Smuggling Strategies in Developing Countries: Dissecting the Two-Person Game

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Abstract- ***This paper examines the complex interactions between smugglers and state security agencies in developing counties through the prism of game theoretical model. The study employ the two-person zero-sum and non-zero sum game to examine situations of conflict and consensus between smugglers and security agents in borderlands. In zero-sum game, the paper identify that smugglers employ the use of route diversification, concealment and speed and timing strategies to achieve their goals. In contest, border security agents employ strategies such as becoming unpredictable, cut-setting targets, use of advance modelling and deception as counter strategies against smugglers which leads to seizure of goods, arrest of smugglers and creating conditions that make it difficult for them to operate. However, despite the security agencies counter-smuggling efforts, the study further finds out that security agents do collaborate with smugglers to facilitate smuggling (two-person non-sum game). The study identify some of the several strategies used by the duo to achieve their goals. This include but not limited to official route collusion, tacit cooperation, institutional co-optation and signalling and coordination. The study concluded that while smugglers constitute threat to the socio-economic and political well-being of developing nations, their success was a product of the partial contributions of border security agencies.***

Index Terms- ***smugglers, security agents, developing countries, strategies***

I. INTRODUCTION

Smuggling refers to the illegal and clandestine movement of goods, people, and contraband across international borders in violation of state laws and regulatory frameworks, often with the intent to evade taxes, promote terrorism, exploit natural resources (such as minerals or fuel), traffic arms, distribute counterfeit drugs, and engage in human trafficking or migrant smuggling (Andreas, 2011; Reuter & Majmundar, 2015). Smuggling is recognised as a global phenomenon and is particularly widespread in developing countries in Asia and Africa, where state borders are porous, institutions are weak, poverty is pervasive, corruption is rampant, regional economic disparities are stark, and ethnic linkages reinforce illicit networks (Nordstrom, 2007). These conditions create a conducive environment for smugglers to operate in defiance of state rules and regulations enforced by agencies such as customs and immigration authorities.

The relationship between smugglers and state agents is characterised by a complex interplay of conflict, cooperation, deception, and negotiation, with each actor employing rational strategies to achieve its objectives (Shelley, 2018). While state agents are trained, equipped, and deployed to curb smuggling activities along borders, smugglers adopt counter-strategies to circumvent security measures, including exploiting weaknesses in border security systems and recruiting security agents as informants (Iwuoha & Chijioke, 2021). The result is a dynamic interaction that generates both gains and losses for the state and smugglers. Notably, the smuggling phenomenon can be conceptualised as a repeated game that enables both actors; state agents and smugglers to interact, adapt, and anticipate each other's actions over time (Tirole, 1988).

Against this backdrop, this paper attempts to apply the game theoretic model to analyse the strategic interactions between the state agents and smugglers. The focus is primarily on a two-person game, examining both conflicting and complementary strategies employed by both players in this ongoing contest.

1.2 Statement of the Problem

Smuggling undermines national security, distort trade policies and national revenue and above all, erodes the legitimacy of state authority. Despite efforts by governments in developing countries to enhance border security by tightening patrols, imposing harsher penalties and in some cases closing the borders, these measures have over the time failed to produce any significant result (Andreas, 2011; Reuter & Majmundar, 2015) as arms, narcotics, illegal aliens and terrorists continued not only flourish but as continued to pose socio-economic and political instabilities to these state. This poses critical challenges to policy makers and researchers. This calls for an investigation into the strategies used by smugglers to achieve their goals and the counter strategies employed by the state through its agents to deter or restrict the smugglers from operating freely.

Existing literature on smuggling has focused primarily on the criminal aspects of smuggling and enforcement measures, with limited attention to the strategic interactions between state agents and smugglers (Nordstrom, 2007; Shelley, 2018). Therefore, this study adopts a game-theoretic approach to analyse smuggling not just as a criminal act but importantly, to understand how the calculated use of information, incentives, expectations, risks, and adaptability by both smugglers and security agents is used to achieve strategic goals. By doing so, this research aims to contribute to the theoretical literature on smuggling and inform strategically grounded policy responses.

