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Does increased bilateral transparency affect offshore activity?

Evidence from Offshore Leaks Database

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Abstract

Tax havens, also known as secrecy jurisdictions, facilitate tax avoidance and other forms of behaviour that cause a challenge to societies. Offshore data leaks such as Panama Papers have intended to reveal the players behind this curtain of secrecy. This thesis looks into tax information exchange agreements' (TIEA) effect on the number of companies located in these jurisdictions, with the use of linear regression and synthetic difference-in-difference applied to the ICIJ Offshore Leaks Database. Yearly and monthly levels of analysis were conducted on offshore entities connected to the U.S., and how the enforcement of a TIEA affected these entities. The hypotheses are based on the change in the number of incorporations and inactivations found in each of the jurisdictions studied.

While there are shortcomings to our study, the results were found to be robust, and to some extent generalizable since the analysis returned similar results when applied to Chinese entities. A rise in activity is found in both cases indicating a definite reaction following the enforcement of a TIEA, although not as expected. Therefore, such agreements may not be as effective in reducing the activity in secrecy jurisdictions. Reasons for this may be the increased ease of utilizing these jurisdictions, as well as the design of the tax information exchange agreements. These reasons could potentially form the basis of further research on this subject matter.

1. Introduction

Tax havens have no generally accepted definition, but according to The Organization of Economic Cooperation and Development (OECD), they are jurisdictions where the level of taxation is low or next to none and are used by companies to avoid paying the amount of taxes that they would pay in a country with a stricter taxation scheme. In addition to offering tax advantages to foreign corporations, some tax havens offer a high level of secrecy that companies and individuals may utilize to maintain their privacy and anonymity. For this reason, tax havens are also synonymous with secrecy jurisdictions. As a result, these secrecy jurisdictions have long been a common tax avoidance strategy adopted by companies and individuals alike.

Over the last decade, several major investigations relating to document leaks have shed light on corporations' usage of these secrecy jurisdictions. The data for these leaks have come from several offshore service providers, law firms and corporate registries, and was published by news corporations. Five of the biggest data leaks are Offshore Leaks (2013), Panama Papers (2016), Bahamas Leaks (2016), Paradise Papers (2017 & 2018) and most recently, Pandora Papers (2021). These investigations by the International Consortium of Investigative Journalists (ICIJ) have brought to light not only renowned company names and famous personalities but also the locations where they conceal their wealth.

What is a matter of concern here is not the existence of foreign investments or entities but rather the anonymity of their original owners. Most of these companies and individuals stay anonymous and untraceable by using *shell companies*, whose incorporation requires no proof of identity, and that makes it possible for both non-criminals and criminals to avoid responsibility (Schjelderup, 2015). ICIJ and its media partners have worked on such investigations for over eight years and suggest that this kind of anonymity often facilitates tax evasion, money laundering and other criminal activities (The International Consortium of Investigative Journalists, 2022b).

In the lack of transparency and effective exchange of information, there may exist an incentive for companies and individuals to practice tax avoidance or the hiding of other financial activity from their home jurisdiction. There has also been growing political pressure toward tax havens; and to address the harmful activities, OECD published an Agreement on Exchange of Information on Tax Matters in 2002. Although it was not the first tax treaty to come into effect, the purpose of this agreement is to "promote international co-operation in tax matters through exchange of

information" and therefore increase the transparency between jurisdictions. The agreement has been a starting point for several bilateral tax information exchange agreements (TIEAs) (OECD, no date). These agreements have existed between many countries for several years, and yet, the continued use of tax havens has been observed.

The data collected in the ICIJ investigations mentioned above include names, addresses and details of individuals and/or companies holding offshore entities. They also include names, incorporation dates, current statuses, etc. of these entities from several tax havens. From this, it is possible to deduce the increase or decrease in offshore entities in these tax havens over time. Hence, we conducted a study on this data, where we included the enforcement of a TIEA in the timeline and monitored the change in the number of offshore entities. We found the change brought about by these agreements to be significant but quite contrary to their objective.

Research Questions

This thesis aims to investigate whether a bilateral agreement, such as a TIEA, manages to reduce the number of offshore entities created in a tax haven. Hence, the main research question of this paper is:

- ***How do taxpayers react to the enforcement of a Tax Information Exchange Agreement?***

We first investigate the year-by-year change in the number of offshore entities. For closer observation, we also explored how people and companies react to this in a shorter time frame by investigating the monthly change.

Since the ICIJ database does not contain confidential information of any businesses, it is difficult to perceive any distinctive changes, for example, in the organizational structure or corporate policies, that may have been made because of a TIEA. However, the data does include incorporation and inactivation dates of entities that can be used to track when new ones are being created and/or existing ones are closed down. Hence, we explore the above questions with respect to the number of new offshore entities being created and inactivated after the enforcement of a TIEA. With the use of incorporation and inactivation dates, we can capture whether the traffic to and from a tax haven has changed.

We have chosen the focus of the research to be the United States, since looking at the global costs of tax avoidance this is a country that stands out as number one. The estimated losses of corporate

taxes in the U.S. are more than 188 billion USD annually, whereas for the number two on the list, China, this figure is estimated at 66.8 billion USD. (Statista, 2017)

We find an increase in both new entities created, and existing entities inactivated following the enforcement of a TIEA. These observed increases are not specific to the U.S. data alone. As a conclusion of our results, we cannot confirm that a TIEA would have a decreasing effect on the use of a secrecy jurisdiction.

