



Distributing tobacco in the dark: assessing the regional structure and shipping patterns of illicit tobacco in cryptomarkets

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ABSTRACT

The size of the global market for illicit tobacco products is estimated to be between USD\$8.6 and USD\$11.6 billion yearly. In addition to an estimated cost of USD\$40.5 billion in lost tax revenue the illicit tobacco market further increases the accessibility of a harmful substance for minors and provides a revenue stream for both organised crime and violent political groups. In this paper, we examine how tobacco products are distributed globally through illicit online platform economies known as cryptomarkets. Using data from the cryptomarket Empire, we find tobacco products remain a small niche market exclusively shipping from the EU and that shipping patterns suggest the emergence of new supply routes for end-consumers within Western Europe originating from the UK. We find that the market for tobacco on cryptomarkets remains minimal, as in previous research, compared to the market for drugs.

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Introduction

The illicit distribution of tobacco has, in addition to the well-established negative health effects of smoking, uniquely harmful¹ social and political implications. Domestically², states are faced with serious losses in tax revenue from buyers consuming tobacco bought illicitly³. As a law enforcement and security problem, engagement in the industry involves less risk than, for example, drug distribution. This has been hypothesised as one of the reasons that organised criminal and terrorist groups engage in the industry reaping significant profits⁴. These profits are the by-product of domestic policies of taxation in combination with the low risk and ease of smuggling or diverting tobacco. At the global scale, the social and political harms associated with the trafficking and illicit distribution of tobacco, however, are not equally distributed: Illicitly traded tobacco is primarily consumed in less developed or low-income countries⁵, which lose important tax revenue. Violent political groups engaged in such countries have also engaged in tobacco trafficking to support armed conflict⁶. As Joossens et al⁷. point out ‘the burden of this illicit trade falls more upon lower-income countries’ who would both gain more tax revenues and reduce mortality to a greater extent than high-income countries.

In recent years, illicit markets have proliferated across a range of internet platforms both integrating themselves in already existing licit platforms and emerging as illicit platform economies⁸. In the latter category, a particular mode of facilitating the distribution of illicit goods and services on the 'dark web', cryptomarkets, which harness encryption and anonymisation technologies, have emerged⁹. A growing body of literature has examined the largest illicit online economies, stolen data and illicit drugs on these platforms¹⁰. However, these markets have also come to integrate other illicit markets for goods and services like tobacco¹¹, weapons¹², and wildlife trafficking¹³ – aspects of the ecosystem that are less understood, and which scholars have only recently begun to examine in depth.

Cryptomarkets predominantly cater to personal use- and retail-¹⁴, as opposed to wholesale-, buyers, but they are inherently transnational in their design, and scholars have found large quantities of the drug trade in these platforms to transcend national borders¹⁵. Combined, these findings attest to a disembedding of the traditionally locally and socially constrained drug trade below wholesale-levels¹⁶. Being a global endeavour, like the drug trade, the emergence of tobacco products in these markets suggests a similar potential with consequences such as the emergence of new supply routes for illicit tobacco, increased accessibility to new markets, easier access to tobacco for minors, and more broadly, a growth in the illicit tobacco market. Following this reasoning, this paper seeks first to establish patterns of supply and demand for illicitly traded tobacco products on cryptomarkets, and second to examine the extent of transnational trade with regards to the trafficking and distribution of illicit tobacco. Doing so, we extend a growing body of literature on the sale of illicit tobacco online¹⁷. We provide the most recent estimates and apply a new approach to differentiating revenues as derived from domestic, regional, or international trafficking, further illuminating on the patterns of trafficking.

Literature review

The WHO Framework Convention on Tobacco Control, FCTC, defines the illicit trade of tobacco as 'any practice or conduct prohibited by law and which relates to production, shipment, receipt, possession, distribution, sale or purchase including any practice or conduct intended to facilitate such activity'¹⁸. The status of illicit will refer to tobacco products that are procured or produced through smuggling, counterfeiting or illicit manufacturing¹⁹. One variety of such products is unbranded tobacco, which does not bear a well-known brand and is produced in clandestine factories. While constituting the largest part of the illicit trade of cigarettes, the market share of unbranded cigarettes has been decreasing in the last decade, losing ground to so-called illicit whites²⁰, which inside the EU grew from constituting 4.9% of the illicit cigarette market in 2007, to 27.9% in 2013²¹. These are legally produced cigarettes typically sold without paying import taxes or duty. Other varieties include the counterfeiting of known brands, or lower-level smuggling of tobacco products between jurisdictions with price differences, bootlegging. With the exception of counterfeiting, which further involves clandestine manufacture and copyright infringement, these varieties of tobacco products have the evasion of tax as a principal quality.

Each year, about 5.7 trillion cigarettes are consumed in the world²² of which between 9–13% are from the illicit trade, representing around 657 billion cigarettes annually²³. The market for illicit tobacco is argued to be growing²⁴ with Transcrime²⁵ suggesting the revenues generated to be between USD\$8.6 and USD\$11.6 billion per year. In terms of

economic consequences, Joossens et al²⁶ estimate that high-income countries experience a revenue loss of USD\$17.6 billion, while lower- and middle-income countries lose USD \$22.9 billion. Thus, should the illicit trade in tobacco be eliminated, this would result in an immediate gain in government revenues of USD\$31.3 billion annually. Further, it is estimated it would produce a drop in tobacco consumption of 2% and save 164,000 lives in 2030 and annually thereafter. Importantly, the social burdens associated with the illicit trade of tobacco are not equally distributed among countries. Instead, they primarily affect lower-income countries wherein consumption, and by extension revenue loss, is greater.

