + \frac{\bar{f}}{1-\lambda_S}$ guarantees $\tilde{k} \in (0,1)$. Let us assume (11) holds throughout so as to examine the market with $\hat{k}, \tilde{k} \in (0,1)$.

Assumption 1 $y > \frac{\bar{f}+\lambda_S(p+q)}{1-\lambda_S} > \frac{(1-\lambda_S)^2(1-\lambda_M)y+\lambda_S q}{1-\lambda_S}$ holds.

In addition to restricting the threshold exploitation capacities, $\tilde{k}$ and $\hat{k}$, over the open interval $(0,1)$, this assumption implies the following.

Lemma 1 *There exists a trafficker who provides a border crossing service even without receiving a smuggling fee.*

Proof. (1), (2) and (3) suggest a trafficker with $k > \frac{\bar{f}+\lambda_S p}{(1-\lambda_S)y-\lambda_S q}$ is active even if $f = 0$. Since $k \in [0,1]$, such a trafficker exists iff $y > \frac{\bar{f}+\lambda_S(p+q)}{1-\lambda_S}$, which is met by the first part of Assumption 1. ■

As we mentioned in Section 2, this is an important feature of the migrant smuggling market.

Note both threshold exploitation capacities, $\tilde{k}$ and $\hat{k}$, are exogenous, as shown in (8) and (10). The relationship between $\tilde{k}$ and $\hat{k}$ is ambiguous without restrictions on the parameters in the expressions. We have the following three possible situations under Assumption 1.

Proposition 1 *The market equilibrium is characterised as follows under symmetric complete information:*

	(a)	(b)	(c)
Environment	$\gamma\bar{f} < f^\circ$	$\bar{f} < f^\circ \leq \gamma\bar{f}$	$f^\circ \leq \bar{f}$
Nonexploitative smugglers	$\Phi(\tilde{k})$	$\Phi(\tilde{k})$	0
Exploitative smugglers	$1-\Phi(\tilde{k})$	$1-\Phi(\hat{k})$	$1-\Phi(\hat{k})$
Inactive smugglers	0	$\Phi(\hat{k})-\Phi(\tilde{k})$	$\Phi(\hat{k})$

where γ is a constant greater than unity.

Proof. (7) and (9) imply all the non-exploitative smugglers participate in the market iff $f^\circ > \bar{f}$. (8) and (10) suggest all the exploitative smugglers participate iff $\tilde{k} > \hat{k} \Leftrightarrow f^\circ > \gamma\bar{f}$ where $\gamma \equiv \frac{\lambda_S(1-\lambda_S)(1-\lambda_M)y+(1-\lambda_S)y-\lambda_S q}{(1-\lambda_S)[(1-\lambda_S)y-\lambda_S(p+q)]} > 1$ under Assumption 1. When $\tilde{k} \leq \hat{k}$, there are $\Phi(\hat{k}) - \Phi(\tilde{k})$ smugglers who can exploit migrants profitably but do not participate in the market, for the smuggling cost is too high, ie, $\hat{\pi}(k > \tilde{k}) \leq \bar{\pi}\ \forall\ k \in (\tilde{k}, \hat{k}]$. ■

In case (a), every smuggling agent supplies a border crossing service. In case (b), there are $\Phi(\hat{k}) - \Phi(\tilde{k})$ agents who can exploit their smuggled clients profitably, which negatively affects the overall profit via a reduction in their fees under symmetric complete information so that they decide not to supply border crossing services. As a result, "modestly exploitative" smugglers, ie, $k \in (\tilde{k}, \hat{k}]$, do not operate. Active smugglers are either non-exploitative, ie, $k \in [0, \tilde{k}]$, or "highly exploitative", ie, $k \in (\hat{k}, 1]$.

In case (c), not only "modestly exploitative" but also non-exploitative smugglers do not supply border crossing services. However, "highly exploitative" smugglers continue to operate, for they can profit from post-smuggling exploitation sufficiently enough to offset their low smuggling fees. Note, under symmetric complete information, any of these outcomes is Pareto-efficient, and each worker pays according to the observable exploitation capacity of each smuggler.