This research should be relevant to professionals working within the area of legislation regarding tax migration. It will contribute to the existing pool of studies on the usage of tax havens and the effectiveness of measures that have been taken in order to increase the level of transparency in tax havens. Our research utilizing the offshore data leaks as a starting point is a unique approach compared to existing research, the leaks providing data on not only companies but also individuals' use of tax havens.

The paper is structured as follows: Part 2 will provide a brief literature review of existing research on tax avoidance, TIEAs and offshore data leaks. In Part 3, we establish the hypothesis of the research, discuss the collection of data, and the sample and research method used. Part 4 displays the results and limitations of the research. In Part 5, we provide further discussion on the effect of TIEAs. Part 6 shows the implications of the thesis, in Part 7 we make suggestions on the further scope of research on the area, and Part 8 summarizes the conclusions we derived from this research.

2. Literature Review

Predominantly, earlier research on TIEAs and data leaks, both of which are expected to increase the transparency regarding corporate taxation, has focused on the effect of these events on various behavioural and financial outcomes. Especially within the existing research on TIEAs, the reviewed papers do not show a uniform outcome for a TIEA, indicating that more research is needed in the area.

In general, the existence of a TIEA (Tax Information Exchange Agreement) between jurisdictions is intended and expected to increase the taxpayers' chances to get caught (Schjelderup, 2015). Braun and Weichenrieder researched on the effect of the international exchange of tax information on the investment of German multinational enterprises in tax havens (Braun and Weichenrieder, 2015). They found that for the tax havens Germany had signed a TIEA with, it resulted in a decreased number of affiliates in the tax haven, whereas the trend continued as a growing one for the tax havens that Germany had no TIEA with. These observed decreases served as a starting point for our hypothesis.

In like manner, Rohan and Moravec carried out a study that was focused on a specific country, the Czech Republic (Rohan and Moravec, 2017). Their studied sample consisted of Czech companies owned by offshore entities, located in tax havens. A difference-in-difference analysis was conducted by them on whether a TIEA affects relocation to other jurisdictions to maintain their level of privacy. In their conclusion, they state that the observed company relocations were indeed associated with the introduction of a TIEA, and therefore deduced that TIEAs are an effective tool to decrease the level of secrecy in a tax haven. Our study aims to analyse whether this decreased level of secrecy leads to a reduction in the usage of a tax haven.

On the other hand, there is also research that suggests the effectiveness of TIEAs only has limited evidence. Kemme, Parikh and Steigner study OECD countries and show that OECD policies do not prevent tax evasion and that the potential benefit from evading taxes is still more weighed by tax evaders than the potential of getting caught by doing so (Kemme, Parikh and Steigner, 2017). Sawyer suggests that the operational scope of TIEAs needs to be improved for them to effectively change the current state of information exchange between countries (Sawyer, 2011). Our quantitative research will add to the evidence on the effectiveness of TIEAs in terms of offshore entities held in tax havens.

Event studies have also been conducted on offshore data leaks. The publication of the Panama Papers, for instance, has been found to have a negative impact on firm value (O'Donovan, Wagner and Zeume, 2019). There has also been discussion on the Panama Papers' connection to tax morality and the potential reputation costs that the revelation of such information might bring to tax evaders and potential tax evaders (Chohan, 2016). Schmal et al. use four data leaks (Offshore Leaks, Panama Papers, Bahamas Leaks, and Paradise Papers) and find indications that after a leak, firms affected by it are likely to change their tax disclosure behaviour (Schmal, Schulte Sasse and Watrin, 2021). They also point out the potential of media attention leading to reputational concerns for the firms. For us, this implies that since there are potential costs with having a connection to a tax haven, entities would care about an agreement such as TIEA which is supposed to help reveal such connections.

Furthermore, information events such as Panama Papers have been found to have an impact on investor decisions on stock sales and purchases. In Mehboob et al., for the countries found significant, surprisingly many experienced a change of abnormal returns in the positive direction instead of the expected negative reaction after the leak event (Mehboob *et al.*, 2020). The conclusions drawn from our research were based on levels of offshore activity as opposed to any financial variables, but a similar rather unexpected increase was discovered.

Panama Papers data has additionally been used to identify the offshore networking behaviour. Dominguez et al. identify the British Virgin Islands to be "the most predominant factor, serving as a hub in the offshoring network connecting countries from different regions" (Dominguez *et al.*, 2020). This is also observed in our data, where the British Virgin Islands is seen to have the highest number of observations for offshore entities created as well as shut down.

Earlier papers on offshore data leaks have pointed out, therefore, that the leaks are vast and informative enough to have a significant economic effect. While fewer entities are expected to create shell companies in tax havens when secrecy, in general, is reduced, empirical evidence does not show this for every instance researched. This study will contribute to the existing pool of difference-in-difference based research that has been carried out to study the effect of TIEAs on the use of tax havens. To our best knowledge, there has not been earlier research carried out on the effect of TIEAs based on data from offshore leaks.