Causes and correlates of tobacco trafficking and illicit tobacco consumption

The causes and correlates of the consumption and trafficking of illicitly traded tobacco products are a subject of scientific debate, which intersects with the interests of different actors. The market for tobacco can be approached as a dual market in which the same product can take both the status of legal and illegal. The price of tobacco is largely a product of taxation, which differs extensively between countries. For example, in 2013 a pack of cigarettes cost EUR2.3 in Bulgaria and EUR8.6 in the United Kingdom²⁷. The profits which may be reaped from between-country differences in taxation, and the structure of global trade, is exemplified by Joossens and Raw²⁸. They present the potential profits from diverting cigarettes produced in a free-trade zone towards Europe: 'organised smugglers can buy a container of Jin Ling cigarettes in Russia (on which they pay no taxes) for USD \$100 000. The value of such a container in the EU is on average USD\$2 million, an enormous profit margin. In the UK the potential profit is as much as three times higher²⁹. As such, the existence of the illicit market for tobacco can be approached as the unintentional consequence of state regulation and taxation, which is typically the position taken by representatives of the industry who have argued that increased taxation increases the potential profits from the illicit trade by increasing the price difference between licit and illicit products. This position is partly supported by empirical evidence from Lakhdar³⁰ who argues that increased taxation in France led to an increase in legal or illegal cross-border purchases³¹. However, differences in taxation regimes cannot exclusively explain the prevalence of illicit trade of tobacco across nations. Joossens and Raw³² underline complementary factors such as the likelihood of being caught, penal sentences, the corruption level, and geopolitical conditions. Likewise, the economic interests of tobacco companies in increasing access to tobacco cannot be discounted either³³.

The convergence of these factors is illustrated by Norway, the country with the highest price of tobacco in the world (USD\$12 a pack of 25 cigarettes), wherein only 6% of survey respondents had encountered smuggled tobacco, compared to 36% in Lithuania where packs are among the cheapest in the world at USD\$2³⁴. In fact, the pattern of trafficking may in some cases be the reverse of what taxation as the primary driver suggests, which is evidenced in trafficking from European countries to, for example, Libya where approximately 80% of the cigarettes consumed are illegal³⁵. A complimentary cause to taxation is thus suggested by scholars who argue that weak state capacities to control the trade, high levels of corruption and the existence of organised criminal or violent political groups, may similarly explain the prevalence of illicitly traded tobacco³⁶. For consumers in these countries, illicitly traded tobacco may also present as preferable due to low standard of living, income, and economic inequality, which may all stimulate demand for cheaper product³⁷.

Thus, two complementary macro-level explanations for the causes of tobacco trafficking are proposed, the differences in taxation between countries and the level of state control and enforcement. Within the EU, with which much research has been concerned, the illicit market for tobacco was estimated at 58 billion cigarettes in 2007 (8.5% of the total market). While the European trade has grown in recent years, there are, however, significant differences between countries where some act as producers, others as transit countries and some as consumption countries³⁸. The barrier into bootlegging, low-scale cross-border purchases that are either legal or illegal, is in this context lowered by the Schengen agreement and the fact that the member states individually set limits, under a maximum defined by the European Union³⁹, on what constitutes a legal quantity that can be transmitted across borders without taxation⁴⁰.

Aziani and Dugato⁴¹ estimates that 42.8% of illicit tobacco in Europe originates in other member states, while 21.3% originate from states bordering the EU and 36.9% originate from non-member states that do not border the EU. Specifically, the most active countries are Russia (20% to 30% of the illegal market⁴²), China, United Arab Emirates, Belarus, Ukraine, Moldova, Latvia, Turkey, Poland, Egypt, Algeria, Pakistan, South Korea, Senegal and Serbia⁴³.

Actors involved in tobacco trafficking

As smuggling operations grow in scale, for example on the continuum from bootlegging to large-scale smuggling, the complexity of networks typically grow beyond single or few actors. Members of such networks take on different roles and positions and may include wholesalers, procurers, smugglers, street sellers, security personnel and so forth, whereas simple cross-border bootlegging may only require only one individual⁴⁴. Beyond networks of loosely affiliated actors⁴⁵, the literature suggests three types of actors to have financial interests and potential involvement in the trafficking of tobacco; organised crime, violent political groups and the industry itself⁴⁶. However, compared to the trafficking of illicit drugs, there is relatively little knowledge on the actors involved smuggling of tobacco.

Historically, organised crime in Europe, namely the mafia, has been active in the smuggling of tobacco, which has intersected with illicit endeavours encompassing stolen vehicles, arms and drug trafficking⁴⁷. Similarly, Colledge⁴⁸ argues, 'there is clear and convincing evidence of organized criminal activity in smuggling tobacco products from the United States into Mexico for at least 167 years'. However, scholars generally argue that contemporary tobacco smuggling is facilitated by networks of loosely affiliated offenders. Scholars have also argued that the tobacco industry may have a financial interest in tobacco trafficking of their own products (e.g. illicit whites), since this results in lower consumer prices and increased availability, for example to minors and people of low income⁴⁹. In fact, parts of the industry has been accused of selling products which they were aware would be diverted to the illicit market, and have been prosecuted for engaging in organised crime, money laundering, narcotics trafficking and financing terrorism group⁵⁰. Finally, there is some evidence that violent political groups, for example Al-Qaeda, ISIS, IRA, ETA, and FARC⁵¹, have profited from engagement in the illicit tobacco trade to finance their operations⁵².