The study therefore seek to answer questions such as what is the nature of strategies used by smugglers in developing countries? What are the counter strategies employed state agents to prevent these activities? Are there areas of collaborations between smugglers and security agents? The objective of this study is to understand the different strategies used by smugglers and the counter strategies employed by state agents to protect the states from illegal intrusion. It also seeks to understand areas of collaborations between smugglers and security agents. The assumption of this study is based on the idea that, smuggling will continue to flourish in developing countries as long as the institutions of the state are weak and security agents are corrupt.

1.3 Significance of the Study

This study is significant to scholarly discourses, especially in policy making and implementation. In the areas of scholarly contribution to scholarly discourse, the study provides us with knowledge on how various illegal but also well-coordinated strategies are formulated and used to facilitate the illegal importation of goods into states despite strict border security measures and sometimes closure. In areas of policy making, the findings of this study have direct relevance for policymakers and researchers in developing nations. Insights into the understanding of the strategies used for smuggling and counter smuggling can inform policy formulation on border security infrastructure, cross-border cooperation between states and cross-border reforms.

1.4 Methodology

The study is basically a qualitative study based on secondary data collected from different online sources (like journals, media articles, official documents, etc.). To analyse the data collected, the study employed the qualitative content analysis by identifying the recurring patterns, perspectives and arguments. It further employ comparative analysis to assess different cases of smuggling in the developing world with view to provide a broad understanding the similarities in the nature and dynamics of different strategies and counter strategies used by smugglers and security agents. The use of qualitative secondary data is suitable because it allows for in-depth analysis and understanding of smuggling and counter-smuggling strategies.

II. WHAT IS GAME THEORY?

Game theory is a branch of applied mathematics concerned with rational decision-making in situations involving multiple actors whose choices influence one another (Michener, 1983). It explains socio-economic interactions, particularly conflict and cooperation among decision-makers, often referred to as players (Rosenmüller & Trockel, 2001; Turocy & Stengel, 2001). The theory emphasises strategic

behaviour, incomplete information, mutual anticipation, bargaining, fairness, and, at times, cooperation through contracts and shared incentives.
Game theory focuses on how rational agents act in decision-making situations (Wetherson, 2011). While its application in mathematics and economics is highly quantitative, in the social sciences it provides an analytical framework for understanding strategic behaviour among political actors such as individuals, groups, and institutions.

In this study, two main categories of players are identified:

1. Smuggling agents (traders, transporters, currency converters, and borderland communities).
2. State representatives (security agencies such as customs officials responsible for border control).

Game theory originated from structured games like chess and poker that operate under defined rules (Brams, 2005). Its modern form is linked to the works of von Neumann and Morgenstern in Theory of Games and Economic Behaviour, later expanded by scholars such as Kenneth Arrow, Anthony Downs, and Mancur Olson (Munck, 2001). The theory is now widely applied in political science to analyse coalition formation, bargaining, and conflict resolution (Zagare, 1984).

Core Assumptions

1. Players: Games involve players who may be individuals, groups, or institutions and whose decisions affect one another (Zagare, 1984; Straffin, 1993).
2. Rationality: Players seek to minimise losses and maximise gains (MINIMAX) by ranking alternatives and selecting the most beneficial option (Olaniyi, 2001).
3. Interdependence: Outcomes depend on a player's decisions and those of others (Chwaszcza, 2008).
4. Nature of Interaction: Games can be cooperative (with communication and agreements) or non-cooperative which involves conflict (Varma, 2001). Strategy 1.
5. Payoffs: Gains or losses, measured in monetary or non-monetary terms, are often expressed numerically (Martins, 1978).
6. Strategy: A rational player adopts strategies to achieve the best possible outcome, anticipating the moves of others (Nitisha, 2016).

Although there are different types of games, this study adopts a two-person game model, specifically the two-person zero-sum and the two-person non-zero-sum games, as the interaction involves two key actors: smugglers and border security agencies.