4 Asymmetric information

Let us now suppose the exploitation capacity of each smuggler is private information. Potential migrants are then unable to distinguish between the smugglers with different exploitation capacities. Accordingly, the smuggling fee is determined independently of the type of the smuggler whom a migrant hires. Because the workers are identical, every one of them forms the same expectation of exploitation in (7), ie, there is a single smuggling fee in the market. Let f be a function of the expected exploitation capacity denoted by κ. In the previous section, we saw the threshold exploitation capacities,

$\tilde{k}$ and $\hat{k}$, were exogenously determined under symmetric information. In this section, we endogenize these in the expected exploitation via the smuggling fee, $f(\kappa)$.

The exploitation condition, $\tilde{\pi}(f(\kappa), k) > 0$, can be rewritten as

$$(12) \quad f(\kappa) < \tilde{f}(k) \equiv \left(\frac{1-\lambda_S}{\lambda_S}y - q\right)k - p.$$

The exploitation decision of a smuggler thus depends on its k. If $y > \frac{\lambda_S}{1-\lambda_S}q$, smugglers with higher exploitation capacities are more likely to decide to exploit their clients. This is the case under Assumption 1.

Those with k at which $\tilde{f}(k) \leq f(\kappa)$ are non-exploitative and enter the market iff $f(\kappa) > \bar{f}$, as shown in (9). That is, the participation decision of a non-exploitative smuggler does not depend on its own type.

Those with k at which $\tilde{f}(k) > f(\kappa)$ are exploitative and enter the market iff $\hat{\pi}(f(\kappa), k) > \bar{\pi}$ which can be rewritten as

$$(13) \quad f(\kappa) > \hat{f}(k) \equiv \frac{\bar{f} + \lambda_S p}{1-\lambda_S} - \left(y - \frac{\lambda_S}{1-\lambda_S}q\right)k.$$

$\hat{f}(k)$ is the shut-down fee for an exploitative smuggler with capacity k. If $y > \frac{\lambda_S}{1-\lambda_S}q$, more exploitative smugglers have lower shut-down fees because of higher expected gains from exploitation in the post-smuggling period. Again, this is the case under Assumption 1. In addition, by Lemma 1, we know there is at least a trafficker who is active but need not charge a fee.

Lemma 2 *Non-exploitative smugglers cannot use a different fee to distinguish themselves from exploitative smugglers.*

Proof. Assumption 1 suggests $d\hat{f}/dk < 0$ in (13), while the non-exploitative smuggler's shut-down fee is fixed at $\bar{f}$ in (9). There exists at least a trafficker for whom $\hat{f} < \bar{f}$ because $\hat{f} < \bar{f} \Leftrightarrow k > \frac{\lambda_S(\bar{f}+p)}{(1-\lambda_S)y-\lambda_S q} \in (0,1)$ under Assumption 1, implying non-exploitative smugglers cannot use a lower-than-the-market fee for signalling. Since (1), (2) and (3) indicate $d\hat{\pi}\left(\tilde{\pi} > 0\right)/df > 0$, neither can a higher-than-the-market price be used for signalling. ■

This suggests there always are exploitative smugglers who are willing to mimic any fee that non-exploitative smugglers might charge. Hence rational workers should ignore any fee signalling by non-exploitative smugglers.

Expressions (12) and (13) can be rewritten in a way analogous to (8) and (10) as follows:

$$(14) \quad k > \tilde{k}' \equiv \frac{\lambda_S f\left(\kappa\right) + \lambda_S p}{\left(1-\lambda_S\right) y - \lambda_S q}$$

and

$$(15) \quad k > \hat{k}' \equiv \frac{\bar{f} + \lambda_S p - \left(1-\lambda_S\right) f\left(\kappa\right)}{\left(1-\lambda_S\right) y - \lambda_S q}$$

Notice, while $\tilde{k}$ and $\hat{k}$ are exogenously given in (8) and (10) under symmetric information, $\tilde{k}'$ and $\hat{k}'$ are dependent on the workers' expectation, κ, via the market fee.