The impact of the internet on tobacco trafficking

While much past research has looked at the offline social networks involved in the illicit trade of tobacco, technology is playing a growing role in the distribution of illicit products and the illicit trade of products at the international level. Goolsbee et al⁵³. evaluate the search conducted by people looking to purchase cigarettes on the internet each year at between 13 and 28 million searches. There is a small, but non-negligible, part of buyers of illicitly traded cigarettes who purchase on the internet. Their number appears to be rising over the past few years. These buyers are distributed all over the world though more prevalent in the United States, where the situation seems particularly problematic for the authorities⁵⁴. According to Hyland and al⁵⁵., 1.3% of US smokers purchase cigarettes on the internet at least once, a share that represents approximately 500,000 people. With the constantly online nature of our modern life, the number of smokers who make purchases online is expected to rise, forcing governments to change how they regulate and address this issue.

Collecting data on the illicit trade of goods on the internet has proved challenging in the past given the anonymous nature of online platforms and the little enforcement actions that have been undertaken. Research on the dark web has provided however interesting methodological designs and findings. The dark web is a subsection of the internet where communications are anonymised through a network of proxies. The dark web can be used to connect to a website anonymously and to host a website without disclosing the location of the hosting server. The dark web hosts on any given day about 90,000 websites and is used by about 2,000,000 individuals⁵⁶. Of these websites, a handful is used to buy and sell illicit goods and services. Called cryptomarkets⁵⁷, these websites have the same visual design as the large legal platform economies like eBay or Amazon: They are run by administrators who regulate the social interactions and take care of the technical aspects of hosting a website. In exchange, they take a commission on every transaction their website facilitates between independent buyers and sellers⁵⁸. The latest statistics show that cryptomarkets facilitate about USD\$550,000,000 in sales per year and that most of those sales are for illicit drugs⁵⁹. Cryptomarkets are a valuable research tool as they provide easy access to large numbers of ads for illicit products and services but also show customer feedbacks and sales statistics⁶⁰. This allows researchers to estimate not only the supply but also the demand coming from countries all over the world.

Scant research has looked at tobacco trafficking on cryptomarkets. Décary-Héту et al⁶¹. found 476 ads for cigarettes, electronic cigarettes, e-cigarettes accessories, rolling tobacco and pipes that generated USD\$75,648 in sales annually. These sales represented less than 1% of all the transactions that take place on cryptomarkets and were part of a large pool of products offered by vendors who also dealt in illicit drugs and counterfeits. The tobacco traffickers were however rarely involved in other sorts of smuggling than drugs like weapons, malware, or fraud products. The study suggests that the illicit trade of tobacco is not a full-time occupation for dark web traffickers due to its low income compared to other types of trafficking, as tobacco smugglers made an average of USD\$89 in revenue per month with the most productive seller earning an income of USD\$1,220⁶². On cryptomarkets, products mostly come from Europe, namely the United Kingdom, generating one fourth of the global revenue. The most active country was the United States, however, from which 151 ads were posted. About 70% of all listings advertised that they were available to international customers while 14% were limited to the United States and 9% to the United Kingdom.

Follow-up research shows that most revenues from tobacco smugglers are derived almost exclusively from other types of trafficking⁶³ and that tobacco vendors tend to be more diversified than other vendors and earn much less than their peers. They are located in the United States and Europe for the most part and were willing to ship worldwide in three quarters of the cases, as is the case for cryptomarket sellers in general⁶⁴. Barrera et al⁶⁵, however, found that activity was actual sales were predominantly from Europe, estimating the European market to generate less than USD\$7,000 per month through the sale of cigarettes and rolling tobacco. Their main revenue driver was different types of illicit drugs such as cannabis, stimulants, and psychedelics⁶⁶.

Combined, these studies provide a picture of online tobacco trafficking that is present, but still dwarfed by offline trafficking. The sale of illicit drugs through cryptomarkets has grown rapidly over the past decade, going from millions of dollars in 2012⁶⁷ to hundreds of millions of dollars⁶⁸. We still do not fully understand how the networks involved in tobacco trafficking are connected to those involved in other types of traffic, and more importantly, if the flows of illicit products sold on cryptomarkets all follow the same flows. The aim of this paper is to build on past research and address this research gap. Our main objective is to describe and understand the transnational qualities of the cryptomarket trade of tobacco. To do so, our two specific objectives will be to assess the size and scope of cryptomarket tobacco trafficking and to identify the countries where the tobacco is coming from and going to. We intend to apply the best methodology available to identify the source and destination of trafficking to enhance past research. Our second specific objective is to compare the flows of illicit goods and the flows of tobacco on cryptomarkets to understand if the same networks are involved in both trades. With this research, we will not only enhance our understanding of cryptomarkets, but also how illicit goods trafficked on the dark web move from one country to another.

Data and methods

We use data from the cryptomarket Empire spanning the period June 2018 to October 2019 collected using the DATACRYPTO infrastructure⁶⁹. Beginning as a relatively small platform, following the voluntary closure of its competitor Dream Market and the seizure of the competing Wall Street Market, Empire has grown into a large platform. While other markets exist, we focus on Empire for its high-quality data. Given the size of the platform and its long lifespan, and the drug economy on Empire broadly corresponding to existing cross-market studies of categories sold and origin countries⁷⁰, Empire market is representative of the cryptomarket economy in general. Empire thus constitutes an alternative to cross-market analyses as applied by Barrera et al⁷¹.

