Deterrence and Displacement in Offshore Trade: Evidence from the Panama Papers Leak

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Abstract

We investigate the impact of the Panama Papers leak on transactions through Offshore Financial Centers (OFCs) using granular international trade data from Ukraine. Trade-based financial transactions through Panama decline by 50 percent, indicating substantial deterrence effects from exposure. Consistent with this interpretation, there is a larger response from firms directly implicated by the leak. We also observe displacement effects, as transactions through other OFCs increase, driven by OFCs that are not officially recognized by Ukrainian regulators. This decline is driven by private firms' trade, while offshoring at state-owned enterprises is unaffected or even increases, suggesting that concerns over enforcement action may drive our results.

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1. Introduction

Offshore entities in tax havens are used by wealthy individuals and corporations to reduce their tax obligations. While no precise figures are available on the extent of evasion, Zucman (2017) estimates that ultrawealthy households alone hold $8.7 trillion in offshore shelters, and Torslov, Wier, and Zucman (2023) estimate that 36 percent of profits of multinationals may be shifted to tax havens.[6]

The scale of assets flowing through tax havens persists despite efforts at creating rules to limit profit-shifting and other tax-avoidance techniques. One potential challenge is the "whac-a-mole" problem inherent in any enforcement problem – if one tax haven is shuttered, funds may be displaced to other locales. Naturally, this type of displacement effect hinges on the substitutability of profit- or asset-shifting destinations.

In this paper, we trace out the displacement of offshoring activity to tax havens by taking advantage of the Panama Papers leak, which reduced the perceived desirability of Panama (and potentially the British Virgin Islands (BVI) as well) in tax-avoidance strategies and exploiting granular data on Ukrainian companies.[7]

The so-called Panama Papers involved a data leak of more than 11.5 million documents that disclosed the business dealings of hundreds of thousands of companies and their use of offshore entities, via the Panama-based law firm, Mossack Fonseca. These offshore vehicles were primarily set up for the purposes of tax avoidance and/or tax evasion. This unexpected release of years of active tax sheltering activity data sent shockwaves through companies worldwide that had used offshore entities in Panama and other countries affected by the leak.

Our study centers around Ukraine-based firms. We focus on this sample for opportunistic reasons – the dataset we use contains the universe of Ukrainian corporations, including both public and private companies that participate in international trade as exporters (we discuss concerns of external validity in Section 3 below). For each firm, we observe all international trade transactions,

[6] O'Donovan, Wagner, and Zeume (2019) conservatively estimate that 1 in 7 firms have secret offshore entities. Crivelli, de Mooij, & Keen (2016) argue that relative to their GDP, developing nations may lose three times as much in tax revenue when compared to Organization for Economic Co-operation and Development (OECD) countries.

[7] It is worth noting that entities from the British Virgin Islands (also an OFC) comprised the majority of Panama Papers entries, with 150,000 versus 50,000 for Panama itself. In our analysis we will thus investigate the impact of the leak on BVI transactions as well.

including both product and financial flows.[8] We use these data to explore how these firms' export flows to Panama and other tax havens (which, as we explain in the next section, often reflect tax-avoidance strategies) shift around key events involving the release of firm-specific information in the Panama Papers. We do so to shed light on the extent of displacement when the cost of utilizing a particular tax haven increases unexpectedly.[9]

Our main findings are as follows. First, among Ukraine-based firms that recorded trade through offshore vehicles in Panama and BVI prior to the leak, there is a 50 percent reduction in exports for which financial transactions are made through Panama. This reduction comes partly through lower exports by firms financing transactions through Panama, and partly via an extensive margin effect: there is a 7-10 percentage point reduction in the fraction of companies trading through Panama in a given week, among those that previously did so. These effects are 2-3 times larger for the companies directly exposed by the leak, particularly after the release of a database listing these firms. Further, only private businesses are affected: state-owned enterprises, if anything, increase their transactions through Panama after exposure. We take this last result to suggest that fear of enforcement accounts for—at least in part—the drop in Panama trade.

Second, we find evidence of displacement to trade with other countries identified as OFCs following the leak. Interestingly, most displacement is into the subset of OFCs not yet officially recognized by the Ukrainian government (and hence may face less scrutiny and/or enforcement action).

Finally, we examine whether the "financialization" of transactions through offshores is affected by the Panama Papers release. To the extent that financing trade through a country other than the ultimate destination for a physical product reflects potential tax avoidance through profit-shifting, we expect this type of trade through offshore centers to decline after the Panama Paper's

[8] In our paper, we predominantly focus on financial flows (versus product flows) used to service export transactions. The destination of financial flows might differ from that of product flows when firms record cash flows that are lower than what is actually received in an effort to avoid taxation. Therefore, when we refer to "exports" or "trade" through a given location, we are referring to the financial side of export transactions. Most of the time financial and product flows involve the same country. However, as we show in the paper, in the case of OFCs, financial flows can be as much as 50 times higher than actual product flows.

[9] Previous studies of offshore operations and the Panama Papers have been limited in scope to only public companies, as private firm information is difficult to obtain (see, e.g., O'Donovan et al, 2019). Our paper extends this analysis to include private firms, which may behave distinctly from more visible public corporations. More critically, our sample provides high-frequency transaction information, which is essential for our main objective, which is tracing out displacement effects. We know of no other data source that includes this granularity of transactions for firms – either public or private.

release. We show that this is the case, with the results driven primarily by offshores recognized by Ukraine's government (in addition to transaction through Panama, which was directly implicated by the leak). Notably, transactions financed through BVI or offshores not recognized by Ukraine's government are not affected much.

Our paper contributes to several areas within the international trade and financial economics literatures. Most directly, we contribute to the literature on offshore tax havens. By its very nature, the study of tax havens, which are known for their secrecy, has been limited by data availability. A small but growing body of research has documented the scale of tax evasion and tax avoidance via tax havens, as well as the techniques firms and individuals deploy to take advantage of them, some of which exploit the Panama Papers (see Wagner and Zeume, 2023, for a survey on data leaks and tax havens more generally). Recent contributions include Omartian (2018), who shows how investors and banks undermine regulation on foreign tax evasion by establishing opaque legal structures in tax havens, Andersen, Johannesen, and Rijkers (2022), who use recent disclosure laws in the United Kingdom to study offshoring via residential real estate, and Johannesen, Miethe, and Weishaar (2022), who show how elites in low-income countries funnel aid disbursements to tax havens. Estimates on the scale of tax evasion via tax havens are found in Zucman (2014), who showed that US companies used offshore financial centers to reduce tax obligations by around 20%, and Gravelle (2015), who presents evidence that trillions of dollars of wealth were hidden in tax havens. Finally, Kavakli, Marcolongo, and Zambiasi (2023) emphasize the role of tax havens in evading economic sanctions and emphasize the importance of broad-based sanctioning coalitions that is particularly relevant for our findings on displacement effects after the release of the Panama Papers.

Evidence of success on the part of the regulators is found in Chernykh and Mityakov (2017), who find that offshore-active banks have a higher likelihood of license revocation and criminal investigation against top management. The overall success of governments and regulatory agencies in fighting tax sheltering is ambiguous, however. While some papers find evidence of success in combating offshore tax avoidance, others find affirmation that the use of offshore entities for tax sheltering still occurs at high rates, which suggests that enforcement of regulations is plagued with challenges. Desai, Dyck, and Zingales (2007) find that higher tax rates increase the amount of income that insiders divert, resulting in worse government outcomes. Janský,

Meinzer, and Palanský (2022) find conflicting evidence on the efficacy of automatic information exchange (AIE) and the blacklisting of noncooperative jurisdictions in fighting tax evasion.

To this point, we know of no other work that considers displacement in offshoring, the effect on private firms, or the implications for regulatory action. We combine the shock caused by the Panama Papers leak with granular transaction-level data on Ukrainian firms' exports to show that this type of "whac-a-mole" problem is substantial, as indicated by the substitution of Panama exports to other evasion-friendly jurisdictions.

More broadly, our paper contributes to the literature on regulatory arbitrage. We deliver a similar message to prior work showing that firms adjust their operations in response to jurisdictional differences in oversight. Focusing on finance-related applications, Houston, Lin, and Ma (2012), for example, demonstrate that banks intentionally transfer funds into markets with fewer financial regulations, and Demyanyk and Loutskina (2016) show that a gap in mortgage regulations allowed bank holding companies (BHCs) to circumvent consumer compliance regulations, mitigate capital requirements, and reduce exposure to loan-related losses via affiliated mortgage companies (AMCs), which are subject to a significantly smaller set of regulations than banks. Bustos, Pomeranz, Serrato, Vila-Belda, and Zucman (2023) document the role played by advisory services in facilitating this displacement, by showing that the introduction of new regulations on profit-shifting in Chile led to an increase in the use of tax advisors and left tax revenues unchanged.

