

Title: Physical vs. Digital Goods: The Tale of Two Markets
Olga Smirnova, Associate Professor, MPA, Department of Political Science, East Carolina University, smirnovao@ecu.edu

ABSTRACT: This white paper focuses on the customer service arrangements, payment methods, and shipment methods differences between physical and digital goods. Some differences are expected such as shipment mentioned in physical goods and services ads more than in digital ones; some findings are new such as mentioning shipment methods for stolen dumps or PayPal account. Overall, both sellers of physical and digital goods and services provide various customer provisions. The digital goods ads are hosted on the Dark Web more than the physical goods.

INTRODUCTION: This paper explores the differences between physical and digital goods advertised on Open and Dark Web sites, based on our sample of advertisements collected from 2018 to 2019 inclusive. We examine: shipping and payment methods, customer support, and Dark Web versus Open web placements. We hypothesized that physical goods sellers would prefer Dark Web sites, shops, and cryptomarkets rather than ads on the Open Web, relative to digital goods. Since the utilization of digital goods may require certain skills, we expected more customer support associated with digital goods sellers rather than physical goods vendors. Finally, we also explored differences in the payment methods and utilization of shipping services across both product types.

METHODS: All analyses were performed through the use of chi-square models segmenting physical and digital goods. Physical goods were classified as plastic and skimmed cards, identity documents, computer and phone equipment, handguns, long guns, explosives, ammunition, drugs, counterfeit currency, drug production equipment, prescription drugs, and hitman services. Digital products included malware, cvv, cashout services, skimmers, dumps, bank accounts, personal accounts, spam and scam materials, drops, eBay or PayPal accounts, fullz, money transfers, dedicated servers, other financial products, booters or stresser services, prepaid cards, personal information, gift cards, and ransomware. We reported Fisher's exact statistical significance for all calculations.

DIGITAL AND PHYSICAL DIFFERENCES:

TOR VS. OPEN WEB: In our sample of 9,915 advertisements for illicit goods, about 57% are hosted on Tor and 43% on the open web. Almost 97% of all our data were sold on various shops. About 53% of all physical products were sold on Dark Web sites while 66% of digital products were sold on this platform. This relationship between the

type of product (digital vs. physical) and the hosting platform was statistically significant ($\text{Chi}^2(1)=151.4, p<0.001$). That is, the perpetrators tried to add extra layers of protection with Dark Web advertisements for digital goods more than for physical ones. Figure 1 shows the breakdown of physical and digital goods on Tor vs. Open platforms (see Page 3). Contrary to our original hypothesis, physical goods ads are hosted more on Open Web platforms. At the same time, there is a large variation of platform use within product categories: 97% of identity document ads are located on Open Web, while about 66% of drug ads located on Tor networks.

CUSTOMER SERVICE: We recorded several types of customer service arrangements presented to potential customers: percentage payments, minimum purchases, bulk discounts, product replacements, free samples, and customer service tools where the seller offers to help the buyers to use the stolen goods. Figure 2 shows most popular customer service provisions used (see Page 3).

Overall, only 0.5% of all ads mention *percent payments*: about 0.1% of digital product ads and 0.4% of physical goods ($\text{Chi}^2(1)=7.2, p<0.01$). The majority of ads mentioning percentage payments are for hitman services that clarify what percent of services need to be prepaid, whether travel expenses are included, and when the remaining amount should be paid to the service provider.

In all, 94.8% of ads included *minimum purchases* in their language. Among physical goods ads, 96.1% mention minimum purchase requirements compared to 91.6% of digital goods ($\text{Chi}^2(1)=92.2, p<0.001$). The ads for dumps (10.6%), identity documents (13.8%), and drugs (40.5%) noted these requirements most often.