3. Research Design

Based on the literature review, this section establishes our hypothesis for the research. This is followed by insights into the process of gathering and cleaning the data. Here, the reader is provided with an understanding of the sample used with the help of descriptive statistics and linear regression results. Lastly, we present a synthetic difference-in-difference study and the results that followed.

3.1. Hypothesis

Following the discussed literature, one may expect TIEAs to have a negative effect on the number of incorporations per year in a tax haven. Regarding the first research question of the thesis we establish our hypothesis with the following regression model:

$$Act_{th} = \alpha_{th} + \beta \times TIEA_{th}$$

where the dependent variable Act_{th} is the offshore activity per time period t and tax haven h. The above equation is used both for the analysis of incorporation dates and inactivation dates, for the first Act_{th} implying the number of incorporations and for the latter the number of inactivations per period t in tax haven h.

The independent variable $TIEA_{th}$ is a dummy variable explaining whether the tax haven h has introduced and enforced a TIEA with the U.S. in period t, or whether at period t a TIEA with the U.S. has been active. This means that on the year of the TIEA implementation the variable turns into 1 and is also equal to 1 for all subsequent periods.

Since it is expected that the number of incorporations and inactivations per time period will be affected after the introduction of a TIEA, we expect the effect of a TIEA to be non-zero. Based on the fundamental definition of a TIEA as well as the earlier literature, we establish our two hypotheses. For the incorporations we expect this effect to be negative. This would imply that

$$H_1: \beta < 0$$

And for the inactivations, we expect this effect to be the opposite of that of incorporations, i.e., positive. This implies

$$H_2: \beta > 0.$$

We will present the regression model testing the above hypotheses more in detail in section 3.3.

3.2. Data Collection

The data for this research has been obtained from the International Consortium of Investigative Journalists (ICIJ), a global and independent reporter organization behind the biggest offshore data leaks. The ICIJ database contains information on five major data leaks over the last decade. It covers more than 800,000 offshore entities within 200 countries and territories (The International Consortium of Investigative Journalists, 2022a). According to the ICIJ, their database is compiled from various investigations and is based on information found in leaked documents, letters, internal notes and unscanned registries. The information includes names, addresses, jurisdictions, and countries that the tax haven associated companies and people have been connected to (Appendix 1).

Our focus is on entities named in Offshore Leaks, Panama Papers, Bahamas Leaks, Paradise Papers, and Pandora Papers. We have limited this to those instances that have been linked to the United States, which narrows this set down to Offshore Leaks, Panama Papers and Paradise Papers (Appendix 1).

One challenge about the use of ICIJ data is regarding the way they have linked entities to countries. They used the addresses they found to identify (at least) two locations for every entity, where one of them is the country where the entity is located (jurisdiction) and another is the nationality or country of the owner of said entity. They carried out the process automatically with the use of geocoding tools, with some addresses being manually reviewed. In case there were no countries determined for an entity, the entity was classified as "not identified". Additionally, ICIJ mentions the potential for country-matching errors. (The International Consortium of Investigative Journalists, 2022b).

In our research, this identification problem points out to an exclusion of a large part of potential data, since jurisdictions with the label "undetermined" have not been possible to be utilized in the analysis. There were more than 41,000 observations before the exclusion of any undetermined data as well as data with missing values regarding the incorporation and inactivation dates of entities. Around 7 per cent of these observations were excluded due to having an undetermined jurisdiction, and 80 per cent due to the missing incorporation dates.

While ICIJ divided the database into intermediaries, entities, officers and addresses, all of these are interconnected (The International Consortium of Investigative Journalists, 2022c). The interconnectedness implies that some entities have more than one country linked to them. Therefore, for our analysis, we have included not only entities with a connection to the U.S. solely, but also entities with any connection to the U.S. overall. In total, after the exclusion of undetermined jurisdictions, and with every entity having information on an incorporation date, the size of the data was 4,521 observations, which includes 1,882 observations for inactivation dates. 2,936 of these entities were connected to the U.S. alone, the remaining 1,585 entities having a connection to the U.S. and one or more other countries.

We aim to investigate the U.S. companies' incorporation dates and inactivation dates per tax haven location and apply regression analysis to the numbers using TIEA dates as a binary predictor in a regression model. The list of dates for TIEAs between the U.S. and the tax havens has been extracted from research by Gavrilova and Polakova (Gavrilova and Polakova, 2018).[1]

3.3. Data & Descriptive Statistics

For the description of the panel data, we use descriptive statistics to provide an overview of the structure of the data, then apply simple linear regression to investigate the relationship between the independent variable and the dependent variable.

We started by merging all the data collected from the ICIJ database into one large data frame and filtered all the entities connected to the U.S. Some of these, as mentioned above, are also connected to more than one country. Next, the data was cleaned up to only include data points relevant to our study, i.e., the incorporation dates. The process was repeated for the inactivation dates.

In its entirety, the ICIJ data had incorporation dates ranging from 1898 to 2016, and inactivation dates ranging from 1982 to 2015. However, until 1990 the number of observations per year was relatively low (less than 50), and several gaps were present in country-specific datasets. In the yearly data, after selecting the subset of years 1990 to 2016, all the jurisdictions have non-zero observations for every year except for 2016. This was the year of the last published data leak, and hence, it is expected that there might be missing values from that year. This does not have any

[1] In this list of TIEA dates, we note that in our code the Virgin Islands have been specified as the British Virgin Islands. Furthermore, since in Barbados there are two agreement dates listed (TIEA and DTC), we have chosen to use the latter one for the jurisdiction, due to our data having fewer zero values around this date.

significant effect on our model. Hence, our panel data was constructed using the incorporation and inactivation dates of all the jurisdictions within the range of 1990 to 2016.