Finally, we contribute to work that exploits data leaks to study economic phenomena. This includes papers that utilize the Panama Papers leak specifically (e.g., Marcolongo, 2020; Omartian, 2018; O'Donovan, Wagner, and Zeume, 2019), as well as other unanticipated exposure via corporate data leaks, which provide access to records of business dealings that would otherwise be inaccessible. Such data are especially powerful when combined with other datasets – for example, Parsons, Sulaeman, and Titman (2018), use the 2015 leak from the notorious infidelity website, Ashley Madison, to construct a metric of city culture in their study on firm financial misconduct. Most directly related to our work is O'Donovan, Wagner, and Zeume (2019), who show that the market value of publicly traded firms that were implicated in the Panama Papers declines, at least in part driven by higher taxes and reduced activities in corrupt countries. We see our work as complementary to their findings in two ways. First, our paper extends the analysis to include private firms, who may behave distinctly from (highly visible) public firms. More critically,

second, our sample provides high-frequency transaction information, which is essential to our main objective of tracing out, at a micro-level, displacement effects.

The rest of the paper is organized as follows. Section 2 discusses Institutional Background on the Panama Papers, offshore schemes and tax evasion. Section 3 discusses the data. Section 4 provides our results. Section 5 concludes.

2. Offshore schemes and tax evasion: Institutional background.

2.1. Offshore schemes and tax evasion

Offshore finance is the provision of financial services by banks and other agents to non-residents, while an offshore financial center (OFC) is any locale where offshore activity takes place (IMF, 2000). These jurisdictions are popular for international financial holdings because they are often characterized by limited financial regulation, laws that protect secrecy, and little-to-no taxation. These factors make OFCs desirable for establishing offshore entities in the form of shell corporations. While establishing and operating these offshore vehicles is perfectly legal, and can be used for tax *avoidance* (again, legal), they can also be utilized for tax *evasion* by residents of other taxable jurisdictions, which is illegal.

As previously mentioned, due to secrecy laws found in OFCs and the lengths that entities go to hide their offshore activities, the true amount of wealth hidden in OFCs is difficult to determine. The Tax Justice Network estimates that $21 to $32 trillion in financial assets are currently in OFCs, and that $427 billion in tax revenue is lost annually to offshore tax havens.[10]

Firms employ a range of techniques to reduce their tax obligations via OFCs. Gravelle (2015) and Zucman (2017) describe a number of methods for using offshore vehicles to lower taxes. The main goal is to shift profits from a higher tax jurisdiction to a lower tax jurisdiction. International trade presents many opportunities for such profit-shifting schemes. In the context of exporters—the data we consider in this paper—a popular tax evasion strategy involves exporting a product to a partner firm located in an offshore jurisdiction at below-market prices, which then resells the product at the market price to its final buyer.[11]

[10] Available at "How much money is in tax havens?" Tax Justice Network (https://taxjustice.net/faq/how-much-money-is-in-tax-havens/, last accessed November 4, 2023).
[11] See, e.g., Desai et al. (2007) for a particularly vivid account of one such scheme employed by Russian oil exporter, Yukos.

Figure 1 contains a basic illustration of such profit-shifting.[12] In this arrangement, a legitimate domestic firm, Company A, exports a product to a (shell) Company B, which is located in an offshore financial jurisdiction, at a below-market price. Company B then resells the product to a legitimate third party (Company C) at full market price. Company B thus accumulates extra profits on which it pays little-to-no tax by virtue of its location in a lower-tax offshore jurisdiction, while Company A posts lower profits, paying the minimal tax on the profit (if any) in the domestic (higher-tax) jurisdiction.[13] Company B then transfers the money to the beneficiaries of such a scheme, in this case, Company A's owner.

Although the use of offshore financial centers is legal, many countries and advocacy groups have taken steps to combat their use for tax avoidance over the years. Many government and non-governmental organizations (e.g., the OECD) have created lists of known tax havens to try to put pressure on them to change their practices, with some success. Indeed, in recent years, a number of countries that have appeared on these lists have modified their banking laws to meet the principles of transparency and information exchange promoted by the OECD. These efforts have been decidedly imperfect, as illustrated in part by the evidence of offshore tax sheltering that appeared in the Panama Papers.

2.2 The Panama papers

The Panama Papers is the name given to an anonymous data leak that was made public on April 3, 2016. The data were provided to the German newspaper, *Süddeutsche Zeitung*, which worked with the International Consortium of Investigative Journalists (ICIJ) to analyze the leaked information. The 2.6 terabytes of data that comprised the Panama Papers contained more than 11.5 million documents related to over 214,000 offshore entities that had been established by the Panamanian law firm, Mossack Fonseca & Company. Given Panama's status as a tax haven, it is likely that these offshore entities were created on behalf of politicians and corporations from around the world for the purpose of hiding assets from taxation. Records in the leak date back to the 1970s.

[12] A similar scheme involves the inflation of costs using import transactions. In this paper, we focus on the export side since these are the data we have at hand.

[13] In the preceding description, the physical product is actually transferred to Company B. In practice, the product may be sent directly from Company A to Company C, with only financial transactions between A-B and A-C pairs. In our data, this will show up as financial transactions to the country location of company B (the party to financial transaction) with product shipments to the country of company C. Notably, we show that in the case of Panama only 2% of financial transactions are made for the products that are actually shipped to Panama. See our data description below and Figure 3.

Many prominent figures were implicated in the Panama Papers, including former heads of state and senior government officials, athletes, corporate executives, and show business personalities. The exposure of the offshore accounts of such notable figures led to front page coverage in major news outlets worldwide that lasted for weeks, which made it a particularly salient event that highlighted Panama's role as an offshore tax shelter.

In addition to breaking the initial story, the ICIJ made the data publicly available, and even created a searchable database to provide global access to the data.[14] The public could thus examine which firms and public figures had used Mossack Fonseca to establish and operate offshore vehicles. Figure 2 shows a distribution of entities mentioned in this database by country of registration.

3. Data description and preliminary analysis

3.1. ICIJ data

The data released by the ICIJ in the Panama Papers contains information on the offshore entities established by Mossack Fonseca. This includes the owner's name, country, officers, intermediaries (law firms, accountants, trust companies, and banks), addresses, and other key information on the offshore entities that the law firm had established. In many cases the name of the offshore entity and the listed directors were not the same as the parent company. It is important to remember that a large appeal of offshore entities is anonymity. Companies often establish their offshore vehicles under unrelated names and list obscure individuals as directors and other points of contact in order to maintain secrecy. To overcome this data limitation, we were able to link firms in our sample to offshore vehicles in the Panama Papers through the listed addresses provided in the leaked data. Through this process we identify 299 "exposed" firms, i.e., companies in our sample that had a related offshore entity revealed through the data leak. We return to this matching process below, after describing our main sample.

[14] Available at ICIJ Offshore Leaks Database: https://offshoreleaks.icij.org/ (last accessed November 4, 2023).

3.2. Measuring financial transactions through offshores

To measure the volume of transactions through offshore tax havens, we utilize Ukrainian trade data purchased from Bizbase.[15] This data is also used by, e.g., Korovkin and Makarin (2023). This dataset contains transaction-level data on the exports of Ukrainian firms, including identifying information about the exporting firm as well as the foreign importing partner (name, address, etc.). It also contains details of the exported product including: the 2012 Harmonized System (HS) product classification, value in U.S. dollars, weight, and product description.

Of particular relevance for our application, there are two fields for the country where the transaction occurs. First, there is information about the destination country (i.e., where the product is shipped, e.g., "Country C" as described in Section 2.1 and illustrated in Figure 1). We call this the "product destination country." Second, there is information about the country of residence of the foreign trading partner, which is the country from which the payment for the exported product is made. We call this the "financial transaction country" (i.e., "Country B" as described in Section 2.1 and illustrated in Figure 1).

In transactions where tax avoidance or evasion schemes are not utilized, the destination country and the financial transaction country are the same. However, as noted in Section 2.1 above, a popular tax evasion scheme involves profit shifting through offshore tax havens. In this case, to properly measure the *financial* flows from/through offshore tax havens rather than product flows, one needs to use the "financial transaction country" field to assign a relevant country to a transaction.

To showcase the importance of this distinction, Figure 3 plots trade flows for several countries based on the "product destination country" versus "financial transaction country" fields, aggregated by month. As a further point of comparison, we also plot monthly Ukrainian exports data from the UN-Comtrade database, which are the official trade statistics as reported to the United Nations.

We first note the very close correspondence in the level and trajectory of aggregates based on our transaction-level data and the product export data from Comtrade, which provides some validation of our micro-data.[16] More strikingly, we observe a wide gap between product and

[15] See https://bizbase.info/, last accessed November 4, 2023.

[16] Speaking to the reliability of our data, we find a close correspondence between our transaction-level data and aggregate trade data from Comtrade: the month-country correlation is 0.99 when we use the product destination field.

financial flows for the offshore havens of Panama (Panel A) and the British Virgin Islands (Panel B). In both cases, product flows are dwarfed by financial transactions – in the case of Panama, only 2 percent of total financial flows from Panama represent payments for the products that are actually delivered to Panama. Previewing the patterns in the analysis that follows, we see a sharp drop in financial transactions with Panama during April and May of 2016, the period when the Panama Papers leak occurred. Notably, there is no change in the actual product shipments to Panama during this timeframe.