Bulk discounts were included in 32.8% of all ads. Again drugs (17.7%), identity documents (4.7%),

and dumps (2.5%) were leading ads that included bulk discounts. None of the hitman services or explosives ads included discounts. Overall 24.5% of physical goods (most of which were drug-related) and 8.2% of digital goods include these services (Chi2(1)=225.4, p<0.001).

About 36.8% of all ads included *product replacements guarantees*: about 22.2% physical goods ads and 14.4% of digital ones (Chi2(1)=36.6, p<0.001). The ads with drugs (16.6%), dumps (4.6%), and personal accounts (3.4%) included this provision the most. For drugs, product replacements often meant certain provisions, including shipment tracking and refunds. Some ads required proof of seizure of any drugs before issuing refunds.

Only 2.4% of all ads included the guarantee of *free samples*. This provision was more common among digital goods (1.6%) than physical (0.9%) (Chi2(1)=89.1, p<0.001). Booters (0.56%) and long guns (0.12%) featured the greatest proportion of free samples. For the long guns, all ads included a free sample of 50 bullets.

About 75.2% of all digital goods listed *customer service support*, and about 83.2% of all physical goods ads included customer service provisions (Chi2(1)=91.2, p<0.001). Of all products, 33.3% drug ads listed this provision, as did 15% of identity documents. Some of identity documents provisions included affiliate programs with the distribution of fake IDs.

PAYMENT METHODS: Figure 3 shows the most popular payment methods in our data (see page 4). About 11.5% of all ads mentioned *escrow payments*, constituting 5.5% of physical goods and 5.9% of digital goods (Chi2(1)=146.7, p<0.001).

Overall 23.5% of all ads mentioned *Western Union*, with 35% in physical good ads compared to about 1.7% of all digital products. The differences are statistically significant (Chi2(1)=1,400, p<0.001).

PayPal (used in 2.9% of all ads) was more common for digital ads (2.4%, n=240) relative to physical ads (0.5%, n=45), (Chi2(1)=303.1, p<0.001). PayPal was primarily mentioned in the ads for booters and stressors.

There were 7,476 ads featuring the acceptance of *Bitcoin* payments (75.6% of all ads; Chi2(1)=28.4, p<0.001). Drug ads accounted for the largest

proportion among physical goods (29.4% of all goods).

Wire Transfers were mentioned in 13.9% of all ads (chi2(1) =701.8, p<0.001); mostly used for physical goods. *Other cryptocurrencies* 19.2% (chi2(1) =138.4, p<0.001) were used in ads mostly associated with CVV, dumps, and drugs, but mostly used for digital goods. *Surcharges* were used in 4.3% ads, mostly for physical goods (chi2(1) =54.3, p<0.001) including drugs and identity documents.

SHIPPING: About a third (35.6%) of all ads contained information on shipping (27.2% of all physical goods; 8.3% of digital goods; Chi2(1)=357.8, p<0.001). Further research is needed to study shipment methods for digital goods, such as PayPal accounts or dumps.

About 11.9% of all ads mentioned *DHL* as the method for shipping; the method was used in 1.1% digital and 10.8% physical goods (Chi2(1)=398.1 p<0.001). About 7.2% used *USPS*, as evident in 9.1% of all physical ads relative to 3.5% of all digital ads (Chi2(1)=107.9 p<0.001).

UPS was mentioned in 14.1% of all ads. Among physical product ads 21.1% mention UPS; among all digital products 1.4% mention UPS (Chi2(1)=731.5, p<0.001). The digital products that mentioned UPS were mainly spam materials.

FedEx was mentioned as a shipping method in about 16% of all ads. Among all physical goods and services ads, 22.9% mentioned FedEx relative to 3.9% of digital goods ads (Chi2(1)=591.5, p<0.001). Finally, other physical shipping services were mentioned in about 19% of all ads. Of those, 18.4% of physical goods and services used this language, while only 0.6% digital ones listed other physical shipments (Chi2(1)= 1,100, p<0.001).