Data was collected through recurring crawls of the website over this period in which data was scraped and stored. All listings were classified using a machine-learning classifier⁷². Tobacco products were further evaluated qualitatively and separated into distinct categories drawing upon Barrera et al⁷³: We first reviewed items classified as tobacco and searched the dataset for listings with a high proportion of tobacco-related terms (e.g. tobacco, Marlboro, Virginia) to ensure items were not misclassified. We then used a revised classification schema building on Barrera et al⁷⁴, focusing specifically on tobacco products that are traditionally taxed.

Reducing the dataset to only drug listings, we identified 58.860 unique product listings, 2.467 vendors and 525.314 feedback ratings left throughout the collection period. Of these, 155 listings were for tobacco-products, 24 sellers sold tobacco products and 704 feedbacks were left for tobacco products. [Table 1](#) shows details the number of products and sellers within each category. Broadly, these figures correspond to what was observed by Barrera et al⁷⁵. which in 2017 found 243 out of 108.461 products across six markets to be tobacco related.

We use shipping information provided by vendors to construct product flows between regions and countries. The identification of origin and destination of products is difficult to assess, as some cryptomarket vendors will not state the nation of origin for their products. However, the relatively limited size of the tobacco market allowed a granular approach in which data collected over the period was used to qualitatively code origin and destination. For every tobacco vendor who did not specify an originating shipping country, we reviewed multiple data sources to identify their origin, including all recorded feedbacks, all observations of listings, and all observations of their vendor profile. In some cases, we were able to establish a more specific origin country than what was listed based on this. For the remainder of vendors, we relied on information provided by themselves.

To estimate revenues generated and products sold, we use the website's designation of the number of times a product was sold which provides a better estimate than using feedback as a proxy for transactions⁷⁶. Comparing the two, we find the former specifies 990 tobacco transactions, while there is only feedback for 704 transactions suggesting a coverage rate of 71.1% within that category. Either way, tobacco constitutes a fraction of the market, corresponding to observations from Barrera et al⁷⁷. The small number of transactions, compared to more popular products like MDMA or cannabis, does not, however, render analysis impossible or infeasible, since we are not dealing with a limited sample but high-quality representative data on actual product flows. The illicit trade of tobacco has a significant impact on tax revenues and the public health of all nations as becomes apparent in past research such as Transcrime's⁷⁸. While undeniably small, it is still essential that published works present the current state of dark web tobacco trafficking to raise the awareness of its existence and to record its nascent trends. Much focus is put in criminology on the professional and large-scale crime; this paper takes the alternative route of delving into a high impact crime through one of its lesser-known forms.

Table 1. Listings and sellers across product categories. Note, a seller can sell products within multiple categories.

Category	Listings	% of listings	Sellers in category
Stimulants	8605	14.62	1037
Opioids	2029	3.45	306
Cannabis	18982	32.25	1286
Prescription	13556	23.03	1087
Psychedelics	7055	11.99	774
Ecstasy	8478	14.4	827
Cigarettes	57	0.1	10
Other (cigars, shisha)	7	0.01	3
Papers, filters	52	0.09	5
Rolling tobacco	26	0.04	8
Tobacco mixed with drugs	13	0.02	3
Total	58.860	100	2.647

To assess the regionality of the tobacco trade, we utilise the classification applied by Demant et al⁷⁹. to produce lower-bound estimates for product sales that are domestic, regional and international: We classify every route (origin and potential destinations of a product) as either domestic, potentially regional, and potentially international. Under the assumption that a cross-border shipment will take more than two days, all reviews which indicate that the product was delivered within two days are also flagged as domestic. We therefore automatically coded feedback that indicated delivery within 2 days or a domestic purchase as domestic. For tobacco feedbacks, we extended the classification by also coding reviews if a destination country is mentioned or the review was written in a non-English language. However, this was a rare occurrence (2% of all feedback) with only eight French and six German reviews identified. Finally, we note that as opposed to using revenue based on the number of times an item was sold, the use of feedback will underestimate actual activity since not all users may leave feedback⁸⁰. However, it is not our aim to provide precise estimates of how much is shipped, but to estimate prevalence. Consequently, we refer to relative numbers and not sum in this part of the analysis.

The estimates produced by this classification produce bounds, which can be used to assess the regionality and direction of the trade in physical products⁸¹. Since a buyer may purchase a product from a domestic vendor who sells internationally, the interpretation of this outcome must be a lower bound, i.e., the number of feedbacks that can with high certainty be considered domestic. A feedback is then considered potentially regional or international if it could have been shipped within a region (e.g. North America, Europe or Australia and New Zealand) and potentially international if the item ships beyond the origin region. Thus, feedback flagged as regional may in fact be for a domestic purchase, while feedback flagged as international may in fact be for a domestic or regional purchase. These two outcomes are therefore to be considered upper bounds (i.e. the highest number of feedbacks that could potentially be regional or international).

Findings

Our analysis proceeds in two parts. We begin by analysing shipping routes and activity associated with them. Hereafter, we produce lower-bound estimates for tobacco sales that are domestic, regional, and international. As such, we begin by examining the potential and actualisation of tobacco trade and proceed to more in-depth assess the regionality of the trade. Given the limited scope of the tobacco trade on cryptomarkets, illustrated in the limited trade within the categories shown in [Table 1](#), we confine the analysis to a descriptive level.

