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Seller's reputation and capacity on the illicit drug markets: 11-month study on the Finnish version of the Silk Road



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ABSTRACT

Aims: This 11-month study analyzed illicit drug sales on the anonymous Tor network, with a focus on investigating whether a seller's reputation and capacity increased daily drug sales.

Design and setting: The data were gathered from Silkkitie, the Finnish version of the Silk Road, by web crawling the site on a daily basis from (November 2014 to September 2015). The data include information on sellers ($n = 260$) and products ($n = 3823$).

Measurements: The measurements include the sellers' reputation, the sale amounts (in euros), the number of available products and the types of drugs sold. The sellers' capacity was measured using their full sales potential (in euros). Fixed-effects regression models were used to estimate the effects of sellers' reputation and capacity; these models were adjusted for the types of drugs sold.

Findings: Overall, illicit drug sales totalled over 2 million euros during the study, but many products were not sold at all, and sellers were active for only a short time on average (mean = 62.8 days). Among the products sold, stimulants were most widely purchased, followed by cannabis, MDMA, and psychedelics. A seller's reputation and capacity were both associated with drug sales.

Conclusion: The Tor network has enabled a transformation in drug sales. Due to the network's anonymity, the seller's reputation and capacity both have an impact on sales.

1. Introduction

Illicit online drug sales first attracted major media attention with the rise and fall of the Silk Road in 2011–2013 (Barratt et al., 2014; Martin, 2014a; Martin, 2014b). The Federal Bureau of Investigation shut down the Silk Road in October 2013 and its successor, the Silk Road 2, in November 2014 (Dolliver, 2015). The Silk Road 3 was launched almost immediately after but was overrun by other sites, such as Agora and Evolution, which adopted some features of the original Silk Road (Dolliver and Kenney, 2016; Van Buskirk et al., 2016). The common feature of all of these websites is that they protect the anonymity of their users; they are hence referred to as “cryptomarkets” (Aldridge and Décarry-Héту, 2016; Bancroft and Reid, 2017; Demant et al., 2016; Martin, 2014b; Van Buskirk et al., 2016). This article focuses particularly on the Finnish online service called Silkkitie.

Silkkitie operates using the Tor network to hide its real location, just as Agora and various Silk Road versions did. The Tor (which stands for The Onion Router) network and software are designed to defend human

rights (Dingledine et al., 2004). This network can be used for censorship circumvention, online anonymity and high-level online privacy. It is possible to host a website inside the Tor network (a so-called onion service) and to hide the physical location of the site's server. Tor provides anonymity by routing the user's traffic through three separate relay servers so that it is difficult to reveal the user's physical location or IP address. This means that Tor protects users by encryption to ensure privacy, authentication between clients and relays and signatures to ensure that all clients know the same set of relays.

Tor is considered very secure and resilient against surveillance: The U.S. National Security Agency called Tor “the king of high-secure, low-latency Internet anonymity” (The Guardian, 2013) in its top-secret documentation, in which it discusses its futile attempts to spy on Tor users. Despite this, different police operations have targeted sites and have at least been partially successful in reducing the activity in cryptomarkets (Décarry-Héту and Giommoni, 2017). Also, the identity of the original Silk Road developer, Ross William Ulbrich, was discovered after the FBI followed his behaviour pattern and gathered cumulative

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critical information for long enough (FBI, 2014).

The anonymity of online drug markets is guaranteed by digital currencies and payment systems that significantly increase the difficulty of tracking down buyers and sellers. Bitcoin is one digital currency and a payment system in one; it was invented by an unknown entity who calls himself Satoshi Nakamoto (Nakamoto, 2008; Bohannon, 2016; Kristoufek, 2015). Bitcoin is a peer-to-peer application that allows digital money transfers between users. Its monetary system is decentralised and designed to work without central banks, governments and regulations. Although Bitcoins are used in multiple legal ways, these anonymity properties also make Bitcoin attractive to criminals.

The work on illicit cryptomarkets has expanded rapidly since 2015. Many of the studies have been based on the Silk Road (e.g., Aldridge and Décary-Héту, 2016; Barratt and Maddox, 2016) and their successors, such as the Silk Road 2.0, Agora, Alphabay and Valhalla (e.g., Van Buskirk et al., 2016; Décary-Héту and Giommoni, 2017; Demant et al., 2016; Dolliver and Kuhns, 2016; Van Hout and Hearne, 2017). Studies have employed traditional research methods such as surveys and interviews (Barratt et al., 2014; Van Hout and Bingham, 2013a, 2013b) and newer approaches employing web crawlers (Aldridge and Décary-Héту, 2016; Demant et al., 2016; Dolliver, 2015; Dolliver and Kenney, 2016; Christin, 2013; Hardy and Norgaard, 2015; Munksgaard et al., 2016). Some studies have also investigated the quality of drugs sold in the cryptomarkets (Caudevilla et al., 2016; Rhumorbarbe et al., 2016). There is also currently a need to understand that cryptomarkets are also used very locally, as in our Finnish case. So far country cases have involved, for example, Canada (Broséus et al., 2016) and Switzerland (Rhumorbarbe et al., 2016), and some studies have involved cross-national comparison (Van Buskirk et al., 2016).