The variations in the dependent variable do not follow a uniform distribution throughout the selected years. Since we chose a time frame of approximately 25 years, we decided to work with jurisdictions that had relatively higher total observations to get a better distribution of non-zero values and a more accurate estimation of the trend. Hence, we selected jurisdictions with over 100 observations for our analysis. Not only do these selected jurisdictions have the most observations in the ICIJ data, but they are also all (excluding the U.S. states) in the top 10 of all offshore centres according to Palan et al. (Palan, Murphy and Chavagneux, 2010).

The sample limited to U.S. entities is mostly constructed by a handful of the 24 jurisdictions: In fact, 10 of them contain more than 50 observations of incorporations from our data source. Table 1 presents the number of incorporated entities for each of the jurisdictions, the mean yearly value, the modal value, the corresponding modal year, as well as the standard deviation. It can be observed that the years 1995, 2000, 2006-2009, and 2014 are the most abundant modal years, appearing more than once. The standard deviation of the number of companies incorporated is in most cases similar to the mean. In the case of the British Virgin Islands and Bermuda, the standard deviation can be seen to be much higher than the mean, implying a high dispersion within the data.

Table 1: Descriptive statistics, tax havens present in the U.S. data (1990-2016)

Jurisdiction	Number of entities	Mean	Modal Value	Modal Year	Std. Dev
BRITISH VIRGIN ISLANDS	1,629	60.333	148	2014	33.266
BERMUDA	819	30.333	146	2000	37.596
PANAMA	593	21.963	75	2007	19.204
CAYMAN ISLANDS	412	15.259	47	2013	12.098
BAHAMAS	402	14.889	43	1996	13.591
BARBADOS	217	8.037	33	1995	6.236
UNITED STATES OF AMERICA	168	6.222	20	2011	5.853
NIUE	86	3.185	21	2000	6.276
SEYCHELLES	68	2.519	11	2006	3.215
COOK ISLANDS	34	1.259	5	1997	1.723
BRITISH ANGUILLA	32	1.185	11	2008	2.512
ISLE OF MAN	27	1	6	2007	1.617
SAMOA	11	0.407	6	2006	1.248
SAINT KITTS AND NEVIS	6	0.222	1	2001	0.424

UNITED KINGDOM	5	0.185	3	2015	0.622
HONG KONG	3	0.111	1	2008	0.320
MAURITIUS	3	0.111	2	2010	0.424
BELIZE	2	0.074	1	2014	0.267
JERSEY	1	0.037	1	2004	0.192
MALTA	1	0.037	1	2015	0.192
NEW ZEALAND	1	0.037	1	2009	0.192
SINGAPORE	1	0.037	1	1990	0.192

Here, the United States of America refers to an aggregate of 'Nevada', 'State of Delaware', and a general 'United States of America' jurisdiction descriptions found in the full data.

Of the five data leaks present in the full data, Offshore Leaks, Panama Papers and Paradise Papers were present in the studied subset. The latter two cover this subset almost entirely. Furthermore, each jurisdiction is covered mainly by only one of the data leaks. Table 2 displays the sources of information for those offshore jurisdictions with more than 100 observations of incorporations.[2]

Table 2: Incorporation date sources for the most abundant jurisdictions (U.S. entities)

Jurisdiction	Bahamas Leaks	Offshore Leaks	Panama Papers	Paradise Papers	Pandora Papers	Total
BAHAMAS	0	0	402	0	0	402
BARBADOS	0	0	0	217	0	217
BERMUDA	0	0	0	819	0	819
BRITISH VIRGIN ISLANDS	0	7	1,548	74	0	1,629
CAYMAN ISLANDS	0	0	0	412	0	412
PANAMA	0	0	593	0	0	593

These jurisdictions with more than 100 observations (British Virgin Islands, Bermuda, Panama, Cayman Islands, Bahamas, and Barbados), highlighted in Table 2, all have an existing TIEA with the U.S. The abovementioned tax havens make up more than 90% of the total data. Furthermore, British Virgin Islands stands out as the most abundant jurisdiction with one-third of the total observations being located in this jurisdiction.

[2] The inactivation data being a subset of the incorporation one, we have only included the incorporation date sources here.

From the enforcement dates of the agreements, displayed in Table 3, we find two jurisdictions with a TIEA date occurring before 1990. Since these dates fall outside our selected time frame, we excluded the jurisdictions, Barbados and Bermuda, from our analysis. Hence, the jurisdictions we use in our analysis are the Bahamas, Cayman Islands, the British Virgin Islands, and Panama.