Potential and actualised product flows

[Table 2](#) shows the number of offered products, their sum, the number of sales, and the revenue generated for each product origin on Empire separated into tobacco and non-tobacco products. Broadly, concerning the products offered, the patterns that can be observed for both product types correspond to those observed in the study of drug trafficking on cryptomarkets, which show that high-income countries of North America,

Australia and Western Europe are responsible for most cryptomarket activity with regards to supply⁸². However, we observe that despite tobacco products being offered across these regions, activity is exclusively within Europe from sellers shipping from the United Kingdom, Spain, Germany, Lithuania, Poland and an unspecified European country. Thus, while vendors based in the USA are responsible for almost a third of all tobacco product offerings (53), and responsible for generating the most revenue on Empire (USD\$46 million), they have not made a single sale of tobacco products. In comparison, in the UK which is responsible for about a third of the revenue generated on Empire (USD\$14 million), 50 tobacco products are responsible for 65% of the revenue within the tobacco category. As such, there is a large discrepancy between drug-related activity and tobacco-related activity in the cryptomarket economy.

Within the European region, activity is not equally distributed, however. Eastern European countries Lithuania and Poland, which both play a key role in the illicit tobacco trade inside the EU as ‘ending points’ for illicit tobacco, with high levels of domestic consumption, and which function to a lesser extent as transit- and production countries⁸³, are responsible for a fraction of the products offered (2 and 4) and have only generated 1.1% and 0.3% of the revenue across the 4 tobacco categories. Similarly, minimal activity is seen from Germany offering only six different products that have generated 1.7% of the tobacco revenue. Spain, another ending point, which historically has had an active, though now less so, market for illicit tobacco is the third-most active country⁸⁴. From here, only four products are offered, though these have still managed to generate 11% of the revenue across the four tobacco categories. Finally, unspecified European countries are responsible for 33 advertisements and 20.8% of the revenue generated.

In summation, our findings concerning origins suggest a supply of tobacco-products that is similar to what is observed for illicit drugs with availability from Western Europe, North America and Australia. However, actualised activity is exclusively European in origin and mainly generated by sellers shipping from the UK. Of note, typical origins of ‘illicit whites’, such as China or Russia, are not active product origins for tobacco products.

Assessing the regionality of the tobacco trade

Using a refined application of a classification scheme developed by Demant et al⁸⁵, discussed in section 3, we used a combination of product information and information left in feedback to classify the 704 product feedbacks as indicative of either domestic, potentially regional and potentially international transactions. Briefly, a product is considered domestic if the review indicates so or it can only be purchased within a country. It is considered potentially regional or international when it could have been shipped within a region (e.g. North America, Europe or Australia and New Zealand) and potentially international if the item ships beyond the origin region. As discussed in the preceding section, we only identify active tobacco trade within the EU, and thus ‘regional’, for this category, is essentially a placeholder for ‘Europe’.

Table 3 shows lower- and upper-bound proportional estimates of domestic, regional and international trade in terms of revenue and sum across categories. Within drug categories, our estimates suggest that for illicit drugs the rate of domestic sales within categories is between 50% (opioids) and 75% (cannabis). Regional trade is estimated at between 8% (opioids) and 22% (ecstasy), while sales that could have been international



Table 2. Products and sales across countries for tobacco and non-tobacco products excluding countries with no tobacco activity. Parentheses in total includes all countries.

Origin	Tobacco		Non-tobacco		Revenue (%)	Revenue	Sold	Revenue (%)	Revenue	Sold	Revenue (%)
	Products	Sold	Products	Sold							
Australia	2	0	3,273	43,495	0	5,892,882	43,495	0	5,892,882	43,495	7.2
Europe	33	169	3,875	24,708	20.8	1,620,291	24,708	20.8	1,620,291	24,708	2
Germany	6	23	375	71,377	1.7	5,406,180	71,377	1.7	5,406,180	71,377	6.6
Lithuania	4	7	240	0	1.1	0	0	1.1	0	0	0
Poland	2	2	72	4,021	0.3	307,565	4,021	0.3	307,565	4,021	0.4
Spain	4	99	2,370	2,844	11	153,073	2,844	11	153,073	2,844	0.2
United Kingdom	50	690	13,967	237,531	65	14,113,491	237,531	65	14,113,491	237,531	17.3
Unspecified	1	0	1,915	7,337	0	491,171	7,337	0	491,171	7,337	0.6
USA	53	0	14,912	261,259	0	45,962,262	261,259	0	45,962,262	261,259	56.3
Total	155	990	46,524 (58,860)	652,572 (735,025)	100	73,946,915 (81,580,039)	652,572 (735,025)	100	73,946,915 (81,580,039)	652,572 (735,025)	90.6

are estimated at between 16% (cannabis) and 42% (opioids). Similarly, revenue within categories is generated predominantly by domestic transactions between 76% (cannabis) and 61% (ecstasy), least so by products that could potentially ship regionally (6% of cannabis revenue, 17% of ecstasy revenue), while between 10% (cannabis) and 30% (opioids) of revenue is generated by transactions that could be international. Thus, for drug products we observe a pattern in which most trade whether measured in sales or revenues is domestic, with a remainder that can predominantly be ascribed to products that could potentially be shipping internationally. Tobacco products are in stark contrast to these patterns.