Studies on the Silk Road indicate that users were typically males in their 20s and prioritised the Silk Road over street markets for quality reasons and for personal safety (Barratt et al., 2014; Van Hout and Bingham 2013b; Barratt et al., 2016a,b). Cryptomarket users have been characterised as a “technological drug subculture” (Van Hout and Bingham, 2013b), which also represents a form of online activism underlining individual freedoms based on libertarian ethos (Maddox et al., 2016; Munksgaard and Demant, 2016). Users’ right to choose is combined with the expressed joy of having the opportunity to choose their preferred drugs like “kids in a candy store” (Barratt et al., 2016b).

As cryptomarkets are organised to guarantee the full anonymity of the users, they also bring challenges for the users. Social psychologists have underlined that anonymous behaviour can be highly regulated on the Internet (Keipi and Oksanen, 2014; Spears et al., 2002). In cryptomarkets, anonymity is enforced by instability, which may even enforce the anonymity effects of online behaviour. Instability is one of the central features of online drug markets, as most items are sold quickly and the majority of sellers disappear within a few months (Christin, 2013). Hence, there is a need for building “reputation systems” (Resnick et al., 2000; Houser and Wooders, 2006) or “trust systems” (Lusthaus, 2012) on cryptomarkets. Public user feedback is one of the common parts of such reputation or trust systems.

A previous study by Hardy and Norgaard (2015) showed that seller reputation had a positive impact on cannabis sales. They argue that users’ feedback is a central feature in cannabis sales on the Silk Road because sellers and buyers do not know each other. Positive reputation gives the impression that the seller is trustworthy, which leads to increased sales (Hardy and Norgaard, 2015). It has also been found that vendors who had poor user ratings were more likely to take the risk of shipping drugs internationally (Décary-Héту et al., 2016). Besides user feedback, it is often important to communicate well with the customer and create an impression of trustworthiness. According to Décary-Héту and Leppänen, successful online criminals have communicative skills that lead to higher rewards (Décary-Héту and Leppänen, 2013).

In the absence of visual cues that are typically available in an offline context, online buyers must rely on what information is available, which also separates online cryptomarkets from the traditional drug

trade. We argue here, in addition to the seller’s reputation, that seller’s capacity is another potential factor of successful sales. Seller’s capacity refers to sellers’ promises regarding the variety and quantity of high-quality products available. This is part of communication with the customers. Seller’s capacity or promise of a lot of drugs in stock will create positive expectations that will lead to higher sales. It is common for cybercriminals to construct an online identity and create trustworthiness to attract criminal partners (Lusthaus, 2012). Seller’s capacity is part of this communication, but it has not been previously studied with regard to cryptomarkets. However, economic studies on advance selling have shown that seller capacity is positively associated with consumer behaviour (Yu et al., 2015).

In this study, our aim was to research both the seller’s reputation and capacity in Silkkitie. We will first provide descriptive results on the general drug sales on Silkkitie. The main focus of the article lies, however, on the reputation and capacity that represent different facets of the seller that are available to buyers. Anonymity directs users’ attention to the available features and typically also enforces group behaviour (Keipi and Oksanen, 2014; Spears et al., 2002). Hence, in cryptomarket, trust system is based on both direct feedback and successful communication (Hardy and Norgaard, 2015; Resnick et al., 2000; Houser and Wooders, 2006; Décary-Héту and Leppänen, 2013; Lusthaus, 2012). Our hypotheses were grounded on these premises, and we expected that a positive seller reputation would be positively associated with that entity’s daily sales. In addition, we expected that an increase in a seller’s capacity would increase that entity’s sales.

2. Methods

2.1. Silkkitie as a marketplace

Silkkitie was opened in the Tor network on 6 January 2014, and it was originally intended to be used specifically for illicit drug sales in Finland. Because both the seller and the buyer are located within Finland, even detecting the drugs is difficult because there is no customs process for screening domestic shipments. For these reasons, virtually all of the Finnish sellers mention that the shipments are posted via domestic mail. As Silkkitie is the main online marketplace for Finnish drug buyers, it is a useful measure of the overall Finnish online drug market. In 2015, Silkkitie published the English translation of the site to attract user space outside Finland. The original Finnish version (<http://silkkitiehdg5mug.onion/>) now has an English translation called Valhalla (<http://valhallaxmn3fydu.onion/>). Bitcoin currency and the Bitcoin wallet system are used for payment, and Silkkitie requires sellers to use PGP encryption (Pretty Good Privacy, see Zimmermann, 1995) and offer their public keys to buyers for encrypted and safe text communication. Silkkitie shows prices in euros and Bitcoins using the latest exchange rate. We have collected transaction data in terms of euros.

After Silkkitie users have created their user accounts on the service, they may select a role as a seller, which enables them to offer products on sale. The sellers may then set the price and describe both the product and the terms of the delivery. The seller’s reputation is a central feature on Silkkitie (see Fig. 1). Buyers can give feedback by rating the product and the transaction (good: + or bad: –). Buyers see this feedback, so sellers have to keep up their reputations. More importantly, Silkkitie offers escrow service by holding the Bitcoins used for purchase and returning them to buyers if there is a lot of negative feedback. This makes it very important for sellers to build good reputations.

2.2. Web-crawling process

We employed automatic web-crawling and web-scraping techniques to extract information from the Silkkitie site every day between 5 November 2014 and 23 September 2015. This method is similar to the one that was developed to study the Silk Road’s transactions (Christin,

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