In Panels C and D, we contrast these patterns with financial transactions and product flows through two non-offshore countries: The United States and Belarus. The former is a developed Western economy while the latter is a former Soviet republic, closer in proximity to Ukraine, both geographically and otherwise. In both the United States and Belarus, financial transactions are comparable in magnitude to the trade flows and are, if anything, smaller than the actual product flows. (The overall value of physical and financial flows for a given firm are, by definition, identical, so a gap in one direction in a subset of countries necessarily implies the opposite gap in others.)

These patterns also emphasize the importance of focusing on financial flows rather than traditional product flows in the analysis of trade with tax havens.

3.3. Offshore tax havens identification

By definition, all OFCs have relatively limited financial regulation, laws that protect the anonymity of their clients, and little-to-no taxation. However, OFCs vary in these attributes, and thus vary in the extent to which they are seen as compliant with international financial standards. Switzerland,

When we use the financial transaction field, the correlation drops to 0.66. One may also be concerned about potential misreporting of the "financial transactions country" field that is central to our analysis. First, we argue that this is unlikely to be a major issue in the data, as reporting to other (non-offshore) countries could expose exporters to potential legal action in those countries – indeed, companies use offshore financing arrangements (as in Panama) to take advantage of less-stringent supervision and legal enforcement, which is complementary to the tax avoidance activities enabled by favorable tax regimes. To the extent that there is underreporting of financial transactions through Panama or other offshores, the direction of bias in our results is not entirely clear. For example, while it may lead to an overestimate of the extent to which transactions through Panama decline (since it would be a combination of an actual drop plus a potential increase in misreporting), our displacement estimates may actually be underestimated to the extent that misreporting is shifted to product destinations rather than other offshores. Alternatively, if misreporting is already a problem before the Panama Papers' release, we would underestimate the direct impact on financial flows through Panama, since questionable transactions would already by disguised as "legitimate" financial flows. Finally, we emphasize that the transactions we study are in a legal gray area that is best described as tax avoidance rather than tax evasion. So, while businesses may wish to avoid having such activities exposed, there are not necessarily any direct legal repercussions.

for example, is generally seen as compliant with international regulations (especially since its 2015 information sharing agreement with the U.S.) and thus is less useful to those looking to evade taxes or engage in illicit financial activities. The Bahamas has weaker regulation and oversight than Switzerland, and thus raises more concerns as a potential location for establishing offshore tax avoidance/evasion vehicles.[17]

In our analysis we utilize two approaches to measuring OFCs. First, we use official offshore tax haven lists as declared in government documents. Given our focus on Ukrainian firms, a natural starting point is the list created in 2011 by the Ukrainian government's main executive body, the Cabinet of Ministers (Executive Order #143-2011-p "About countries designation as offshore zones").[18] This list is comprised of the OFCs officially recognized by the Ukrainian government as offshore zones. Panama itself was not added to this list until 2018 (possibly in response to the Panama Papers); other notable exclusions include the Bahamas and the United Arab Emirates (primarily Dubai).

Since we are interested in the shifting of trade across different types of tax havens, we also utilize the Russian Central Bank's (RCB) 2012 list, as used in Chernykh and Mityakov (2017). The Russian and Ukrainian lists of OFCs have considerable overlap, but notably the RCB list contains more localities. We hypothesize that given the geographical proximity and common institutional background (as well as the quite often interlinked ownership of companies) of the two countries, Russian and Ukrainian firms are likely to use similar tax evasion schemes and localities. To the extent that transactions involving OFCs on the Ukrainian list are apt to raise red flags with Ukrainian authorities, we argue that countries on the RCB offshore list that are omitted from the Ukrainian list may offer a potential regulatory arbitrage opportunity. These omitted countries include, for example, the Bahamas and the UAE.[19] We thus designate countries on the RCB list that are not on the Ukrainian government list as offshore tax havens "unrecognized" by the Ukrainian government (as of 2016).

Interestingly, offshore designations are very highly correlated with "revealed offshoring" as captured by a mismatch between product and financial flows, as described in the previous

[17] We describe OFCs as if there were some objective metric for categorizing which ones have sufficiently weak oversight to raise concerns among regulators. But this classification is inherently subjective, and, as a result, different jurisdictions may end up with different OFC lists.
[18] https://zakon.rada.gov.ua/laws/show/143-2011-p/ed20110223?lang=en#Text, last accessed November 4, 2023.
[19] We include the full lists for both Ukraine and Russia in Appendix Tables A1.1 and A1.2, respectively.

section. As we discuss in detail in Section 3.2 above, our data contain information about the country where a product is actually shipped as well as the country through which the associated financial transaction is made. To capture the mismatch between product and financial flows, we calculate the ratio of product flows into a given country to the sum of product and financial flows over 2014-2015. This "product shipment share" is 0.015 and 0.011 for Panama and BVI, respectively. For recognized offshores, weighted by the sum of product and financial flows to a county, the average value is 0.045, while for unrecognized offshores it is 0.226. Countries on neither the Ukrainian nor Russian list have a far higher rate of product flows – a weighted average of 0.525. Note that in our final set of analyses, we will examine whether this figure – which we take as a summary measure of tax avoidance through offshoring – is affected by the Panama Papers release.

3.4 Summary statistics

Our analysis centers on firm-country pairs for which there was at least one financial export transaction during 2015-2016. We do this to overcome the challenge of a sparse data matrix. Our main analysis sample is comprised of the weekly trade transactions of 23,830 firms, involving a total of 69,113 firm-country pairs with positive trade during 2015-2016. The distribution of transaction size is highly skewed – the mean weekly transaction is around $121,000, though with a standard deviation of more than $900,000. The median weekly value (conditional on non-zero trade) is $13,000.

Table 1 contains summary statistics for our sample. In Panel A, we include all firm-destination country observations. One percent of firms' financial transactions involve Panama. While the British Virgin Islands (BVI) was a less salient tax haven relative to Panama (as evidenced by the name of the data leak and the location of Mossack Fonseca), it was frequently listed as the locale of offshore vehicles in the Panama Papers. We thus include the BVI as a separate category, which accounts for 0.4 percent of weekly firm-country transactions. We further include two broad classes of offshore locations – those recognized by Ukraine, excluding Panama and BVI (*Recognized Offshores*) and those recognized by Russia but not Ukraine (*Unrecognized Offshores*). These offshores account for 0.9 percent and 2.4 percent of observations, respectively.

In Panel B, we limit the sample to firms with substantial prior exposure to Panama or BVI transactions, defined as having more than 5 percent of transaction volume in 2014 through the two

countries. This restriction omits firms with little-to-no initial propensity to execute transactions through these offshores. By construction, the average fraction of transactions going to *Panama* and *BVI* increase. Interestingly, the fraction of transactions going through other offshores increases as well, with the value of *Recognized* and *Unrecognized Offshores* increasing to 4.7 percent and 4.3 percent (from 0.9 percent and 2.4 percent), respectively.

Before proceeding to our results, we make several observations about the extent to which our findings may generalize to offshoring in general. As noted at the outset, we focus on Ukrainian exporters because of the unique dataset we have obtained for our analysis. While any empirical setting has its idiosyncrasies, the type of tax-reducing strategy we focus on here is common worldwide (Liu, Schmidt-Eisenlohr, and Guo, 2020, Davies, et al., 2018, Fisman, Hardy, and Mityakov, 2021). To the extent that these behaviors—and responsiveness to exposure—transcend national boundaries, we may expect our findings to apply to tax avoidance activities and their displacement more broadly. Further, insofar as legal enforcement is more rigorous in other countries (relative to Ukraine), we may anticipate even stronger displacement effects. While it is possible that stronger enforcement would lead to less use of such transfer pricing schemes in general, the results of O'Donovan, Wagner, and Zeume (2019) suggest otherwise. They report that among publicly listed firms, an estimated one in seven, i.e., 14 percent, engage in offshore transactions to avoid taxes. In our sample of Ukrainian exporters, 8 percent engage in transactions through OFCs (including smaller exporters, many of which are less likely to have the sophistication or scale to engage in extensive offshore tax avoidance operations), while for the above-median set of companies, the corresponding figure is 13.4 percent, which is roughly comparable to the proportion in O'Donovan, Wagner, and Zeume (2019). Overall, while we acknowledge that Ukraine represents a potentially unusual case, we do not necessarily expect that it would bias our estimates of offshoring activity generally, nor the reaction to public exposure.

4. Results

4.1. Baseline results

We begin by investigating how firm-level financial transactions with Panama change around key dates in the Panama Papers leak, benchmarked against transactions to other localities. We conduct our analysis at a weekly frequency from January 2016 through December 2016. We aggregate data

at the firm-week-destination[20] country level and define three main time periods. As discussed in Section 2.2, the leak was announced on April 3, 2016, and a searchable database was posted on May 9, 2016. Since April 3 was a Sunday, we consider weeks up to and including the week containing that date as the "pre-leak" period; May 9 was a Monday, so we take calendar weeks containing that date as coming after the database's release.[21] In our regression analyses, we thus define three periods: before the week of the announcement ("Pre-leak," up to and including the week containing Sunday, April 3); between the initial leak and the release of the database ("Post-leak," from the announcement date until the week ending Sunday May 8); and after the release of the database ("Post-database"). Of course, these two time periods also capture the short- versus long-run adjustment to the leak.