Within the three tobacco categories, we find little activity within the categories tobacco mixed with drugs and papers and filters compared to rolling tobacco and cigarettes, which constitute the bulk of revenue and sales. Principally, the market therefore supplies smokable products. For these two, we find a pattern that distinguishes itself from the drug trade. In terms of domestic trade, we find a lower bound that is the lowest across all categories (15% of revenue, 17% of sales). In terms of sales (58%), rolling tobacco is broadly on level with drug categories, but a large discrepancy is observable as only 20% of revenue is generated domestically as opposed to the drug categories. For both, we find high ratios of potentially regional trade, 22% of rolling tobacco sales and 41% of revenue, 81% of cigarette sales and 85% of revenue. Finally, we find the lowest ratio of potential international sales across all categories for cigarettes in terms of both sales and revenue suggesting that, at most, only 2% of cigarette sales could be international and only 0.3% of revenue. For rolling tobacco, we find, disregarding the tobacco categories with negligible activity, the highest rate of potentially international trade in terms of revenue (39%) but a ratio of sales on par with drug categories (20%).

Thus, in comparison to illicit drugs we find lower rates of national activity, higher rates of regional activity, and a sharp distinction in potentially international trade between rolling tobacco and cigarettes. Following from the previous findings, it is important to note that since tobacco trade is reserved to the European region what we suggest is the upper bound of regional trade is exclusively inter-European, while potentially international trade is exclusively outwards of Europe.

Discussion and conclusion

Within this paper, we have addressed a research gap with regards to the transnational qualities of the cryptomarket trade in illicit tobacco using data from Empire Market. We find that the market for tobacco on cryptomarkets remains minimal, as in previous research, compared to the market for illicit drugs⁸⁶, and make several distinct contributions to this body of literature. In addition to presenting recent findings, we have applied a more restrictive categorisation of tobacco products, as opposed to Barrera et al⁸⁷. and Décarry-Hétu et al⁸⁸., focusing exclusively upon tobacco products and excluding products like vaporisers and e-cigarettes. Using an approach to classifying products as sold domestically, regionally, or internationally, developed by Demant et al⁸⁹., we find that tobacco products, as opposed to drugs, exhibit distinct shipping patterns. Our findings suggest that, in addition to being anchored in Europe, this trade is more regionally oriented than that for drugs. This new measurement methodology and the updated data enables us to better frame policy recommendations regarding the illicit trade of tobacco. Repeated



Table 3. Lower bound estimates for domestic, regional and international trade in terms of transactions and revenues generated.

Category	Feedback	Domestic (%)	Potentially regional (%)	Potentially international (%)	Revenues (USD)	Domestic (%)	Potentially regional (%)	Potentially international (%)
Stimulants	102,359	55%	18%	26%	\$15,845,863	69%	13%	18%
Opioids	23,280	50%	8%	42%	\$2,311,760	64%	6%	30%
Cannabis	146,194	75%	9%	16%	\$18,106,244	84%	6%	10%
Prescription	114,132	64%	13%	23%	\$11,160,640	76%	8%	17%
Psychedelics	82,605	57%	11%	33%	\$8,288,259	63%	10%	28%
Ecstasy	55,952	55%	22%	23%	\$6,079,650	61%	17%	23%
Cigarettes	218	17%	81%	2%	\$9,511	15%	85%	<1%
Papers, filters	3	33%	0%	67%	\$31	33%	0%	67%
Rolling tobacco	464	58%	22%	20%	\$8,768	20%	41%	39%
Tobacco mixed with drugs	19	32%	0%	68%	\$145	44%	0%	56%

measures are an essential part of the scientific validation process and we are now able, using past and this current research to better understand what the response to the illicit trade of tobacco should be.

With a total revenue generated of USD\$21,486 compared to illicit drugs' USD\$86.5 million, we do not find evidence of a large tobacco economy on the darkweb. In a broader context of illicit online economies on the dark web, we thus suggest considering the tobacco market as on par with those for weapons and wildlife trafficking as *potential but relatively inactive*⁹⁰. However, the demand for illicit tobacco and the market for such products is, contrary to these niche products, much larger and much more accessible. Building on our findings, we proceed to discuss the niche market for tobacco on the dark web, how it may be situated in the global tobacco economy and what actors are likely involved. Finally, we discuss policy relevance of our findings concerning the control of illicit tobacco trade.