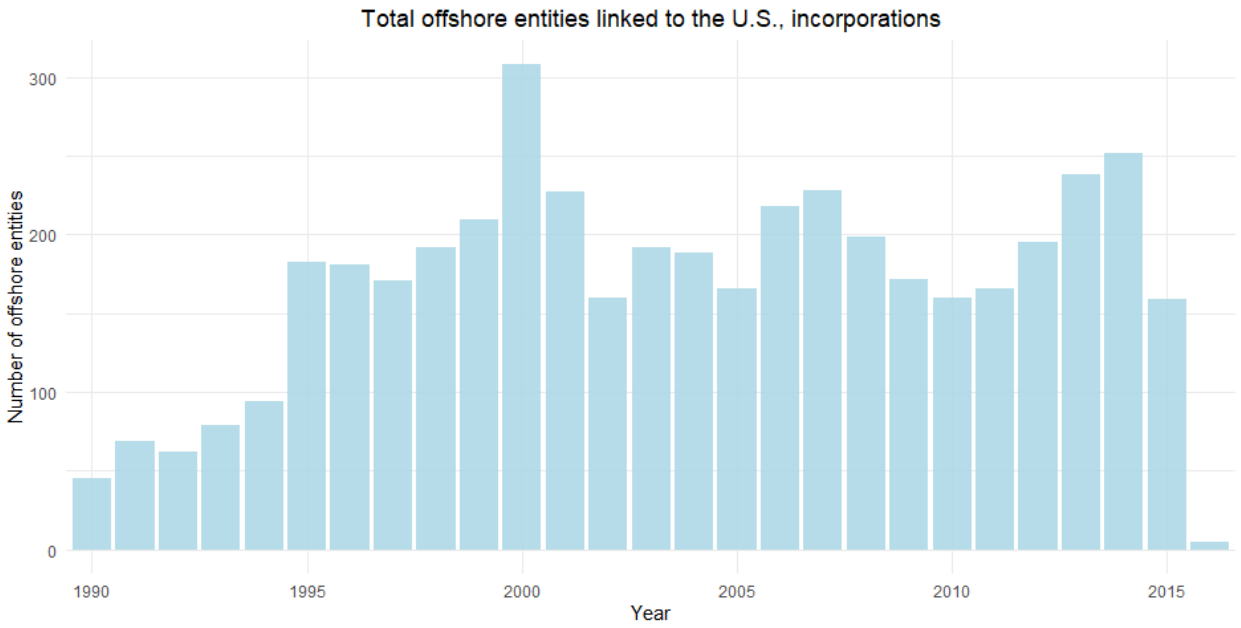
Table 3: TIEA dates between the U.S. and selected jurisdictions

Agreement	Date	Country
TIEA	1984-11-03	BARBADOS
DTC	1986-02-28	BARBADOS
TIEA	1988-12-02	BERMUDA
TIEA	2006-01-01	BAHAMAS
TIEA	2006-03-10	CAYMAN ISLANDS
TIEA	2006-03-10	BRITISH VIRGIN ISLANDS
TIEA	2011-04-18	PANAMA

As shown in Figure 1, the trend consisting of all 22 tax havens shows a general increase of new entities created over the years up until the early 2000s, after which there can be observed no clear upward or downward trend. In the 2010s the sum of new entities created per year was around three times the number of entities created in the 1980s. This could potentially stem from the ease of purchasing shell companies, which nowadays to a large extent happens online. Examples of websites that sell shell companies located in tax havens are offshorebvi.com and smergers.com, the latter being a platform for selling shell companies all around the world.

A few peaks can be observed especially in 2000, 2007 and 2014, and drops during the early 2000s and after 2007. In the year 2000, the Dot Com Bubble was an ongoing financial event, caused by a rapid growth of internet-based companies (Business Insider, 2020). The highest peak in tax haven incorporations can be observed during the same period. It could be that the two trends, increased incorporations in tax havens and the Dot Com Bubble, have a connection. The same could be the case with the increase in incorporations after 2007 when the 2008 financial crisis occurred. Some even say that tax havens' role in easy registering of offshore entities might itself be the reason behind these crises (Batrancea, Chiril and Nichita, 2014). The 2014 increase could be partly explained by the annexation of Crimea by the Russian Federation (Walker, 2014), which resulted in global sanctions potentially encouraging tax haven usage similarly.

Figure 1: Development of offshore entity creation (1990-2016)



In terms of individual countries, the trend over the years is also mostly increasing (Appendix 2). This is most clearly indicated for the British Virgin Islands, for which no significant gaps in the number of incorporations can be observed over the decades. For Panama, the trend is mostly increasing as well, but as opposed to the overall increasing trend in the 1990s, the data for Panama reaches some of its lowest values during the 1990s and its highest peak in 2007.