As is standard in the international trade literature, we focus on overall trade using the Poisson-Pseudo Maximum likelihood estimator proposed by Santos Silva, and Tenreyro (2006), to deal with the non-positive trade values in many firm-country-week observations. We also explore the effects at the extensive margin (i.e., decision to export) in a simple linear probability model. Namely, we consider the following empirical specification:

$$Trade\ Margin_{f,c,t} = \psi_c + \phi_{f(,y)} + \mu_t + \beta_1 Panama_c \times PostLeak_t + \\ + \beta_2 Panama_c \times PostDatabase_t + \epsilon_{f,c,t} \quad (1)$$

$Trade\ Margin_{f,c,t}$ captures either overall trade or its extensive margin, as follows:

i) Volume of trade by firm f through country c in week t, $Trade_{f,c,t}$, which reflects the combined *intensive* and *extensive margins*, for which we use PPML estimation.[22]

ii) An indicator variable of positive trade flow by firm f through country c in week t $1(Trade_{f,c,t} > 0)$ for the *extensive margin.*

[20] Here and in what follows, destination country is the country from through which payment is made for the exports, (unless it is specifically noted otherwise, as e.g. in Section 5.3 below)

[21] In our study we utilize the ISO 8601 date formatting standard, which is common in Europe, and defines the beginning of a new week as Monday.

[22] Note that in this case, we need to impute zero values when no trade is observed. Rather than creating a sparse matrix of *all* possible firm-by-country observations we use observed trade patterns in 2015 and 2016 and retain only those firm-by-country pairs that are observed trading during those two years.

$Panama_c$ is an indicator variable that takes on a value of one if the transaction country is Panama and zero otherwise. The estimation sample time horizon is from January 1 – December 31, 2016, at a weekly frequency. The coefficient, β_1 (on the interaction between $PostLeak_t$ and $Panama_c$), reflects the change in trade with Panama after the leak announcement but before company names were released, while the coefficient, β_2 (on the interaction between $PostDatabase_t$ and $Panama_c$), reflects the change (relative to the pre-leak period) in trade after the searchable list of company names involved became available.

We include weekly fixed effects, μ_t, as well as country, ψ_c, and firm, ϕ_f, fixed effects in all specifications. As noted above, we estimate model (i) using PPML with fixed effects and model (ii) with a linear probability model. In both cases, standard errors are computed using clustering at the destination-country levels.

Table 2, Panel A, Column 1 presents the estimation results for the PPML estimates that capture the overall change in trade. The results indicate a relative decline in trade through Panama that conditional on a positive volume of trade, the amount of trade decreases within a given week both after the leak announcement ($\beta_1 < 0$) and when the leaked data was posted ($\beta_2 < 0$). The coefficient on *PostLeak* of -0.138 implies a 13 percent reduction in trade post-leak. The longer-run effect is considerably larger – the coefficient on *PostDatabase* of -0.699 implies a relative reduction of trade financed through Panama approximately 50 percent.[23]

In Column 2 of Table 2, Panel A, we study the effect at the extensive margin, i.e., the decision to trade. We find that firms are less likely to execute transactions through Panama after the leak took place ($\beta_2 < \beta_1 < 0$). If we take as the benchmark the fraction of firms that executed transactions through Panama in 2015 (9.3 percent), $\beta_2 = 0.049$ implies a more than 50 percent drop in the frequency of trade through Panama after the leak, suggesting that much of the impact operates through firms ceasing to trade through Panama rather than reducing transaction size.

As discussed in Section 3, the client database leaked in the Panama Papers contains entities from many offshores even though the name of the leak gave particular salience to Panama-based transactions and involved the accounts of a Panamanian firm (Mossack Fonseca). Notwithstanding the salience of the country of Panama in the leak, the BVI comprise the largest number of offshore entities (150,000) leaked in the Panama Papers, well ahead of the number of Panama offshore

[23] $e^{-0.14} - 1 \approx -0.13$ and $e^{-0.69} - 1 \approx -0.5$, respectively.

entities (48,000). Note that this is not the case for the Ukrainian firms that we focus on – as shown in the summary statistics for our sample, a higher fraction of firm-country transactions involve Panama than BVI-based offshore entities.

In Table 2, Panel B we provide the results of an investigation of the impact of the leak on trade through BVI. The added benefit of this approach is that it allows us to further disentangle the effect of the actual leak versus the public perception of the leak, which might have been shaped more by salience than the actual information contained in the leaked documents.

To this end, we augment our initial specification as follows:

$$\begin{gathered} Trade\ Margin_{f,c,t} = \psi_c + \phi_f + \mu_t \\ +\beta_1 Panama_c \times PostLeak_t + +\beta_2 Panama_c \times PostDatabase_t \\ +\gamma_1 BVI_c \times PostLeak_t + \gamma_1 BVI_c \times PostDatabase_t + \epsilon_{f,c,t} \end{gathered} \quad (2)$$

We consider the same two empirical models as in Table 2. The interactions of BVI_c, with $PostLeak_t$, and $PostDatabase_t$ allow us to separately study the effect of trade with Panama and BVI (relative to other localities). The results involving BVI are similar to those of Panama, though the point estimates imply a marginally smaller effect on overall trade in the longer-run (Column 1). If anything, there is an increase on the intensive margin over the longer-run (Column 1).

In the full-sample results above, we arguably include many firms that are not on the margin of executing transactions through Panama or BVI. In Panel C of Table 2, we thus focus on the subsample of exporters with substantial prior exposure to trade with Panama and BVI, based on whether an exporter had at least one percent of total financial transactions in 2015 made through Panama or BVI. For such firms, the results indicate a larger effect overall for both offshore localities, particularly for the extensive margin. In most of our analyses below, we focus on this subsample of firms.

4.2. Displacement effects in offshore activities

Our findings to this point suggest that trade through Panama and BVI fell after the Panama Papers leak. This finding begs the question as to whether businesses make less use of offshore transactions thereafter, or whether these transactions simply shift to other locales.

To explore this question, we identify OFCs using the approach outlined in Section 3 above. Namely, we use the official lists of OFCs, and consider the impact of Panama papers leak on firms' financial transactions for the following country groupings: (i) Panama; (ii) BVI; (iii) other offshores "recognized" by Ukraine in 2016; (iv) "unrecognized" offshores; (v) non-offshores. Recall from our earlier data description that we define unrecognized offshores as those that are recognized by Russia but not Ukraine, and exclude Panama and BVI from the definition of either offshore group. We consider empirical specifications for different trade margins similar to equation (2), while including interactions with countries in groups (i)-(iv), with non-offshores serving as the omitted category.

We present the results in Table 3. Focusing first on unrecognized offshores, we observe an *increase* in transactions in the longer term (i.e., post-database) overall (column 1) and also for our extensive margin estimates (column 2); there is no significant effect in the shorter-run. The economic significance of the long-run estimates is very large. For example, the coefficient in our PPML specification implies an increase in trade of nearly 180%. For the recognized offshores we do not see any robust substitution pattern either in the short-run (after the leak announcement) nor in the longer-run (after the database posting); if anything, there is a decline in trade through recognized offshores, as indicated by the negative coefficient in the extensive margin specification.

The (longer-run) increase in trade with unrecognized offshores among firms that had prior sizeable exposure to trade with Panama and BVI suggests that, in response to the Panama Papers leak, these businesses may actively seek alternative offshore destinations for their financial transactions. At the same time, they exercise some caution in the choice of alternative OFCs – substitution is to OFCs that are not recognized as such by Ukraine's legal code.

4.3. Heterogeneity by leak exposure

To summarize our results thus far, the Panama Papers leak is associated with substantial reductions in financial transactions with Panama and BVI, accompanied by substitution into other OFCs. However, firms conducting business through Panama and BVI had differing levels of exposure as a result of the leak, depending on whether they were clients of Mossack Fonseca. In this section, we explore whether we observe a differential response for those directly implicated in the leak, i.e., Mossack Fonseca clients.

To do so, we further take advantage of details in our transaction-level database, which includes the address of the foreign counterpart for each financial transaction.[24] We merge the address data to the searchable database of addresses released in the Panama Papers, in order to divide exporters with prior exposure to Panama/BVI into two groups:

i) Firms that traded in 2014-2015 through counterparts whose addresses were specifically mentioned in the Panama Papers ("exposed" exporters).

ii) Firms that traded with Panama/BVI but whose counterparts' addresses were not mentioned in the Panama Papers ("not-exposed" exporters).