Two-Person Zero-Sum Game

A two-person zero-sum game occurs when the interests of two players are completely opposed, so one player's gain equals the other's loss (Encyclopedia of Mathematics, 2014; Stengel, 2008). In such non-cooperative settings, communication is absent, and the sum of payoffs equals zero. In the context of smuggling, when traders successfully smuggle goods, the state loses through reduced revenue, market distortion, and security risks such as illegal arms or drug inflow. Conversely, when security agencies seize contraband, traders suffer losses in goods, finances, or even lives. A matrix of zero sum game is shown in the diagram below:

Table 1: Two Person zero sum game

	Smuggling Agents
Strategy	1 2
1 Security Agents 2	-3 +3 +3 -3

Summary:
Smugglers = - 3, Border Security Agents = +3. Hence, - 3 (+ 3) = 0;
Strategy 2. Border Security Agent= +3, Smugglers -3. Hence, (+3) – 3 = 0

Two-Person Non-Zero-Sum Game (Variable Sum Game)

Unlike the zero-sum game, where players' interests are strictly opposed, the two-person non-zero-sum game features both competitive and complementary interests (Straffin, 1993). In such a game, players' gains and losses are not equal, and the total outcome is not fixed. Cooperation is theoretically possible, as players may communicate and choose strategies simultaneously, but in practice, cooperation is rare (Straffin, 1993).

Here, each player's payoff depends on the strength and efficiency of their strategy. A gain by one player does not correspond to an equivalent loss by the other. For instance, if Player A receives a payoff of 5, Player B may receive 7 or 10, depending on their respective strategies. This variability explains why the game is termed a variable-sum game (Olaniyi, 2001). A well-known example is the Prisoner's Dilemma. In this scenario, two individuals accused of a crime are interrogated separately. Each faces the following options:

- If one confesses (defects) while the other remains silent (cooperates), the confessor is freed, and the other receives a maximum sentence (e.g., three years).
- If both confess, they receive moderate sentences (e.g., two years each).
- If both remain silent, they face minimal punishment (e.g., one year each).

This example illustrates how strategic decisions under uncertainty shape outcomes, demonstrating that individual rationality can lead to collectively suboptimal results.

Table 2: Two person non-zero-sum game: The Prisoner's Dilemma Game

Strategy		*Player B*	
		1	2
No confession	1	(-1, - 1)	(- 3, 0)
Player A			
Confession	2	(0, -3)	(-2, 2)

Ideally, each player in this situation will prefer not to confess, especially if he is certain that his counterpart will adhere to the non-confession strategy (one year). This is more likely if both players have previously developed trust or communicated beforehand. However, in the absence of information sharing and trust, each prisoner is likely to adopt the confession strategy (two years) to avoid the possibility of receiving the maximum sentence. This tendency increases when one or both suspects anticipate the risk of betrayal by the other (Olaniyi, 2001).

The prisoner's dilemma, therefore, illustrates a situation in which individuals choose a relatively undesirable strategy to avoid an extremely undesirable outcome. In this case, confession (or disloyalty to the partner) becomes the dominant strategy: the most rational decision under the MINIMAX principle (Olaniyi, 2001).

III. APPLICATION OF TWO PERSON GAME TO SMUGGLING

The relationship between smugglers and security agents can be understood as a two person strategic interaction involving smugglers and state agents such as Customs, Immigration, and the Police. This relationship may be purely adversarial, where one player's gain equals the other's loss, or collaborative, where outcomes are mutually beneficial through cooperation or collusion. The interaction is represented by a payoff matrix, where each player's payoff depends on the effectiveness of their strategy.

3.1 The Zero Sum Strategies

In a zero-sum context, the smuggler and the state are two opposing but contesting players. State agents seek to prevent the illegal importation or exportation of goods, services, and people, whereas smugglers aim to bypass legal protocols by any means necessary in pursuit of profit. This creates a situation in which each actor operates with the intention of outmaneuvering the other. Strategies are shaped by the availability of information, the geography of the border, and the nature of the goods being smuggled. The success of one actor is often measured by the corresponding loss of the other (Andreas, 2011; Frontex, 2017).

Route Diversification

Route diversification is one of the most common strategies employed by smugglers to minimize detection and maximize profit. The rationale is to remain unpredictable and reduce surveillance by security forces. Smugglers often abandon traditional trails in favor of mountainous passes, bush paths, or sea corridors, even if these are longer and more dangerous (Reitano & Shaw, 2015). To enhance resilience, smugglers maintain multiple corridors, allowing them to switch routes when others are compromised. This adaptability is frequently supported by informants recruited from borderland communities who provide intelligence on enforcement patterns (Micallef, 2017).