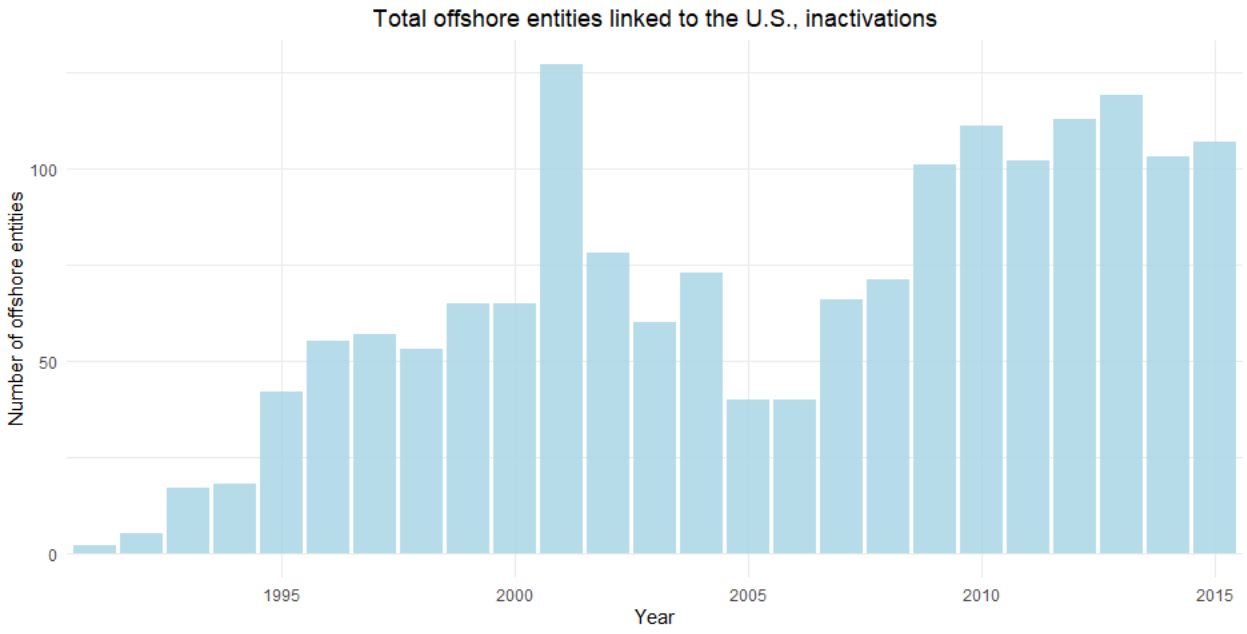
For the Bahamas on the other hand, any overall increasing trend is harder to observe: Most of the incorporations occur in the 1990s, after which there is a sharp decrease in 2000, and an increase around 2008, after which there occurs no clear trend. For the Cayman Islands, the overall trend again is increasing, with two notable peaks in the late 1990s and in 2008.

Regarding the TIEA enforcement dates, for the Bahamas, British Virgin Islands and the Cayman Islands this occurred in 2006, whereas for Panama in 2011. For the Bahamas and the British Virgin Islands, a short term decrease in the number of incorporations can be observed for 1-2 years after the year of TIEA enforcement, whereas for Panama even such a short-term decrease is not present. No clear decline can be observed in the Cayman Islands either – in fact, they experienced a short-term increase in incorporations after 2006.

Furthermore, along with looking into the development of new activity (incorporation), we also investigated the trends in companies ceasing their operations in tax havens (inactivation).

According to the ICIJ, the 'inactivation date' variable is defined as the "date when a client told the agent to deactivate the offshore entity, which could be reactivated at a later date." (The International Consortium of Investigative Journalists, 2022b). Over time, the number of inactivated companies per year has, like incorporations, increased, as shown in Figure 2.

Figure 2: Development of offshore entity inactivation (1990-2015)



If based on theory incorporations are expected to decrease after a TIEA, inactivations of companies are expected to increase. For this purpose, we utilized the variable 'inactivation date' in the U.S. data set. In general, the inactivation dates were less common than incorporation dates, the size of data amounting to 1,882 observations. As opposed to the 22 jurisdictions that were investigated in the incorporation date part, there were inactivation dates available for 11 jurisdictions. Since those with more than 100 observations were selected for the inactivation date analysis, we ended up with three jurisdictions. These are displayed in Table 4.

Table 4: Total number of inactivations in top tax haven jurisdictions (1990-2015)

Jurisdiction	Number of inactivations
BAHAMAS	326
BRITISH VIRGIN ISLANDS	805
PANAMA	343

Comparing Figures 1 and 2, one can observe that throughout the time period studied, the number of inactivations per year is always smaller than the number of incorporations per year. It can also be observed when looking at jurisdictions specifically. For the jurisdictions, the Bahamas, the British Virgin Islands and Panama, it is evident that the number of inactivations (Table 4) is higher than the total number of incorporations (Table 2) over the same period. This indicates that the overall development in the number of companies located in tax havens is increasing.

Appendix 3 shows the individual jurisdictions' development in terms of inactivations per year. For the British Virgin Islands and Panama, there can be observed an increasing trend over the years, whereas the Bahamas' development seems to have dropped after the enforcement date of a TIEA with the U.S. The peak for the Bahamas occurs in 2001, whereas the British Virgin Islands and Panama have peak values after 2010. This also shows that growth in inactivations has a different trend in the Bahamas as compared to the two other jurisdictions studied.

In conclusion, based on offshore data leaks, generally, the trend of creating new corporations in tax havens has shown a steep rise since the end of the 20th century, but this increase has slowed down since the early 2000s, fluctuating at its current level the last two decades. The trend of closing down existing offshore entities also slows down in the early 2000s but shows a growth following 2005 and has remained steady in the past decade. After a look at the descriptive statistics and visualizations drawn, we can observe an overall upward trend for incorporations as well as for inactivations after the enforcement of a TIEA. We then move on to statistical models to investigate the relationship closer.