While we find a relatively limited economy for tobacco products, this market takes on a distinct form: We find that tobacco products may be purchased from vendors in North America, Australia and Europe, but we exclusively find actual activity in Europe. The geographical dispersion of the tobacco trade thus distinguishes itself from that for illicit drugs, which is a global phenomenon⁹¹. These European sellers almost exclusively supply cigarettes to a domestic or European market, while we find an upper-bound that suggests rolling tobacco may be shipped globally. Thus, our findings suggest that the market for tobacco on cryptomarkets a) remains relatively small, b) that there are strong indications of an economy concentrated within Europe, particularly in the United Kingdom and, c) little indication of international supply routes extending from Europe. On these indicators, the market for tobacco clearly distinguishes itself from that for illicit drugs that are more geographically dispersed and tends more towards international transactions. Barrera et al⁹². argues that tobacco transactions on cryptomarkets are of relatively low value. Similar findings within research on cryptomarket drug distribution have been argued to provide evidence for these markets catering to the lower levels of drug supply chains⁹³. Similarly, we find no indications that supply routes from known starting points (e.g. Russia, China) are active on cryptomarkets, which is corroborated by Barrera et al⁹⁴. Rather, we exclusively find activity in a region, Europe, known for its role as an endpoint. In fact, we predominantly find activity in the United Kingdom, a country that is primarily a consumer of illicit tobacco⁹⁵. At the macro-level, we neither observe demand nor supply from countries with weak state institutions as suggested by Joossens et al⁹⁶. While we do observe that the United Kingdom, which has a high level of tobacco taxation, is the most active country, we do not observe any activity relating to a country like Norway, which has high levels of taxation as well⁹⁷. This difference becomes even more stark, as the USA, by far one of the most active countries in the cryptomarket economy cannot be associated with one sale of tobacco in our dataset, despite being responsible for 56% of the revenue generated in drug categories. In this sense, a small European market for illicit tobacco is actualised, while it remains a hypothetical in the USA. Our findings thus do not suggest that country-level cryptomarket usage is an adequate explanation for the sale of illicit tobacco on cryptomarkets.

In combination, our findings concerning shipping routes, Barrera et al⁹⁸. and the current research on cryptomarkets, allow us to propose where to situate cryptomarkets in the global supply of tobacco, and by extension, what actors are involved. Given that

shipments originate predominantly from within endpoint countries⁹⁹, it is unlikely that violent political groups or corporate interests are directly involved¹⁰⁰. Neither does the size of the revenues generated or the findings from Barrera et al¹⁰¹. concerning supply suggest large-scale trafficking networks are directly involved, since these will predominantly trade in bulk. We cannot provide evidence as to who procures the tobacco sold, which may originate within the EU, or be aided by organised crime or political groups, or which may be simply trafficked through low-level cross-border smuggling¹⁰². However, we suggest that sellers are either procuring product through higher-level actors or through lower-level smuggling like bootlegging. Building on the findings of this paper, the literature on cryptomarket drug distribution and current knowledge on illicit tobacco trade, we thus suggest that at the present time, cryptomarkets function as a new niche mode for low-level suppliers to provide illicit tobacco products to end-users.

The relevance of cryptomarkets for tobacco regulation policies should consider the relatively limited scope of this market, and whether the pursuit of seemingly low-level actors is a fruitful strategy. However, it remains that it is today possible to procure illicit tobacco within the Schengen zone from highly safe illicit online markets with little risk. We suggest three direct implications of this. First, it is now possible to source illicit tobacco without being 'in the know' and having the necessary informal networks. Second, recent findings have shown that minors are likely to use cryptomarkets¹⁰³ to procure illicit drugs and may now also circumvent regulation that limits their access to legal tobacco. Finally, the mere availability of illicit tobacco products on cryptomarkets, despite the relatively small size of the market, should be considered in the light of the high prevalence of smoking among drug users¹⁰⁴. The lower price of illicit tobacco and a population that is more prone to using tobacco is thus a situation that is grounds for concern with regards to health.

With regards to further research, we principally suggest continued monitoring of tobacco products on cryptomarkets. Presently, we do not believe the population of vendors and products provides grounds for extensive statistical analysis beyond descriptive analysis, but we note that topics discussed here may be explored further. Recent advances in individual-level analysis of drug purchases could be applied to study whether drug users also purchase tobacco¹⁰⁵, and survey data could be used to explore whether minors are accessing tobacco via cryptomarkets¹⁰⁶. Finally, a larger collection of data would allow a more thorough analysis of supply, demand and the macro-level explanations of tobacco trafficking¹⁰⁷.

Another interesting development in online illicit trading is the rise of single vendor shops¹⁰⁸. These shops are run by single vendors who offer a limited set of products. Past research has identified dozens of these shops though many more are probably being run discreetly on the darkweb. While not as popular as large cryptomarkets, they cater to specific needs of niche populations of buyers who could be making purchases of tobacco through these platforms. We suggest that dark web research expands beyond cryptomarkets to also focus on the other means of transaction on the dark web to provide a more accurate and complete picture of the illicit trade of tobacco. Technologies have transformed how offenders communicate with each other and while cryptomarkets have yet to make their mark on the illicit trade of tobacco, anonymity technologies provide many benefits that are likely to transform illicit dealings in the future, whether it be through large-scale markets or small and niche platforms.