Expression (14) implies $\tilde{k}' \in (0,1)$ if

$$\frac{1-\lambda_S}{\lambda_S}y - p - q > f > -p,$$

and $\hat{k}' \in (0,1)$ if

$$\frac{\bar{f}+\lambda_S p}{1-\lambda_S} > f > \frac{\bar{f}+\lambda_S\left(p+q\right)}{1-\lambda_S} - y.$$

The first relationship and the first inequality in the second hold under Assumption 1. The second inequality in the second relationship also holds under the same assumption if $f \leq \bar{f}$. Hence we have $\tilde{k}', \hat{k}' \in (0,1)$.

Also note that (14) and (15) imply

(16) $\bar{f} < f\left(\kappa\right) \Leftrightarrow \hat{k}'\left(\kappa\right) < \tilde{k}'\left(\kappa\right)$

which leads to the following lemma.

Lemma 3 *The total number of active smuggling agents is non-decreasing in the fee, and the average exploitation is strictly decreasing in it.*

Proof. (i) If $f > \bar{f}$, (9) suggests all non-exploitative smugglers are active. (16) suggests all traffickers are also active. Hence the number of active suppliers totals to measure one. If $f \leq \bar{f}$, all non-exploitative smugglers are inactive. There are $1-\Phi(\hat{k}')$ active traffickers where (15) suggests $\partial\hat{k}'/\partial f < 0$. (ii) If $f > \bar{f}$, the average exploitation capacity is $\int_{\tilde{k}'}^{1} k\phi\left(k\right)dk$ where (14) suggests $\partial\tilde{k}'/\partial f > 0$. If $f \leq \bar{f}$, it is $\left(\int_{\hat{k}'}^{1}\phi\left(k\right)dk\right)^{-1}\int_{\hat{k}'}^{1} k\phi\left(k\right)dk$. (15) suggests $\partial\hat{k}'/\partial f < 0$. Hence the denominator and the numerator are both strictly increasing in f. But $\forall \hat{k}_0', \hat{k}_1' \in (0,1)$ with $\hat{k}_0' > \hat{k}_1'$, we have $\int_{\hat{k}_1'}^{\hat{k}_0'} k\phi(k)\,dk < \int_{\hat{k}_1'}^{\hat{k}_0'} \phi(k)\,dk$. ■

The following table summarises the two possible situations:

	(a)	(b)
Environment	$\bar{f} < f(\kappa)$	$f(\kappa) \leq \bar{f}$
Nonexploitative smugglers	$\Phi(\tilde{k}')$	0
Exploitative smugglers	$1 - \Phi(\tilde{k}')$	$1 - \Phi(\hat{k}')$
Inactive smugglers	0	$\Phi(\hat{k}')$

Compared to the table in Proposition 1, there is no case where some traffickers are inactive while non-exploitative smugglers are active. Such a case was a possibility in the previous section because shut-down fees of "modestly exploitative" traffickers might be higher than non-exploitative smugglers' under symmetric information.

Let us now characterize the market equilibrium. The set of exploitation capacities of the smugglers who are willing to participate in the market at a given fee is

$$K(f) = \left\{ k \in [0,1] : \begin{array}{ll} f > \bar{f} & \text{for } k \leq \tilde{k}'(f) \\ f > \hat{f}(k) & \text{otherwise.} \end{array} \right\}$$

Since every worker believes the average exploitation capacity in the market is κ, (6) and $m \gg 1$ suggest each smuggler can charge for a clandestine border crossing service

$$f(\kappa) = (1 - \lambda_S)(1 - \kappa) f^{\circ}.$$

Note, as shown in the table after Lemma 3, there is no environment where only non-exploitative smugglers are active in the market. Therefore, $\kappa > 0$, and hence $-\lambda_S$ is present in the expression.[29]

As in standard adverse selection models, we define the equilibrium as the situation where the workers' expectation of the average exploitation capacity equals the actual average.[30] That is, we assume all the agents in the market know the distribution of the k parameter among the smugglers, and hence the workers' beliefs correctly reflect the actual average exploitation capacity of the smugglers who are active in the market. Accordingly, $\kappa = E[ek|k \in K]$.