TAKEAWAYS FOR POLICY/PRACTICE: There is some degree of overlap in the facilitators employed by digital and physical goods vendors, including the use of payment service providers. The differences in advertising platforms between the product types was also unexpected. Thus there is a need for greater research exploring the decision-making processes of offenders as to why they advertise in Dark Web or Open web platforms.

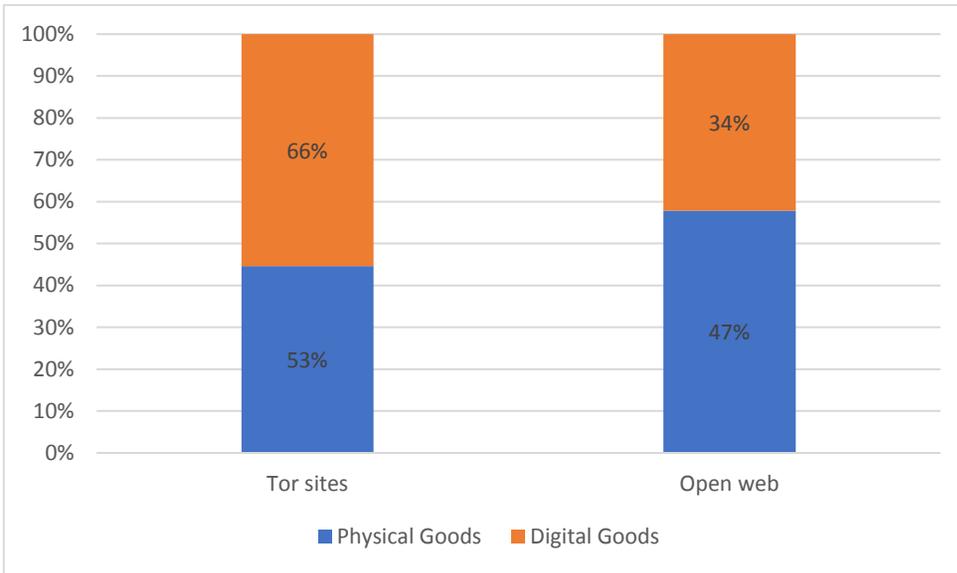


Figure 1. Tor v. Open web.