3.4. Methodology

We performed a quantitative analysis to study the change in the number of offshore entities before and after the enforcement of a TIEA. We used linear regression to identify the relationship between the dependent and independent variables and synthetic difference-in-difference to measure the impact of the independent variable.

For all the analysis methods we used in our study, we have applied them on three levels:

i) Using incorporation dates by year, indicating the number of entities created every year,

ii) Using incorporation dates by month, indicating entities created 12 months before and after each TIEA[3],

iii) Using inactivation dates by year, indicating the number of entities inactivated every year.

We began our study using linear regression to identify whether our independent variable, TIEA, had any impact on the number of entities created and closed over time. To ensure the robustness of the linear regression results, Poisson regression was also applied to the count data.

The synthetic difference-in-difference method was applied to the year-by-year data for incorporation dates. For every jurisdiction, we included the full set of countries with no TIEAs, keeping the control group consistent in every case. The same method was applied to the inactivation dates.

For the monthly event study, we used the same method but with a time frame of [–12, +12]. However, since we used a narrower time frame in this part of the analysis, more countries were eligible to be included in each control group.

Most observations in the data were spread over a few jurisdictions, with most of the jurisdictions having less than 100 observations, as seen in Table 1. Additionally, as mentioned previously, the data also contains several gaps that could not be entirely excluded. The synthetic difference-in-difference method "uses past data not only to check whether the trends are parallel, but also to construct the weights to make them parallel" (Arkhangelsky *et al.*, 2019). Therefore, this eliminates the need to manually select control group units, which means, the system selects a suitable control group each time based on pre-treatment data. Hence, using this method allowed us to utilize more data regardless of the drawbacks.

[3] The monthly data included some missing values since the time variable (both year and month) is created from the incorporation dates. Hence, to ensure that our dataset included 12 months calendar period, we added the missing months with zero values for the dependent variable.

4. Results

Here, the results from our analysis are presented, starting from linear regression estimation, and continuing with the synthetic difference-in-difference results.

4.1. Linear Regression – Estimating Equation & Results

By considering the introduction of a TIEA as an event in our study, we specify the following regression equation:

$$Act_{th} = \alpha_{th} + \beta \times TIEA_{th} + X_h\gamma + \epsilon_{th}$$

where Act_{th} is the number of incorporations or inactivations per year t in tax haven h. In the monthly level of analysis, Act_{th} is the incorporations per month t in tax haven h. $TIEA_{th}$ is an indicator taking a value of 0 in the years before a TIEA is introduced, and 1 when the agreement has come to practice. On the yearly level of analysis, the number of years before t=0 when TIEA is enforced varies for each tax haven, as for all cases the data starts in 1990 and ends in 2016. For the monthly analysis, a window of [–12, +12] months is used to catch the short term effects of the agreement. Furthermore, any fixed effects associated with a tax haven are denoted by X_h.

It is important to note, that although adding additional variables to this regression equation may have given us a better model, any other factors present in the raw data (displayed in Appendix 1) that could be used as variables are not as quantifiable.

We applied a linear regression model to the time-series dataset we created for each jurisdiction and tabulated the results. Although a linear regression may not be the ideal method to test our type of data, it produced some interesting results as a starting point, as shown in Table 5.

In relative terms, the intercept gives out what has already been mentioned in the previous section: the British Virgin Islands is expected to have the most company entries per year. The TIEA estimates for all countries are positive, pointing out that there would, instead of the hypothesized decrease, be an increase in tax haven usage after the enforcement of a TIEA. For the significant jurisdictions, the effect seems to be the strongest for the British Virgin Islands, and the weakest for the Bahamas, which is also the only one out of the four showing a negative coefficient.

The fit of this simple model would seem to be the best for the Cayman Islands with the lowest residual error, although for the British Virgin Islands most variation in observations (31.3%) can be explained by the simple model.

Table 5: Linear regression (incorporations), all years (1990-2016)

	Dependent variable:			
	Incorporations per year			
	Bahamas	Cayman Islands	British Virgin Islands	Panama
	(1)	(2)	(3)	(4)
TIEA	-9.170*	6.773	37.176***	4.119
	(5.110)	(4.638)	(11.012)	(9.028)
Intercept	18.625***	12.500***	45.187***	21.048***
	(3.261)	(2.961)	(7.029)	(4.256)
TIEA introduced	2006-01-01	2006-03-10	2006-03-10	2011-04-18
Observations	27	27	27	27
R^2	0.114	0.079	0.313	0.008
Adjusted R^2	0.079	0.042	0.286	-0.031
Residual Std. Error (df = 25)	13.045	11.843	28.116	19.504
F Statistic (df = 1; 25)	3.221*	2.132	11.396***	0.208
Note:				*p<0.1; **p<0.05; ***p<0.01

The simple regression model was repeated for another set of data we constructed to explore the development of monthly incorporations. We limited this set to start 12 months before and end 12 months after the month of TIEA enforcement for each jurisdiction. The incorporations within the two years were distributed over each of the 25 months, giving a closer look at the short-term response to an agreement. The results are summarized in Table 6.