The changing dynamics of migration illustrate this pattern. Since 2017, smugglers on the Libyan coast have shifted from the central Mediterranean route to the western Mediterranean, which, although longer and riskier, has weaker patrol presence (Hoffmann Pham & Komiyama, 2022). Likewise, when crackdowns in Agadez and Gao intensified or COVID-19 restrictions closed borders, smugglers redirected flows to emerging hubs such as Tahoua in Niger and onward to Tamanrasset in Algeria (United Nations Office on Drugs and Crime [UNODC], 2021).

Concealment

Smuggling is also heavily reliant on concealment, whereby illicit goods are hidden within legitimate cargo, clothing, or ordinary objects to avoid detection. Concealment is often a direct response to heightened enforcement efforts (Basu, 2014). Smugglers transporting high-risk items such as cocaine and heroin disguise them inside shoes, food parcels, or electronic goods. Nigerian smugglers in particular are known for using human couriers who ingest narcotics for transport to Europe and Asia (UNODC, 2013). Others conceal drugs in smoked fish, cartons, and other everyday commodities (Adeniran, 2019).

Speed and Timing

Speed and timing are critical to smuggling operations. Smugglers study border enforcement routines, identifying high- and low-surveillance periods. Movements are often timed for nights, holidays, or seasonal disruptions when authorities are less vigilant (Frontex, 2017). Rapid mobility using motorcycles or speedboats enhances the chances of evasion. Success is frequently facilitated by insider notifications or bribe-based permissions, allowing smugglers to operate when officials are indifferent or disengaged (Reitano & Shaw, 2015).

These patterns are observable across different regions. At the Nigeria–Benin border, smugglers use motorcycles on bush routes between midnight and early morning (Meagher, 2014). Along the Zimbabwe–Mozambique border near Penhalonga, speedboats are employed under cover of darkness, prompting locals to remark that “borders move at night.” In Thailand, cocaine and heroin are concealed in timber shipments, while in Mozambique and Malaysia, elephant tusks, rhino horns, and pangolin scales are hidden within wood exports. In Somalia, banned charcoal is routinely relabelled as originating from Djibouti or Tanzania to circumvent sanctions (Elliott, 2018; UNODC, 2020).

3.2 Border Security Agents and Counter Smuggling Strategies

Commitment to Unpredictability

The degree of success in a zero-sum smuggling strategy depends largely on the information available to smugglers. In response, border security agencies avoid fixed patterns of operation when carrying out patrols, surveillance, inspections, and enforcement operations by making unknown to the public the day, time, location, and methods of checks. They further adopt randomized mobile checkpoints, otherwise known as leapfrogging (Darlington, Glazebrook, Leslie, Shone, & Szechtman, 2022). Smugglers are business-minded clandestine traders; they calculate risks before moving their goods. If they can predict enforcement behaviour, they can reduce risk; however, if they cannot, they will pay higher costs, losing their goods, paying huge bribes, taking costlier routes, wasting more time, and putting more goods in danger (UNODC, 2022a).

In Nigeria, the Nigerian Customs Service (NCS) created a special mobile unit known as the Strike Force. This unit is known for irregular patrol schedules and relocates from one checkpoint to

another, enticing even other customs officers in the borderlands (Mohammed, 2019). In Kenya–Somalia border areas, unpredictable roadblocks instead of checkpoints exist. They move their control points at different times of the day and at night to intercept smuggling convoys coming from Somalia (International Crisis Group, 2020). These measures make it difficult for smugglers to predict security operations and locations, placing them at higher risk of being arrested.

Interdiction on Networks (Cut-set Targeting)

This involves identifying and striking key linkages, actors, and driving forces within the smuggling network to weaken the entire structure (Cheema, 2023). The goal is to remove critical connection points to cut financial, information, and communication flows. Measures may include closing fuel stations supplying smugglers, arresting kingpins and financiers, freezing bank accounts, and dismantling logistics chains (UNODC, 2022b). This approach can be a game-changer, especially when combined with modern technology such as GIS mapping and drone surveillance (Darlington et al., 2022).

For example, Brazilian authorities sometimes target strategic docking stations and airstrips used by cocaine traffickers to disrupt logistics chains, forcing traffickers to seek costlier alternatives and reducing overall overflow (Darlington et al., 2022). Indian authorities are known for destroying diesel storage depots and tanker supplies, which act as stock points for smugglers (Cheema, 2023). In Kenya, authorities have worked with INTERPOL to identify export hubs and shipping agents connected to the ivory trade (International Crisis Group, 2020).