We then estimate specifications similar to those in Tables 2 and 3 separately for these two groups of firms. Table 4 contains estimation results for overall trade via a PPML specification, as well as the extensive margin. We observe roughly similar effects for overall trade (columns 1 and 3). For the extensive margin, however, the point estimates are far larger for those exposed in the leak, both in the short and long run.

Overall, these results provide (somewhat mixed) evidence of a stronger response for exposed firms. It is also intriguing that we observe a sharper reaction for exposed firms in both the short- and long-run. This could be because of anticipation of the database release – these companies were likely aware that their identities would be revealed in the longer-run.

4.4. Heterogeneity by firm ownership

Our main analysis includes all Ukrainian firms. It is plausible that private firms are at greater risk of government disciplinary action relative to state-owned enterprises (see, e.g., Fulmer, Knill, and Yu, 2023).[25] In our final set of firm heterogeneity analyses, we explore heterogeneity as a function of firm ownership. We use data from the SPARK-Interfax database to divide exporters into private companies versus state-owned enterprises (SOEs).[26] We first note that SOEs are a relatively small subsample of our data: they constitute 1.5 percent of all firm-country-week observations with positive export values. In particular, there are very few SOEs with exports through BVI and other

[24] Note that for both groups of firms, we still restrict our attention to exporters with substantial prior involvement in trade with Panama/BVI, based on whether more than five percent of the firm's export transactions occurred through Panama/BVI in 2014

[25] SOEs may also make different use of offshore vehicles, driven more by theft rather than tax avoidance.

[26] SPARK-Interfax database is subscription-based database that contains firm identifying information gathered from official statistics government sources for all firms registered in Ukraine, Russia, and other former USSR countries. (See www.spark-interfax.ru for more details, last accessed November 6, 2023.)

offshores (only one SOE has positive trade through BVI, for example).[27] As such, for this final set of results, we focus on trade through Panama.

We provide these results in Table 5, which implies a very stark contrast between the responses of private firms versus SOEs to the Panama Papers leak. For private firms, the patterns look quite similar to our full-sample results, which is unsurprising given that they comprise the bulk of our sample. By contrast, we observe an *increase* in SOE transactions through Panama after the leak. This may suggest that SOE managers felt they could continue to trade through Panama with impunity. Furthermore, given the observed increase, they may have even been able to take advantage of opportunities that were created by the drop in private demand for Panama-based offshoring.

4.5. Results at the destination country level

Our focus to this point has been on the *firm's* decision to export a product via an offshore. Yet these transactions also require the participation of a counterparty in the product's destination country. It is natural, therefore, to consider whether we see a reduced willingness to engage in trade financed through Panama after the Panama Papers' leak. To examine responsiveness by destination countries, for each product-by-destination-country observation in a given week we calculate the percentage of product deliveries that are paid through: i) all offshores, ii) Panama (iii) BVI, iv) recognized offshores, and v) unrecognized offshores. We then assess whether there is a change in this fraction following the leak of the Panama Papers.

We then consider the following empirical specification:

$$Fraction_{c,t}^{(k)} = \phi_c + \beta_1 PostLeak_t + \beta_2 PostDatabase_t + \epsilon_{c,t} \quad (3)$$

where $Fraction_{c,t}^{(k)}$ is one of five fractions (in %) of deliveries to country c in week t financed through one of five offshore groups k defined above.

Destination country fixed effects, ϕ_c, are included in all specifications and standard errors are clustered at destination country level. To avoid potential home-bias in trade effects we consider

[27] A natural alternative interpretation is that SOEs simply engage in legitimate exports to Panama. However, we find an even larger mismatch between product and financial flows for SOEs: there are virtually no product flows through Panama by SOEs.

only destinations that themselves are non-offshore financial centers. We estimate (3) via weighted regressions using past values (circa 2015) of total product flows as weights to avoid upweighting destinations with extreme values of fractions but modest trade flows.

Table 6 contains estimation results. In the full sample of non-OFC destinations (Table 7, Column 1) we observe a sizeable decrease in the fraction of deliveries financed through all OFCs, at least in the longer-run. The effect is statistically significant and implies effects of considerable economics magnitudes: the fraction of total product deliveries financed through all OFCs declines by 1.6 percentage points, which is a sizeable effect given that this fraction is, on average, around 6 percentage points with a standard deviation of 13.5 percentage points.

Inspecting different offshore destinations in Columns 2-5 of Table 6, we find that the result is driven by not only a decrease in transactions with Panama, but also with other recognized offshores. Notably, there is little change in transactions through unrecognized offshores or BVI.

Overall, we conclude that post-leak, the destination countries' level product shipments started to shift away from being paid through Panama and other recognized OFCs with little change in transactions with BVI or unrecognized offshores.

5. Conclusion

Using detailed firm-level exports for Ukrainian firms, we show a robust negative decline in trade conducted through Panama in the aftermath of the Panama Papers data leak. International trade-related financial transactions going through Panama fell by approximately 50 percent. We observe a more modest decline in transactions through the British Virgin Islands, another country that figured prominently in the Panama Papers. At least some of this decline was offset by trade through other offshore havens, in particular those that were un recognized by Ukrainian regulators. In particular, we observe an increase in transactions in the longer term (i.e., post-database) with the economic significance of this effect implying an increase in trade in these unrecognized OFCs of as much as 180%.

We also find that our results are driven by private firms. In contrast, state-owned firms, which are owned at least in part by the government, do not decrease their transactions through Panama. We conclude that these firms do not fear a regulatory response to offshore activity and therefore do not react to the Panama Papers leak.

At the destination country level, we find an overall decrease in product deliveries financed through offshore financial centers, but it is mainly driven by the decline in financing of trade through Panama and other OFC recognized by the Ukrainian government. Notably, OFCs present on other lists, but absent from the Ukrainian regulator list, were not affected.

We hope that in future work researchers may further the agenda that we lay out in this paper. Natural directions include further analysis of the types of companies that engage in tax-reduction strategies via international trade, and the specific strategies they might employ in responding to enforcement efforts. We hope these efforts may be facilitated by access to comparable trade data from other countries, to further compare how local institutions – enforcement and otherwise – may impact companies' offshoring activities.

Finally, our paper offers policy-relevant evidence on the role of displacement in limiting any efforts at curbing offshore activities – to the extent that such efforts focus on a subset of offshore havens, companies can shift transactions even in the relatively short run to other more compliant jurisdictions. Our findings thus reinforce the potential revenue benefits of proposals such as the global minimum tax of 15 percent proposed by the OECD, but also the critical importance of broad-based participation in these initiatives.

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Tables

Table 1: Summary statistics

Panel A: Whole sample of exporters

Variable	Obs	Mean	Std. dev.	Min	Max
Log exports	561,180	9.627	1.697	-3.398	18.203
1(exports>0)	4,791,644	0.117	0.322	0	1
Value of exports, $M	4,791,644	14.224	341.264	0	80,399
Panama	4,791,644	0.011	0.106	0	1
BVI	4,791,644	0.004	0.063	0	1
Recognized offshores	4,791,644	0.009	0.093	0	1
Unrecognized offshores	4,791,644	0.024	0.152	0	1
Calendar week	4,791,644	106	30	53	156
Panel B: Exporters with substantial prior exposure to Panama/BVI					
Log exports	13,460	9.717	1.867	2.553	17.494
1(exports>0)	96,512	0.139	0.346	0	1
Value of exports, $000	96,512	20.204	298.100	0	39,575
Panama	96,512	0.123	0.328	0	1
BVI	96,512	0.020	0.140	0	1
Recognized offshores	96,512	0.050	0.217	0	1
Calendar week	96,512	103	30	53	156
Exposed firm	96,512	0.239	0.426	0	1

Notes: The sample in Panel A is the balanced panel of all exporting firmXdestination countryXweek observations from Bizbase over 2015-2016. The balanced panel is constructed using all firm-country observations that have traded at least once during 2014-2016, imputing zero trade flows for missing trade observations. Panel B further restricts attention to observations pertaining to exporting firms that have a fraction of 2014 trade with Panama/BVI greater than 5 percent of total 2014 exports for this firm. Log exports (1(export>0), Value of exports ($M in Panel A and $000 in Panel B) is log of weekly export flows (dummy for such flows being positive, level of such flows in thousands/millions of dollars, respectively) performed by a given exporting firm with all counterparties registered in a given country. “Recognized” offshores is a dummy for countries designated as offshore tax havens by the Ukrainian government according to Executive Order #143-2011-p of the Cabinet of Ministers of Ukraine. “Unrecognized” dummy is set equal to unity for countries not present in the above list but present on the Russian Central Bank list of groups 2 and 3 of semi- and non-transparent offshore tax havens as described by Chernykh and Mityakov (2017). Panama and BVI are excluded from those lists when used to construct all those dummies. Exposed firm dummy is a dummy for the firm to do business with a counterparty whose address was listed in Panama papers database.