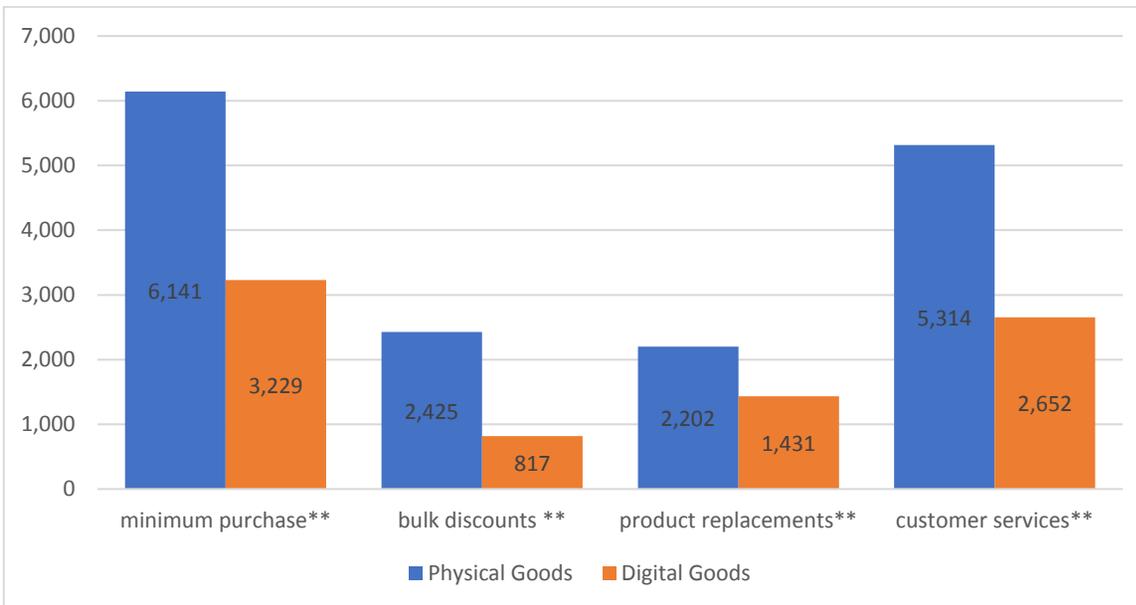


Figure 2. Customer service provisions

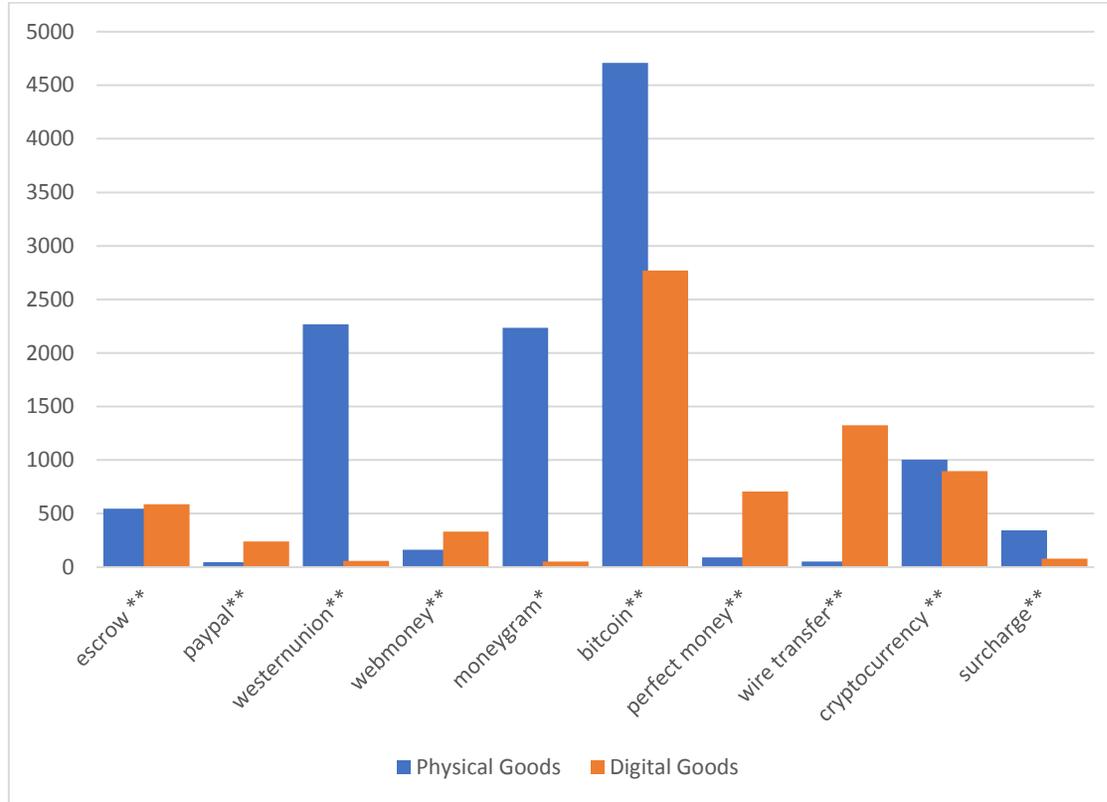


Figure 3. Payment methods

REFERENCES: This white paper draws on the research conducted for the larger project “Understanding the Economy and Social Organization for the Underground Market for Cybercrime as a Service” funded by Criminal Investigations and Network Analysis (CINA) A DHS Center of Excellence George Mason University (United States Department of Homeland Security).