Engaging in Adversary Modelling

This proactive border security strategy involves studying smugglers' psychology, methods, and motivations to anticipate and neutralize their activities (Darlington et al., 2022). Agencies develop detailed profiles of smuggling actors, including traders, transporters, brokers, corrupt officials, and financiers. They also analyse routes, terrain, seasonal mobility patterns, and transport modalities to understand smuggling strategies such as concealment, under-invoicing, misclassification, and falsification of countries of origin (UNODC, 2022a). Simulation exercises replicate smugglers' patterns without the knowledge of patrolling officers to identify loopholes in the border control system. Officers are then mobilized to conduct intelligence-based operations to dismantle smuggling networks, routes, and storage facilities. On the Pakistan–Afghanistan border along the Durand Line, officers conduct terrain analysis, tribal network mapping, and prior network data to forecast likely smuggling activities (UNODC, 2022b; Cheema, 2023).

Use of Deception Strategies

Deception strategies deliberately use misinformation, unpredictability, and tactical ambiguity to mislead smugglers and lure them into traps (Darlington et al., 2022). Security agencies create false checkpoints, rotate patrol schedules, use coded language, spread rumours, and disguise vehicles to patrol suspected routes for interception. Officers are sometimes planted as informants within smuggling networks. Dummy cameras, drones, and radars are also deployed to create the impression of constant surveillance (Mohammed, 2019).

The Nigerian Customs Service is known for using dummy checkpoints to confuse smugglers (Mohammed, 2019). Indian Customs use decoy trucks with controlled goods to attract and arrest smugglers or bribe-seeking officers (Cheema, 2023). In Kenya, fake CCTV cameras along porous borders create the illusion of continuous monitoring (International Crisis Group, 2020). In the Pakistan–Afghanistan borderlands, false information is leaked to smugglers through informants, forcing them to reroute to areas where security agents are waiting (UNODC, 2022b).

The objective of all these strategies is to disrupt smuggling routes, make smuggling riskier, more dangerous, expensive, and easier to intercept, reducing smugglers' confidence in their intelligence and making them fearful of the outcomes (Darlington et al., 2022; UNODC, 2022a).

3.3 The Zero-non-sum strategies

While the zero-sum strategy portrays the relationship between state security agencies and smugglers as purely a conflicting contest where the gains of one actor are necessarily the losses of the other, in the non-zero-sum strategy, such relationship is guided by mutual dependence backed by cooperation and bargaining (Andreas, 2011). Hence, rather than security agencies and smugglers seeing themselves as enemies, the non-zero-sum game recognises the fact that state legitimacy, local economic survival, and security imperatives are interconnected (Golub, 2012). It focuses on the existence of accommodation, negotiation, and tolerance in smuggling and security. Some of the strategies employed by both security agents and smugglers to achieve the non-zero-sum strategy include:

Official Route Collusion

Official Route Collusion (ORC) refers to a non-zero-sum smuggling approach in which border security operatives cooperate with smugglers to facilitate the illegal movement of people, goods, and services through official routes (Golub, 2012). Unlike in the zero-sum game, where smugglers use clandestine routes and choose between total gain and total loss, under this strategy, both players cooperate to achieve the common goal of smuggling (Andreas, 2009). This form of smuggling flourishes in states that are weak and fragmented, with security agents receiving low pay and weak oversight functions, creating a conducive environment for corruption (Golub, 2012). Under this arrangement, security agents refrain from inspecting, seizing, or reporting illegal goods or people in exchange for a fixed negotiated amount. This interaction is based on a repeated game model where both players prefer long-term cooperation over short-term betrayal (IOM, 2020).

Such situations can be observed at the Pakistan–Afghanistan border at Torkham crossing, where officials set fixed bribe payments for customs and security agents and, in turn, allow goods to cross without inspection (Felbab-Brown, 2013). The collusion usually involves customs officers, border police, and political elites. At the Seme-Krake border crossing along the Nigeria–Benin border, smugglers collude with customs through local trade unions to allow the passage of goods. Officials receive bribes (locally known as “roja” or “egunje”) to allow goods to cross the border without checks (Golub, 2012). Similar cases are observed at the Thailand–Myanmar border at Mae Sot–Myawaddy crossing and at South Sudan’s Heglig–Bentiu axis (McLinden et al., 2011).