Table 2: Baseline effect of Panama Papers leak

	(1)	(2)
Dependent variable	*Exports*	*1(Export>0)*
	Panel A: Panama only	
Panama X PostLeak	-0.138***	-0.029***
	(0.035)	(0.002)
Panama X PostDatabase	-0.699***	-0.049***
	(0.037)	(0.003)
Observations	2,563,756	2,563,756
R-squared		0.142
	Panel B: Panama and BVI	
Panama X PostLeak	-0.143***	-0.029***
	(0.037)	(0.002)
Panama X PostDatabase	-0.711***	-0.049***
	(0.035)	(0.003)
BVI X PostLeak	-0.123***	-0.027***
	(0.037)	(0.002)
BVI X PostDatabase	-0.416***	-0.045***
	(0.035)	(0.003)
Observations	2,563,756	2,563,756
R-squared		0.142
	Panel C: Panama and BVI:	
	Exporters with substantial prior trade with Panama/BVI	
Panama X PostLeak	-0.096	-0.078***
	(0.146)	(0.006)
Panama X PostDatabase	-1.359***	-0.105***
	(0.156)	(0.008)
BVI X PostLeak	-0.196	-0.092***
	(0.146)	(0.006)
BVI X PostDatabase	-0.355**	-0.106***
	(0.156)	(0.008)
Observations	69,368	69,368
R-squared		0.148
Margin	Both	Extensive
Week X year FE	Yes	Yes
Country X year FE, Firm X year FE	Yes	Yes

Notes: The sample is the balanced panel of all exporting firmXdestination countryXweek observations from Bizbase over 2015-2016. The balanced panel is constructed using all firm-country observations that have traded at least once during 2014-2016, imputing zero trade flows for missing trade observations. Panel C further restricts attention to observations pertaining to exporting firms that have a fraction of 2014 trade with Panama/BVI greater than 5 percent of total 2014 exports for this firm. The dependent variable in column (1) is the level of export transactions paid by entities located in a given country in a given week, the dependent variable in column (2) is a dummy variable that is set to 1 where transactions are positive. "Panama" and "BVI" are dummies for exports to Panama and BVI, respectively. PostLeak dummy is set to 1 after the initial leak announcement but before the actual posting of the leaked data. PostDatabase is the dummy set to one after the posting of the leaked data. All specifications include firm-year, destination country-year, and week-year fixed effects. The specification in column (1) is estimated by Poisson Pseudo-Maximum Likelihood (PPML) while the specification in column (2) is estimated by OLS-FE. Two-way clustered robust standard errors at the exporting firm and at the destination country levels are reported in parenthesis. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 3: Substitution into other offshores. Subsample of exporters with sizeable prior trade with Panama/BVI.

	(1)	(2)
Dependent variable	*Exports*	*1(Export>0)*
Unrecognized offshore X PostLeak	-0.372	0.007
	(0.238)	(0.013)
Unrecognized offshore X PostDatabase	1.026***	0.039**
	(0.337)	(0.015)
Recognized offshore X PostLeak	-0.042	-0.027
	(0.655)	(0.018)
Recognized offshore X PostDatabase	0.070	-0.024**
	(0.886)	(0.011)
Observations	69,368	69,368
R-squared		0.148
Additional controls		
Leak dummies X Panama	Yes	Yes
Leak dummies X BVI	Yes	Yes
Week X year FE	Yes	Yes
Country X year FE	Yes	Yes
Exporting firm X year FE	Yes	Yes

Notes: The sample is the balanced panel of all exporting firmXdestination countryXweek observations from Bizbase over 2015-2016. The balanced panel is constructed using all firm-country observations that have traded at least once during 2014-2016, imputing zero trade flows for missing trade observations. Sample is further restricted to observations pertaining to exporting firms that have a fraction of 2014 trade with Panama/BVI greater than 5 percent of total 2014 exports for a given firm. The dependent variable in column (1) is the level of export transactions paid by entities located in a given country in a given week, the dependent variable in column (2) is a dummy variable that is set to 1 where such transactions are positive. "Recognized" is a dummy set to 1 for countries designated as offshore tax havens by the Ukrainian government according to Executive Order #143-2011-p of the Cabinet of Ministers of Ukraine. "Unrecognized" is a dummy set to 1 for countries not present in the above list but present on the Russian Central Bank list of groups 2 and 3 of semi- and non-transparent offshore tax havens as described by Chernykh and Mityakov (2017). Panama and BVI are explicitly excluded from the definitions of those dummies. PostLeak dummy is set to 1 after the initial leak announcement but before the actual posting of the leaked data. PostDatabase is the dummy set to one after the actual posting of the leaked data. Both Leak dummies interactions with Panama and BVI are included in the regression but not reported. All specifications include firm-year, destination country-year, and week-year fixed effects. The specification in column (1) is estimated by Poisson Pseudo-Maximum Likelihood (PPML) while the specification in column (2) is estimated by OLS-FE. Two-way clustered robust standard errors at the exporting firm and at the destination country levels are reported in parenthesis. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 4: Exposed vs non-exposed exporting firms:

	(1)	(2)	(3)	(4)
Dependent variable:	*Exports*	*1(Export>0)*	*Exports*	*1(Export>0)*
Subsample:	*Exposed firms*		*Not exposed firms*	
Panama X PostLeak	-0.262	-0.141***	-0.056	-0.040***
	(0.241)	(0.011)	(0.204)	(0.007)
Panama X PostDatabase	-1.015***	-0.127***	-1.519***	-0.093***
	(0.281)	(0.011)	(0.089)	(0.009)
BVI X PostLeak	-0.501**	-0.177***	0.011	-0.041***
	(0.241)	(0.011)	(0.204)	(0.007)
BVI X PostDatabase	-0.202	-0.188***	-0.285***	-0.055***
	(0.281)	(0.011)	(0.089)	(0.009)
Observations	19,136	19,136	50,188	50,232
R-squared		0.222		0.140
Year X month FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Exporting firm FE	Yes	Yes	Yes	Yes

Notes: The sample is the balanced panel of all exporting firmXdestination countryXweek observations from Bizbase over 2015-2016. The balanced panel is constructed using all firm-country observations that have traded at least once during 2014-2016, imputing zero trade flows for missing trade observations. Sample is further restricted to observations pertaining to exporting firms that have a fraction of 2014 trade with Panama/BVI greater than 5 percent of total 2014 exports for a given firm. In columns (1)-(2) and (3)-(4) the sample is further subdivided into firms "exposed" and "not-exposed" by the Panama Papers leak, respectively. An exporting firm is considered to be "exposed" if during 2014-2015 it used to trade with entities whose addresses are contained in Panama Papers database posted online and it is a firm with sizeable prior trade with Panama/BVI. The dependent variable in columns (1) and (3) ((2) and (4)) is the level of export transactions (dummy for such transactions to be positive) with zeroes imputed as described above. "Recognized" is a dummy set to 1 for countries designated as offshore tax havens by the Ukrainian government according to Executive Order #143-2011-p of the Cabinet of Ministers of Ukraine. "Unrecognized" is a dummy set to 1 for countries not present in the above list but present on the Russian Central Bank list of groups 2 and 3 of semi- and non-transparent offshore tax havens as described by Chernykh and Mityakov (2017). Panama and BVI are explicitly excluded from the definitions of those dummies. PostLeak dummy is set to 1 after the initial leak announcement but before the actual posting of the leaked data. PostDatabase is the dummy set to one after the actual posting of the leaked data. Both Leak dummies interactions with Panama and BVI are included in the regression but not reported. All specifications include firm-year, destination country-year, and week-year fixed effects. The specifications in columns (1) and (3) are estimated by Poisson Pseudo-Maximum Likelihood (PPML), while the specifications in columns (2) and (4) are estimated by OLS-FE. Two-way clustered robust standard errors at the exporting firm and at the destination country levels are reported in parenthesis. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 5: Private vs State-owned firms. One of main results

	(1)	(2)	(3)	(4)
Dependent variable	*Exports*	*1(Export>0)*	*Exports*	*1(Export>0)*
		Panel A: Private Firms		
Panama X PostLeak	-0.115**	-0.021***	0.023	-0.083***
	(0.048)	(0.002)	(0.167)	(0.006)
Panama X PostDatabase	-0.713***	-0.056***	-1.357***	-0.136***
	(0.052)	(0.003)	(0.172)	(0.007)
Observations	1,658,488	1,658,488	48,256	48,256
R-squared		0.146		0.139
		Panel B: SOEs		
Panama X PostLeak	-0.132	0.006	1.859*	-0.025
	(0.697)	(0.011)	(1.106)	(0.047)
Panama X PostDatabase	0.236	0.058***	-0.005	0.160***
	(0.232)	(0.014)	(0.122)	(0.049)
Observations	22,204	22,204	2,808	2,808
R-squared		0.230		0.310
Margin	*Both*	*Extensive*	*Both*	*Extensive*
Subsample:	*Whole sample*		*Sizeable 2014 trade with Panama*	
Week FE	Yes	Yes	Yes	Yes
Country FE, Firm FE	Yes	Yes	Yes	Yes