Definition 1 Under asymmetric information, an equilibrium is characterized by a pair of a smuggling fee, f^*, and a set, K^*, of exploitation capacities being present in the market such that

$$(17) \quad f^* = (1 - \lambda_S) f^\circ (1 - \kappa^*)$$

where $\kappa^* = E[ek|k \in K^*]$, and

$$(18) \quad K^* = \left\{ k \in [0,1] : \begin{array}{ll} f^* > \bar{f} & \text{for } k \leq \tilde{k}^* \\ f^* > \hat{f}(k) & \text{otherwise} \end{array} \right\}$$

[29] For simplicity, we do not discount $-\lambda_S$ by the ratio between traffickers and smugglers.
[30] See for instance Mas-Colell, Whinston and Green (1995: 439).

where $\tilde{k}^* \equiv \tilde{k}'(f^*)$ and, with $\hat{k}^* \equiv \hat{k}'(f^*)$,

$$(19)\quad \kappa^* = \begin{cases} \int_{\tilde{k}^*}^1 k\phi(k)\,dk & \text{if } f^* > \bar{f} \\ \left(\int_{\hat{k}^*}^1 \phi(k)\,dk\right)^{-1} \int_{\hat{k}^*}^1 k\phi(k)\,dk & \text{otherwise.} \end{cases}$$

Proposition 2 *Under asymmetric information, if $f^* \leq \bar{f}$, the market equilibrium is characterized by adverse selection: only traffickers are active even though each worker is willing to pay $f^\circ > \bar{f}$ to a non-exploitative smuggler.*

Proof. (9) implies all non-exploitative smugglers are inactive iff $f^* \leq \bar{f}$. (16) and (15) indicate traffickers with $k > \hat{k}^*$ are active regardless of f^*. By Lemma 1, such traffickers exist under Assumption 1. ■

Thus, in this market for migrant smuggling, the equilibrium might be of adverse selection first characterized by Akerlof (1970): all non-exploitative smugglers are driven out of the market while migrants are willing to pay a high fee to hire such a supplier.

The equilibrium is not necessarily unique, as in Wilson (1980). The multiplicity depends on $\Phi(k)$. Rose (1993) argued multiple equilibria are rare possibilities in this type of adverse selection model. Hence let us assume that the capacity distribution gives a unique equilibrium. We now examine how policy instruments would affect the number of active smugglers and the average exploitation in equilibrium.

5 Policy implication

Using this model, let us now examine ceteris paribus effects of anti-illegal migration measures on the market equilibrium. There are two equilibrium situations: $f^* > \bar{f}$ and $f^* \leq \bar{f}$. In the former case, all smugglers are active, while all non-exploitative smugglers are absent in the latter. The following proposition is for the full participation equilibrium before a policy change.

Proposition 3 *When all smugglers are active in initial equilibrium, ie, $f^* > \bar{f}$, we have the following:*

(i) *Improved border apprehension, either β_M or β_S, does not directly affect the average exploitation by affecting exploitation decision making. However, it may drive away all non-exploitative smugglers from the market by raising their shut-down fee.*

(ii) *An increase in the penalty for migrant smuggling, p, decreases the average exploitation. It increases both non-exploitative smugglers' shut-down fee and the equilibrium fee, and hence it is ambiguous whether it tends to drive away all non-exploitative smugglers from the market.*

(iii) *An increase in the marginal penalty for exploitation, q, decreases the average exploitation. It also maintains the full participation by increasing the equilibrium fee.*

(iv) *Improved inland apprehension of smuggled migrants, λ_M, increases the average exploitation. It may drive away all non-exploitative smugglers from the market by reducing the equilibrium fee.*

(v) *Improved inland apprehension of exploitative smugglers, λ_S, increases the* *average exploitation if λ_S remains sufficiently small:* $\frac{(y+q)\tilde{k}^*+(1-\lambda_M)y(1-\kappa^*)+p}{2(1-\lambda_M)y(1-\kappa^*)} > \lambda_S$ *in particular. If this condition is met, it may drive away all non-exploitative smugglers from the market by reducing the equilibrium fee.* (*If this condition is not met, the average exploitation is non-increasing in it, and its effect on the equilibrium fee is ambiguous.*)

Proof. See Appendix 2. ■

The intuition behind Part (i) of the proposition is that border control does not directly affect the exploitation decision making because exploitation takes place after border crossing. That is, the decision is made, assuming successful border crossing. However, it raises the shut-down fee for non-exploitative smugglers in (9). This also affects the shut-down fees for exploitative smugglers in (13). This increase is to compensate an increased risk of apprehension at the border. As (16) implies, the least capable of exploitation will exit the market first.