Tacit Cooperation

Tacit cooperation refers to silent, non-enforcement and informal tolerance between small-scale informal traders and security agents (Golub, 2012). It is based on informal understandings, silent agreements, and mutual tolerance between survival traders and border security agents. Unlike official collusion which involves deliberate cooperation, tacit cooperation does not require any form of communication or direct alliance; rather, it is based on mutual avoidance of confrontation and the informal recognition of boundaries and interests (Flynn, 1997). This strategy flourishes where there is widespread small-scale informal trade across borders, and security agents recognise that local economies depend heavily on informal economies for survival (Golub, 2012).

Examples include Nigeria’s Illela and Kamba borders, where security agents focus on inspecting larger trucks while allowing small-scale smugglers to operate undisturbed (Golub, 2012). Similar patterns are seen at Uganda’s Arua border, where officials overlook smuggling of sugar, petrol, and clothing in small volumes. Comparable cases exist at the Indonesia–Malaysia border, where security agents allow locals to trade freely provided it remains discreet and non-criminal (IOM, 2020). At the Pakistan–Afghanistan border (Torkham and Chaman), security agents focus on discretionary checks of goods such as fuel, food, and electronics to avoid tribal resistance (Felbab-Brown, 2013). Ethnicity also promotes tacit cooperation as officers tend to avoid policing those from their kinship or linguistic group (Golub, 2012). Golub (2012) refers to this form of strategy as “legal illegality.”

Institutional Co-optation

Institutional co-optation involves the deliberate incorporation of state institutions into the smuggling network, allowing smuggling to flourish with less resistance (Andreas, 2011). It transforms law enforcement officials into smuggling facilitators,

providing smugglers with time schedules, clearance, and route security (McLinden et al., 2011). Beyond routine bribery, smugglers often fund political parties, influence security deployments, and integrate state actors as financial stakeholders (Golub, 2012).

This strategy is evident in Nigeria–Niger and Nigeria–Benin borderlands, where smugglers of fuel, foodstuffs, and manufactured goods are often escorted for guaranteed safe passage (IOM, 2020). In Uganda's border with the Democratic Republic of Congo (DRC), officials openly collect informal taxes on banned goods, highlighting state complicity (Felbab-Brown, 2013).

Signalling and Coordination

Unlike institutional co-optation, signalling and coordination focus on trust-building and network communication among smugglers. This is often achieved through coded language, cultural signs, colours, and non-verbal cues (Flynn, 1997). Mobile technology and social media have enabled the use of emojis and layered codes to communicate border security updates (IOM, 2020). These strategies exploit weak periods, such as during market days, religious festivals, or night-time fatigue of officers (McLinden et al., 2011). Examples include Nigeria–Niger smugglers using proverbs and headlight flashes, Pakistan–Afghanistan smugglers using tribal codes, and Tuareg smugglers in Mali–Algeria employing symbolic vehicle markings (Felbab-Brown, 2013).

CONCLUSION

This study explored key smuggling strategies in developing countries through the application of game theory, focusing on two-person zero-sum and non-zero-sum models. Using secondary data, the findings show that the interaction between smugglers and security agencies varies between conflict and cooperation. The zero-sum perspective reflects an adversarial relationship, where the success of one party represents a complete loss for the other. Within this framework, smugglers commonly employ tactics such as route diversification, concealment, and strategic timing, while enforcement agencies respond with counter-strategies like unpredictability, network disruption, adversary modelling, and deception.

The non-zero-sum approach presents a different reality, where mutually beneficial arrangements emerge. These include official route collusion, tacit cooperation, institutional co-optation, and signalling and coordination. Such strategies suggest that both actors often adapt to systemic weaknesses for their respective advantages. The continuation of these practices is closely linked to weak governance structures, porous borders, and widespread informal economic activities. These conditions create opportunities for smuggling networks to operate with relative ease.

Government therefore needs to take strict measures of border control by improving the institutional strength and accountability of border security agencies and providing alternative economic opportunities to border communities and above all, promote regional collaboration to ending smuggling.

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