Notes: The sample is the balanced panel of all exporting firmXdestination countryXweek observations from Bizbase over 2015-2016. The balanced panel is constructed using all firm-country observations that have traded at least once during 2014-2016, imputing zero trade flows for missing trade observations. Sample in columns (4)-(6) is further restricted to observations pertaining to exporting firms that have a fraction of 2014 trade with Panama/BVI greater than 1 percent of total 2014 exports for a given firm). The dependent variable in columns (1) and (4) is the level of export transactions with zeroes imputed as described above paid by entities located in given country in a given week, the dependent variable in columns (2) and (5) is a dummy variable for such transactions to be positive. Panel A restricts attention to private firms while Panel B consider state-owned firms. Ownership data was retrieved from the SPARK-Interfax database. PostLeak dummy is set to 1 after the initial leak announcement but before the actual posting of the leaked data. PostDatabase is the dummy set to 1 after the actual posting of the leaked data. All specifications include firm-year, destination country-year, and week-year fixed effects. The specifications in columns (1) and (3) are estimated by Poisson Pseudo-Maximum Likelihood (PPML), while the specifications in columns (2) and (4) are estimated by OLS-FE. Two-way clustered robust standard errors at the exporting firm and at the destination country levels are reported in parenthesis. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

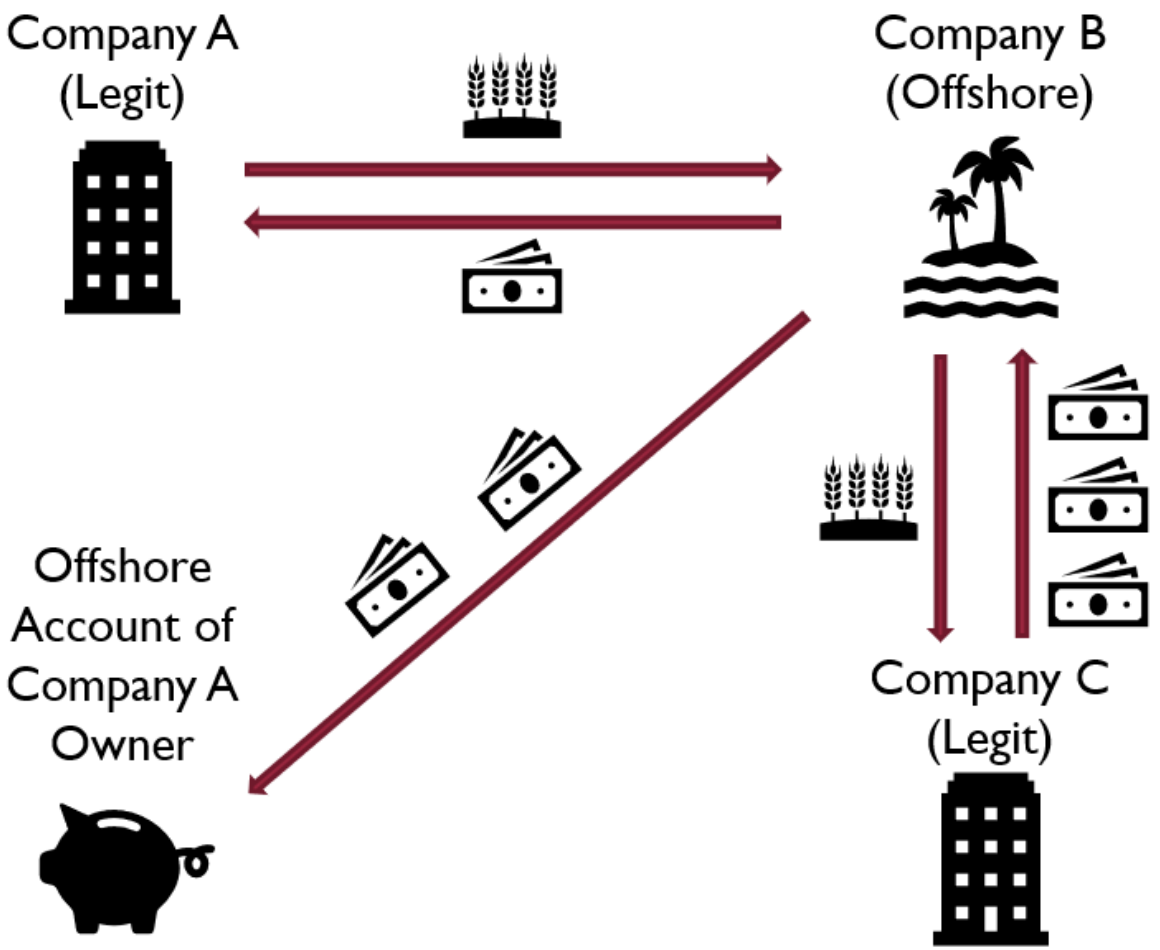
Table 6: Results for the destination country

	(1)	(2)	(3)	(4)	(5)
	Dependent variable: Fraction of shipments finance through				
	All Offshores	*Panama*	*BVI*	*Unrecognized*	*Recognized*
Post Leak	-1.380	-0.044	0.159	-1.517	0.022
	(1.517)	(0.431)	(0.868)	(1.160)	(0.413)
Post Database	-1.634**	-0.624**	-0.262	0.111	-0.860***
	(0.666)	(0.307)	(0.249)	(0.667)	(0.293)
Observations	5,864	5,864	5,864	5,864	5,864
R-squared	0.441	0.089	0.211	0.466	0.196
Destination Country FE	Yes	Yes	Yes	Yes	Yes

Notes: The sample is the panel of all destination countryXweek observations from Bizbase over 2016. The dependent variable is the fraction of total shipments to a given country that are paid by financial transactions through: i) all offshore zones (column 1); ii) Panama/BVI in columns (1) and (4) is the level of export transactions with zeroes imputed as described above paid by entities located in given country in a given week, dependent variable in columns (2) and (5) is a dummy variable for such transactions to be positive. PostLeak dummy is set to 1 after the initial leak announcement but before the actual posting of the leaked data. PostDatabase is the dummy set to one after the actual posting of the leaked data. All specifications include firm-year, destination country-year, and week-year fixed effects. The specifications in columns (1) and (3) are estimated by Poisson Pseudo-Maximum Likelihood (PPML), while the specifications in columns (2) and (4) are estimated by OLS-FE. Two-way clustered robust standard errors at the exporting firm and at the destination country levels are reported in parenthesis. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

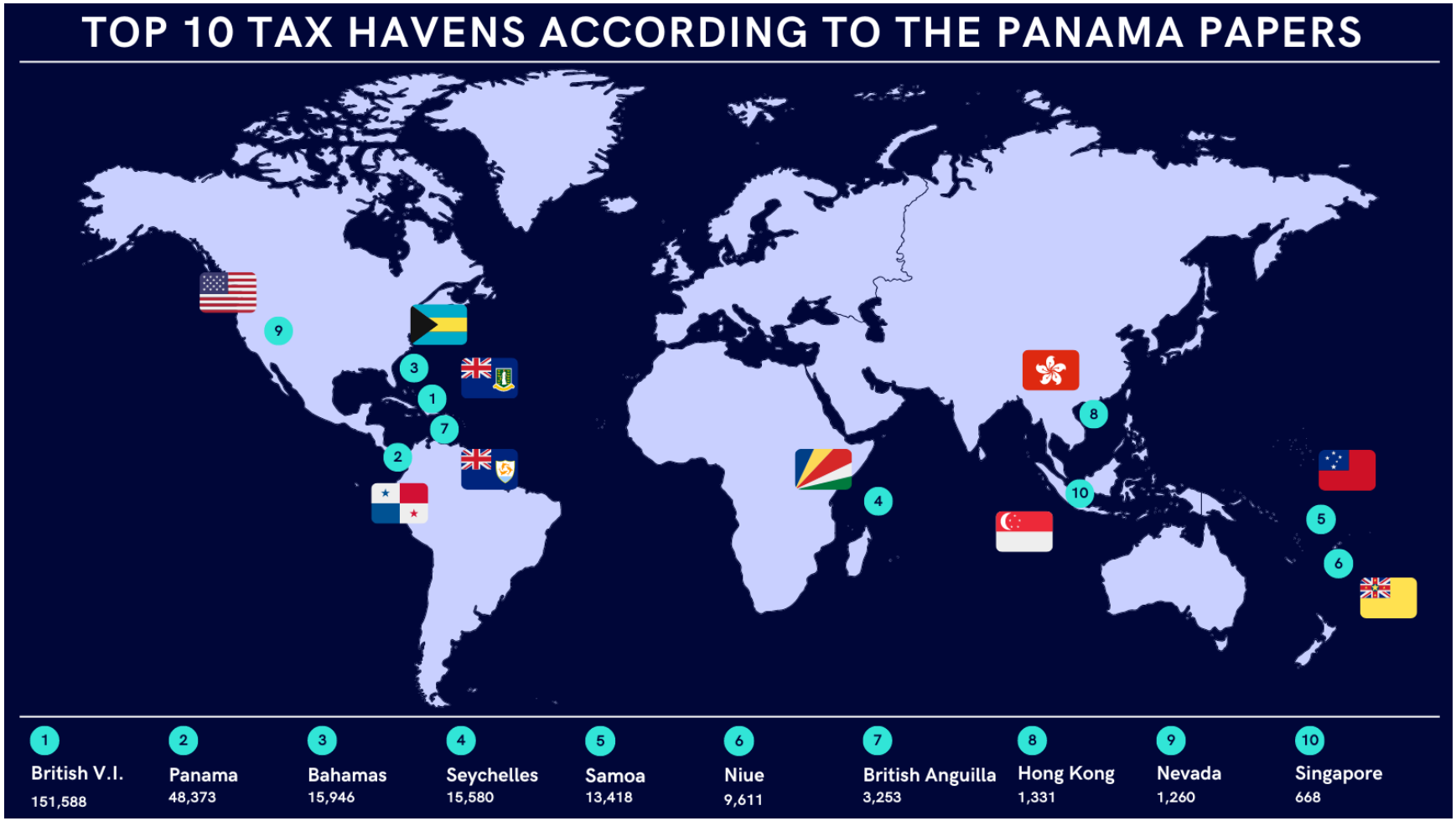
Figures

Figure 1: Profit-shifting tax evasion scheme using exports



Notes: This table illustrates a tax evasion scheme based on mispricing of exports. See Section 2.1 for more details.