Parts (ii) and (iii) of the proposition result from the fact that these measures negatively influence the profitability of migrant exploitation via (1), and an increase in these implies a smaller number of smugglers to become exploitative. The marginal penalty for exploitation does not affect the profitability of smuggling, as far as the smuggler decides not to exploit its customer. Hence the full participation is maintained. However, the penalty for smuggling negatively affects both the profitability of exploitation and smuggling, as (1) and (3) imply. As a result, its effect on the number of active smugglers remains ambiguous.

The intuition behind Part (iv) of the proposition is that a high probability of catching smuggled migrants reduces each worker's expected gain from migration. This will be reflected in the equilibrium fee in (17). A fall in f then lowers $\tilde{k}^*$, which increases the average exploitation by increasing the ratio of exploitative to non-exploitative smugglers. Lemma 2 indicates that the higher the exploitation capacity, the lower the shut-down fee. Hence sufficiently high λ_M will drive away non-exploitative smugglers from the market.

Part (v) of the proposition suggests that the effect of improved inland apprehension of exploitative smuggers is similar to that of improved inland apprehension of smuggled migrants, as far as the apprehension rate remains low. If λ_S exceeds a certain level given in the proposition as a result of improved apprehension effort, the average exploitation decreases because $\tilde{k}^*$ would then be increased. Its effect on the equilibrium fee then becomes ambiguous, and hence it is not clear whether the full participation is maintained.

Compared to this full participation case, we have a simple, unambiguous result when the initial equilibrium is characterized by adverse selection, ie, the absence of non-exploitative smugglers.

Proposition 4 *When all non-exploitative smugglers exit the market in initial equilibrium, ie, $f^* \leq \bar{f}$, the number of active exploitative smugglers is decreasing in any of the anti-smuggling measures, while the average exploitation in the market is increasing in it.*

Proof. See Appendix 2. ■

The implication is that, under adverse selection, policymakers face a dilemma of whether to reduce the average exploitation that each smuggled migrant suffers from or the availability of smuggling services to potential migrants.

6 Conclusion

This paper formalized the migrant smuggling market in which migrants face a risk of being exploited after successful border crossing. Our model is a variant of Akerlof's (1970) lemons framework.

The comparative statics analysis provided us with policy implications by linking the fight against illegal migration with the risk of exploitation that migrants face when using smuggling services.

We found that, in the market where all migrants are more or less exploited by smuggling agents (Proposition 4), policies that reduce the number of active smuggling agents inevitably raise the average exploitation. Policy-makers are thus likely to face a dilemma of whether to minimize the mean exploitation of trafficked migrants or to reduce the availability of smuggling services. Accordingly, if exploitation is becoming severer than before, it might be a byproduct of a successful reduction in the number of smuggling activities overall.

We also found that, in the market where there are some unexploited migrants (Proposition 3), unlike the adverse selection case, different policy instruments do not have the same effect on the average exploitation and the number of active smugglers.

A severe marginal penalty for labor exploitation (Part iii) is a policy choice for those who are concerned with the welfare of smuggled migrants because it reduces the average exploitation. Regardless of how severe it is, an increase in the marginal penalty avoids the exit of all non-exploitative smugglers that results in a sudden increase in the average exploitation.

A large penalty for migrant smuggling (Part ii) also reduces the average exploitation. However, it raises both non-exploitative smugglers' shut-down fee and the equilibrium fee, and it remains ambiguous whether a large penalty for smuggling can avoid a sudden increase in the average exploitation due to the exit of all non-exploitative smugglers.

An improvement in border control (Parts i and ii) is not recommended because, while it has no effect on the average exploitation as far as the equilibrium fee is higher than non-exploitative smugglers' shut-down fee, it raises the latter by increasing the risk of conducting the illicit business. Improved border apprehension then indicates the market moves to the adverse selection state.