Notes

1. Transcrime, *European outlook*.
2. Joossens et al., "The impact."
3. Collin et al., "Complicity in Contraband"; and Joossens and Raw, "From cigarette smuggling."
4. Joossens et al., "Issues in the smuggling"; and Coker, "Smoking may not only."
5. See note 2 above.
6. Joossens et al., "Assessment of the European Union's"; Coker, "Smoking May Not Only"; and Billingslea, "Illicit Cigarette Trafficking."
7. See note 2 above.
8. Moyle et al., "#Drugsforsale: An exploration"; Demant et al., "Drug Dealing on Facebook"; and Christin, "Travelling the Silk Road."
9. Martin, "Lost on the Silk."
10. Soska and Christin, "Measuring the Longitudinal Evolution"; Demant et al., "Personal use, social supply"; and Aldridge and Décary-Hétu, "Hidden Wholesale."
11. Barrera et al., "Size and Scope."
12. Rhumorbarbe et al., "Characterising the online weapons."
13. Harrison et al., "Assessing the extent."
14. Demant et al., "Personal use, social supply"; and Aldridge and Décary-Hétu, "Hidden Wholesale."
15. Demant et al., "Going Local."
16. Aldridge and Décary-Hétu, "Hidden Wholesale."
17. Décary-Hétu et al., "Le trafic illicite"; and Barrera et al., "Size and Scope."
18. WHO, "WHO Framework Convention".
19. Joossens et al., "Issues in the smuggling."
20. Joossens and Raw, "From cigarette smuggling."
21. Transcrime, *European outlook*, 33.
22. Drope, *The Tobacco Atlas*.
23. See note 2 above.
24. Calderoni, "A New Method."
25. See note 1 above.
26. See note 2 above.
27. See note 1 above.
28. See note 20 above.
29. Ibid.
30. Lakhdar, "Quantitative and qualitative estimates."
31. Joossens and Raw, "Smuggling and cross border."
32. See note 20 above.
33. Legresley et al., "British and American Tobacco."
34. See note 2 above.
35. See note 20 above.
36. See note 2 above.
37. Prieger and Kulick, "Cigarette Taxes and Illicit"; Calderoni et al., "Price and Non-Price Determinants"; and Joossens and Raw, "From cigarette smuggling."
38. Transcrime, *European outlook*; Coker, "Smoking May Not Only"; and Joossens and Raw, "From cigarette smuggling."
39. European Union, *Rules for carrying alcohol*.
40. See note 2 above.
41. Aziani and Dugato, "Cigarette trafficking."
42. See note 1 above.
43. Transcrime, *European outlook*; and Aziani and Dugato, "Cigarette trafficking."
44. Antonopoulos, "The Greek Connection(s)."
45. Benson and Decker, "The Organizational Structure"; and Caulkins et al., "How Illegal Drugs Enter."

46. Coker, "Smoking May Not Only."
47. Von Lampe, "Organized Crime and Trust"; and Calderoni, "A New Method."
48. Colledge, "Illicit Tobacco Trade."
49. See note 31 above.
50. Joossens et al., "Assessment of the European Union's"; Collin et al., "Complicity in Contraband"; and Gilmore et al. "Exposing and addressing."
51. See Melzer and Martin, "A brief overview", for further examples.
52. See note 46 above.
53. Goolsbee et al., "Playing With Fire."
54. Chaudhry and Zimmerman, "Illicit trade."
55. Hyland et al., "Individual-level predictors of cessation."
56. Tor Project, *Tor Metrics*.
57. See note 9 above.
58. Christin, "Travelling the Silk Road."
59. Décary-Héту et al., "Patterns in Cannabis Cryptomarkets."
60. Martin et al., *Cryptomarkets: A Research Companion*.
61. Décary-Héту et al., *Le trafic illicite*.
62. *Ibid.*, 4.
63. Munksgaard et al., "Diversification of tobacco traffickers."
64. Décary-Héту et al., "Going international?"; and Demant et al., "Going local."
65. Barrera et al., "Size and Scope", 10.
66. See also Décary-Héту et al., "The shift to Online."
67. See note 58 above.
68. See note 59 above.
69. Décary-Héту and Aldridge, "Sifting through the Net"; Demant et al., "Going Local"; and Martin et al., "Effects of restricting legal."
70. Demant et al., "Going Local"; and Soska and Christin, "Measuring the Longitudinal Evolution."
71. See note 11 above.
72. Soska and Christin, "Measuring the Longitudinal Evolution"; and Demant et al., "Going Local."
73. See note 11 above.
74. *Ibid.*
75. Barrera et al., "Size and Scope", 34.
76. Morelato et al., "An Insight into Prescription."
77. See note 11 above.
78. See note 1 above.
79. See note 15 above.
80. Stinenbosch, *Measuring Darknet Markets*.
81. See note 15 above.
82. e.g. Van Buskirk et al., "Who Sells What?"; and Tzanetakis, "Comparing cryptomarkets for drugs".
83. See note 1 above.
84. Joossens et al., "The impact"; and Coker, "Smoking May Not Only."
85. See note 15 above.
86. Barrera et al., "Size and Scope"; Munksgaard et al., "Diversification of tobacco traffickers"; and Décary-Héту et al., *Le trafic illicite*.
87. See note 11 above.
88. See note 61 above.
89. See note 15 above.
90. Rhumorbarbe et al., "Characterising the online weapons"; and Harrison et al., "Assessing the extent."
91. Broséus et al., "A Geographical Analysis"; Demant et al., "Going Local"; and Dittus and Graham, "Platform Criminalism."
92. See note 11 above.

93. Demant et al., “Personal use, social supply”; and Aldridge and Décary-Hétu, “Hidden Wholesale.”
94. See note 11 above.
95. See note 1 above.
96. See note 2 above.
97. See note 1 above.
98. See note 11 above.
99. See note 1 above.
100. See note 46 above.
101. See note 11 above.
102. Lakhdar, “Quantitative and qualitative estimates”; and Antonopoulos, “The Greek Connection(s).”
103. Demant, “Are Adolescent Buyers of Drugs.”
104. Martínez-Ortega et al., “Nicotine dependence”; and Kalman et al., “Co-morbidity of smoking.”
105. Duxbury and Haynie, “Building them up”; and Norbutas, “Offline constrains in online.”
106. Demant, “Are Adolescent Buyers of Drugs”; and Barratt et al., “Use of Silk Road.”
107. See note 31 above.
108. Décary-Hétu and Flamand, “The Open and Dark.”

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