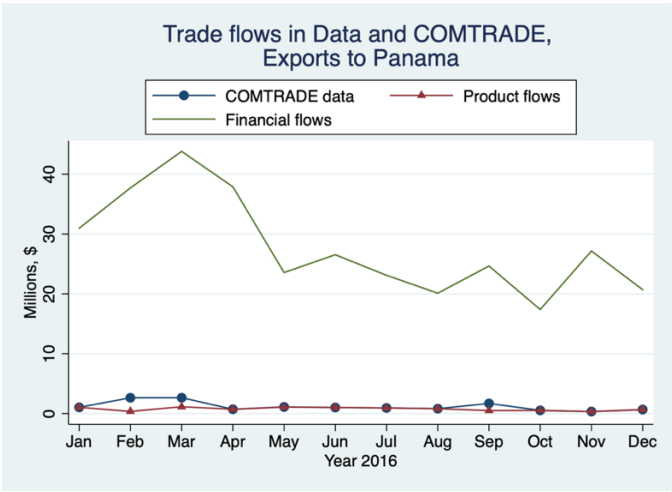
Figure 2: Top ten countries mentioned in Panama Papers leaks



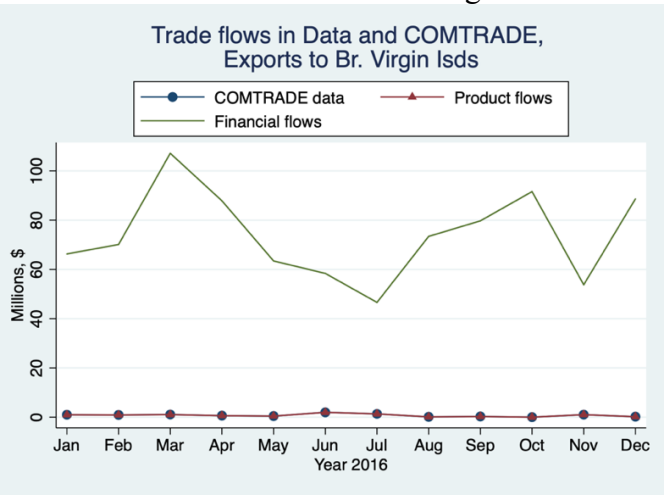
Notes: This figure shows the distribution of entities exposed by Panama Papers leak by country of registration.

Figure 3: Trade vs financial flows

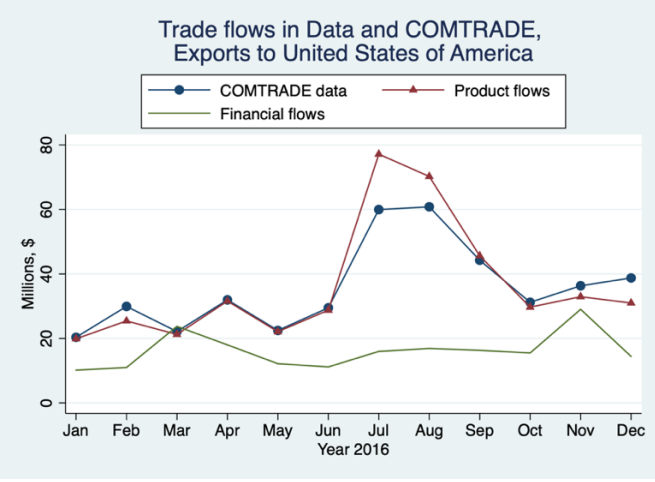
Panel A: Panama



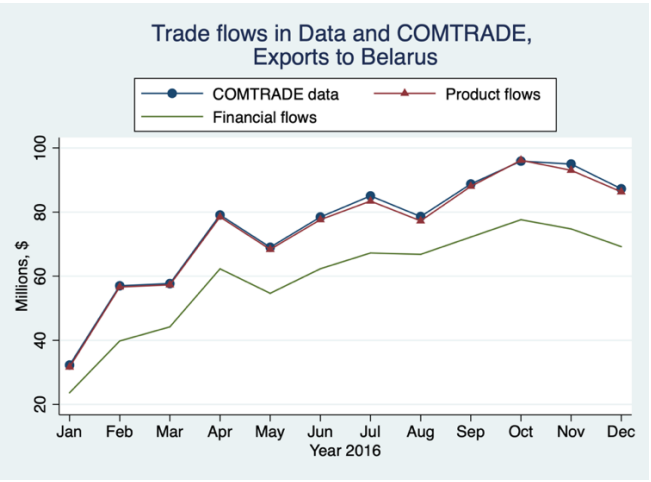
Panel B: British Virgin Islands



Panel C: USA



Panel D: Belarus



Notes: These figures plot total export transaction in millions of $US over months of 2016. 'Comtrade data' shows UN-Comtrade statistics. 'Product flows' shows aggregates from transaction-level data when aggregation is done by the country to which the exported product is actually shipped. 'Financial flows' shows aggregates from transaction-level data when aggregation is done based on country of registration of foreign counterparty to the transaction.

Online Appendix

Table A1.1: Offshore financial centers lists according to Executive Order #143-2011-p of the Cabinet of Ministers of Ukraine

Dependent territories of Britain

Guernsey, Jersey, Isle of Man, Alderney Island

Middle East

Bahrein

Central America

Belize

Europe

Andorra, Gibraltar, Monaco

Caribbean

Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Bermuda Islands, BVI, American Virgin Islands, Grenada, Cayman Islands, Montserrat, Netherland Antilles, Puerto Rico, St Vincent and the Grenadines, St Kitts and Nevis, St Lucia, Dominica commonwealth, Turks and Caicos

Africa

Liberia, Seychelles

Pacific region

Vanuatu, Marshall Islands, Nauru, Niue, Cook Islands, Samoa

South Asia

Maldives

Table A1.2: Offshore financial centers according to Russian Central Bank (from Chernykh and Mityakov (2017))

Tier 1: "Civilized" offshores (no additional loss reserve requirement)

1.1. Some areas of UK
- Guernsey, Jersey, Sark
- Isle of Man

1.2. Ireland (Dublin, Shannon)
1.3. Cyprus
1.4. Malta
1.5. China (Hong Kong)
1.6. Luxembourg
1.7. Switzerland
1.8. Singapore

Tier 2: "Grey" offshores (50% loss reserve requirement on all transactions)

2.1. Antigua and Barbuda
2.2. Bahamas
2.3. Barbados
2.4. Bahrain
2.5. Belize
2.6. Brunei-Darussalam
2.7. Dependent territories of UK
- Anguilla
- Bermudas
- British Virgin Islands
- Montserrat
- Gibraltar
- Turks and Caicos Islands
- Cayman Islands

2.8. Grenada
2.9. Djibouti
2.10. Dominica
2.11. China (Macao)
2.12. Costa-Rica
2.13. Lebanon
2.14 Mauritius
2.15. Malaysia (Island Labuan)
2.16. Maldives
2.17. Netherlands Antilles
2.18 Monaco
2.19. New Zealand
- Cook Islands
- Niue

2.20. UAE (Dubai)
2.21. Panama
2.22. Portugal (Madeira Island)

2.23. Western Samoa
2.24. Seychelles
2.25. St Kitts and Nevis
2.26. St Lucia
2.27. St Vincent and the Grenadines
2.28. USA
- US Virgin Islands
- Puerto Rico
- State of Wyoming
- State of Delaware

2.29. Tonga
2.30. Sri Lanka
2.31. Palau

Tier 3: "Black" offshores (100% loss reserve requirement on all transactions)

3.1. Andorra
3.2. Comoros
- Anjouan Island

3.3. Aruba
3.4 Vanuatu
3.5. Liberia
3.6. Liechtenstein
3.7. Marshall Islands
3.8. Nauru
3.9. Serbia and Montenegro