Improved inland apprehension of smuggled migrants (Part iv) is not a choice either if the welfare of smuggled migrants is important, while our result leaves ambiguity as to the effect of improve inland apprehension of exploitative smugglers on the mean exploitation and the number of active smugglers (Part v).

If a sufficient resource is available under this initially non-adverse selection equilibrium, inland apprehension of smuggled migrants (λ_M) and border apprehension (β_M and β_S) can be used to first push the market to the adverse selection state, and then any instrument may be used to reduce the number of active smugglers to zero. However, such a sufficient resource is unlikely to be available.

Policymakers may also note the conflicting effects among the instruments. For instance, a combination of a large marginal penalty for exploitation (q) and a high probability of apprehending smuggled migrants inland (λ_M) would imply that one effect is likely to offset the other. As a result, neither of the instruments may appear effective *ex post*.

The reliability of the results in this paper is limited in several aspects. One concern is that the model assumes an exogenous distribution of the exploitation capacity among potential suppliers of smuggling services. However, it is perceivable that this capacity would respond to the profitability of exploitation. Extending the model by endogenizing exploitation capacity building may change the results and is left for a future study.

Another future research topic in this area is to see the equilibrium in a dynamic setting. Descriptive evidence suggests that potential migrants often make use of social networks in their search for reliable smugglers. On the other hand, it also suggests that traffickers are cunning and are able to find victims. A study that examines an equilibrium path with information transmission over time is suggested.

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Appendix

1. Excerpts from UN (2000a) and UN (2000b)

UN 2000b, Article 3(a) "Smuggling of migrants" shall mean the procurement, in order to obtain, directly or indirectly, a financial or other material benefit, of the illegal entry of a person into a State Party of which the person is not a national or a permanent resident;

UN 2000b, Article 3(b) "Illegal entry" shall mean crossing borders without complying with the necessary requirements for legal entry into the receiving State;

UN 2000a, Article 3(a) "Trafficking in persons" shall mean the recruitment, transportation, transfer, harbouring or receipt of persons, by means of the threat or use of force or other forms of coercion, of abduction, of fraud, of deception, of the abuse of power or of a position of vulnerability or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation. Exploitation shall include, at a minimum, the exploitation of the prostituion of others or other forms of sexual exploitation, forced labour or services, slavery or practices similar to slavery, servitude or the removal of organs;

UN 2000a, Article 3(b) The consent of a victim of trafficking in persons to the intended exploitation set forth in subparagraph (a) of this article shall be irrelevant where any of the means set forth in subparagraph (a) have been used;

2. Proof of Propositions 3 and 4 (comparative statics)

First, we show how the expected labor exploitation changes with respect to a change in the threshold exploitation capacity. Second, we show how the threshold exploitation capacity changes with respect to a change in each policy instrument. Using the obtained results, we summarize how the average exploitation changes with respect to a change in each policy instrument. Finally, we show how the gap between the equilibrium fee and the shut-down fee for non-exploitative smugglers changes with repect to a change in each policy instrument because, as (16) implies, the number of active smuggling agents depends on the equilibrium fee in relation to the shut-down fee.

(19) suggests $d\kappa^*/d\tilde{k}^* < 0$ if $f^* > \bar{f}$. Otherwise, $d\kappa^*/d\hat{k}^* > 0$ because $\hat{k}^* \in (0,1)$ although both the denominator and the numerator of κ^* are decreasing in $\hat{k}^*$. That is, the size of the decrease in the numerator is smaller than that in the denominator. Note $d\kappa^*/d\tilde{k}^* \in (-1,0)$ and $d\kappa^*/d\hat{k}^* \in (0,1)$.

Let us rearrange $\tilde{k}^*(p, q, \lambda_M, \lambda_S)$ in (14) as follows:

$$\begin{aligned} F_1 &\equiv [(1-\lambda_S)\, y - \lambda_S q]\, \tilde{k}^* - \lambda_S (1-\lambda_S)(1-\lambda_M)\, y\, (1-\kappa^*) - \lambda_S p \\ &= 0. \end{aligned}$$

By applying the implicit function theorem to F_1, we obtain the following derivatives:

$$\begin{aligned} \frac{d\tilde{k}^*}{dp} &= \frac{\lambda_S}{\partial F_1/\partial \tilde{k}^*} \\ \frac{d\tilde{k}^*}{dq} &= \frac{\lambda_S \tilde{k}^*}{\partial F_1/\partial \tilde{k}^*} \\ \frac{d\tilde{k}^*}{d\lambda_M} &= \frac{-\lambda_S (1-\lambda_S)\, y\, (1-\kappa^*)}{\partial F_1/\partial \tilde{k}^*} \\ \frac{d\tilde{k}^*}{d\lambda_S} &= \frac{(y+q)\, \tilde{k}^* + p + (1-2\lambda_S)(1-\lambda_M)\, y\, (1-\kappa^*)}{\partial F_1/\partial \tilde{k}^*} \end{aligned}$$

where $\partial F_1/\partial \tilde{k}^* = (1-\lambda_S)\, y \left[1 + \lambda_S (1-\lambda_M)(d\kappa^*/d\tilde{k}^*)\right] - \lambda_S q$. Note that $\partial F_1/\partial \tilde{k}^* > 0 \Leftrightarrow (1-\lambda_S)\, y \left[1 + \lambda_S (1-\lambda_M)(d\kappa^*/d\tilde{k}^*)\right] > \lambda_S q \Leftrightarrow$

$$y > \frac{\lambda_S (1-\lambda_S)(1-\lambda_M)\, y (d\kappa^*/d\tilde{k}^*) + \lambda_S q}{1-\lambda_S}$$

which is the case under Assumption 1. Hence $d\tilde{k}^*/dp > 0$, $d\tilde{k}^*/dq > 0$ and $d\tilde{k}^*/d\lambda_M < 0$. The sign of $d\tilde{k}^*/d\lambda_S$ is determined by the numerator. $d\tilde{k}^*/d\lambda_S > 0$ if $(y+q)\, \tilde{k}^* + p + (1-2\lambda_S)(1-\lambda_M)\, y\, (1-\kappa^*) > 0$ or

$$\frac{(y+q)\, \tilde{k}^* + (1-\lambda_M)\, y\, (1-\kappa^*) + p}{2(1-\lambda_M)\, y\, (1-\kappa^*)} > \lambda_S.$$

Let us rearrange $\hat{k}^* (p, q, \lambda_M, \lambda_S, \beta_M, \beta_S)$ in (15) as follows:

$$\begin{aligned} F_2 &\equiv \frac{\beta_S p + c + \bar{\pi}}{(1-\beta_S)(1-\beta_M)} + \lambda_S p \\ &\quad - (1-\lambda_S)^2 (1-\lambda_M) y (1-\kappa^*) - [(1-\lambda_S) y - \lambda_S q] \hat{k}^* \\ &= 0. \end{aligned}$$

By applying the implicit function theorem to F_2, we obtain the following derivatives:

$$\begin{aligned} \frac{d\hat{k}^*}{dp} &= \frac{\beta_S / (1-\beta_S)(1-\beta_M) + \lambda_S}{-\partial F_2 / \partial \hat{k}^*} \\ \frac{d\hat{k}^*}{dq} &= \frac{\lambda_S \hat{k}^*}{-\partial F_2 / \partial \hat{k}^*} \\ \frac{d\hat{k}^*}{d\lambda_M} &= \frac{(1-\lambda_S)^2 y (1-\kappa^*)}{-\partial F_2 / \partial \hat{k}^*} \\ \frac{d\hat{k}^*}{d\lambda_S} &= \frac{2(1-\lambda_S)(1-\lambda_M) y (1-\kappa^*) + (y+q)\hat{k}^* + p}{-\partial F_2 / \partial \hat{k}^*} \\ \frac{d\hat{k}^*}{d\beta_M} &= \frac{(\beta_S p + c + \bar{\pi}) / (1-\beta_S)(1-\beta_M)^2}{-\partial F_2 / \partial \hat{k}^*} \\ \frac{d\hat{k}^*}{d\beta_S} &= \frac{(p + c + \bar{\pi}) / (1-\beta_S)^2 (1-\beta_M)}{-\partial F_2 / \partial \hat{k}^*} \end{aligned}$$

where $-\partial F_2 / \partial \hat{k}^* = (1-\lambda_S) y \left[1 - (1-\lambda_S)(1-\lambda_M)(\partial \kappa^* / \partial \hat{k}^*)\right] - \lambda_S q$. Note that $\partial F_2 / \partial \hat{k}^* < 0 \Leftrightarrow (1-\lambda_S) y \left[1 - (1-\lambda_S)(1-\lambda_M)(\partial \kappa^* / \partial \hat{k}^*)\right] > \lambda_S q \Leftrightarrow$

$$y > \frac{(1-\lambda_S)^2 (1-\lambda_M) y (\partial \kappa^* / \partial \hat{k}^*) + \lambda_S q}{1-\lambda_S}$$

which is the case under Assumption 1. Hence the six total derivatives are all positive.

To summarize the results so far, if $f^* > \bar{f}$,

$$\frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{dp} < 0, \; \frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{dq} < 0, \; \frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{d\lambda_M} > 0, \text{ and}$$

$$
\begin{aligned}
\frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{d\lambda_S} &> 0 \text{ if } \frac{(y+q)\,\tilde{k}^* + (1-\lambda_M)\,y\,(1-\kappa^*) + p}{2\,(1-\lambda_M)\,y\,(1-\kappa^*)} > \lambda_S \\
&\leq 0 \text{ otherwise.}
\end{aligned}
$$

If $f^* \leq \bar{f}$,

$$
\frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{d\beta_M} > 0,\ \frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{d\beta_S} > 0,\ \frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{dp} > 0,\ \frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{dq} > 0,
$$

$$
\frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{d\lambda_M} > 0, \text{ and } \frac{d\kappa^*}{d\hat{k}^*}\frac{d\hat{k}^*}{d\lambda_S} > 0.
$$

We now turn to the number of active smugglers in the market. As (16) and Lemma 3 indicate, it is dependent on the gap between the market fee and the shut-down fee for non-exploitative suppliers. Let

$$
\begin{aligned}
D\,(\beta_M, \beta_S, p, q, \lambda_M, \lambda_S) &\equiv f^* - \bar{f} \\
&= (1-\lambda_S)\,(1-\lambda_M)\,y\,(1-\kappa^*) - \frac{\beta_S p + c + \bar{\pi}}{(1-\beta_S)\,(1-\beta_M)}.
\end{aligned}
$$

Lemma 3 implies the full participation when $D > 0$. The relevant threshold capacity is $\tilde{k}^*$. We have

$$
\begin{aligned}
\frac{dD}{d\beta_M} &= \frac{-\,(\beta_S p + c + \bar{\pi})}{(1-\beta_S)\,(1-\beta_M)^2} < 0 \\
\frac{dD}{d\beta_S} &= \frac{-\,(p + c + \bar{\pi})}{(1-\beta_S)^2\,(1-\beta_M)} < 0 \\
\frac{dD}{dp} &= -\,(1-\lambda_S)\,(1-\lambda_M)\,y\frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{dp} - \frac{\beta_S}{(1-\beta_S)\,(1-\beta_M)} \\
\frac{dD}{dq} &= -\,(1-\lambda_S)\,(1-\lambda_M)\,y\frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{dq} > 0 \\
\frac{dD}{d\lambda_M} &= -\,(1-\lambda_S)\,y\,(1-\kappa^*) - (1-\lambda_S)\,(1-\lambda_M)\,y\frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{d\lambda_M} < 0 \\
\frac{dD}{d\lambda_S} &= -\,(1-\lambda_M)\,y\,(1-\kappa^*) - (1-\lambda_S)\,(1-\lambda_M)\,y\frac{d\kappa^*}{d\tilde{k}^*}\frac{d\tilde{k}^*}{d\lambda_S}
\end{aligned}
$$

When $D \leq 0$, the relevant threshold capacity is $\hat{k}^*$. We then have all the six derivatives negative.