For the data based on monthly distribution, we see that half of the coefficients are negative, whereas most of them are in the vicinity of zero. This could point toward the possibility that there exists a short-term negative reaction to a TIEA. The simple regression model, however, does not show significance for any of the jurisdictions, with the lowest p-value equaling 0.15. The relatively high errors also point out that there is either no clear direction in the trend that can be detected, or that it is not a TIEA that explains such a change. The simple monthly regression is, in most cases,

only able to explain around 1% of the variation in the number of companies created. These results, therefore, do not add significant value to our analysis.

Table 6: Linear regression (incorporations), 12 months before and after a TIEA

	Dependent variable:			
	Incorporations per month			
	Bahamas	Cayman Islands	British Virgin Islands	Panama
	(1)	(2)	(3)	(4)
TIEA	-0.103	-0.077	0.763	1.019
	(0.220)	(0.382)	(1.251)	(0.691)
Intercept	0.333**	1.000***	6.083***	1.750***
	(0.159)	(0.275)	(0.902)	(0.498)
TIEA introduced	2006-01-01	2006-03-10	2006-03-10	2011-04-18
Observations	25	25	25	25
R^2	0.009	0.002	0.016	0.086
Adjusted R^2	-0.034	-0.042	-0.027	0.047
Residual Std. Error (df = 23)	0.551	0.954	3.125	1.726
F Statistic (df = 1; 23)	0.216	0.041	0.372	2.175
Note:				*p<0.1; **p<0.05; ***p<0.01

Unlike the incorporation dates, no inactivation dates were found for the Cayman Islands. The linear regression results for inactivation dates are shown in Table 7. We observe the linear regression model to be a relatively better fit for the British Virgin Islands and Panama than it is for the Bahamas. For the two statistically significant countries, the positive estimate of a TIEA agreement would imply that inactivations are also increased when a TIEA is enforced. This is consistent with the hypothesis, H_2. In the case of inactivation dates, for the British Virgin Islands and Panama, the TIEA dummy variable can explain 40-50% of the variation observed.

Table 7: Linear regression (inactivations), all years (1990-2015)

	Dependent variable:		
	Inactivations per year		
	Bahamas	British Virgin Islands	Panama
	(1)	(2)	(3)
TIEA	-8.900	18.500***	30.350***
	(5.566)	(5.166)	(4.665)

Intercept	16.600***	24.800***	7.650***
	(3.520)	(3.267)	(2.086)
TIEA introduced	2006-01-01	2006-03-10	2011-04-18
Observations	25	25	25
R^2	0.100	0.358	0.648
Adjusted R^2	0.061	0.330	0.633
Residual Std. Error (df = 23)	13.635	12.653	9.331
F Statistic (df = 1; 23)	2.557	12.826***	42.318***
Note:			*p<0.1; **p<0.05; ***p<0.01

4.2. Synthetic Difference-in-Difference

4.2.1. Incorporation Dates as Response Variable – Yearly Data

We apply the synthetic difference-in-difference method, where our treatment group consists of the four jurisdictions with more than 100 observations and the control group consists of all the jurisdictions from our acquired list that have no TIEA with the U.S. The control group in our case contains data for 14 jurisdictions. However, following the synthetic difference-in-difference technique, the units in the control group in each case are assigned a weight based on their resemblance with the pre-treatment period of the treatment group. This gives us a different set of control group jurisdictions for each of our treatment jurisdictions.

It is also important to note that the pre-treatment and post-treatment period varies for each of the units in the treatment group. In the dataset we have used, except for Panama, all other units have been observed for at least 10 or more years before and after treatment. For Panama, the post-treatment period was 5 years long.

Table 8: Synthetic DiD, year-by-year incorporations (1990-2016)

Agreement	Date	Jurisdiction	DiD	Error
TIEA	2006-01-01	BAHAMAS	5.303	2.246
TIEA	2006-03-10	CAYMAN ISLANDS	10.569	2.048
TIEA	2006-03-10	BRITISH VIRGIN ISLANDS	14.373	2.121
TIEA	2011-04-18	PANAMA	6.187	2.160

All the treated jurisdictions produce positive DiD results, indicating that all of them result in a steeper slope compared to the expected trend based on the control group. However, all four jurisdictions behave slightly differently.

As shown in Figures 3 and 6 respectively, the control groups in Bahamas and Panama have an almost parallel trend, which means that in the absence of a TIEA, the number of incorporations is expected to stay consistent over time. Contrary to our expectations, the real data for both Bahamas and Panama show an increasing trend. Both results can be considered reliable since the plot shows a short difference between the control group and the expected parallel trend. The difference in the trends for the Bahamas is close to 5, and for Panama between 10-15 incorporations. This means that the control group closely resembles the treated group, making the results more dependable.

The control group for the Cayman Islands, although almost horizontal, shows a slight decrease over time and hence, produces an expected decrease for Cayman Islands. However, the treated unit, the Cayman Islands, also shows quite a steep increase in line with the other jurisdictions. This is also a relatively conclusive result since the difference between the trends of treatment and control (Figure 5) is less than 10 incorporations.

British Virgin Islands, on the other hand, has the least resemblance with its control group (Figure 4), with the difference in the control group and expected trends being about 60-65 incorporations. Hence, in relation to its control group, it cannot be deduced how accurate the result is. Although, just like the others, the data for the British Virgin Islands also produced a steep slope showing a hefty increase in offshore entities.

Figure 3: Synthetic DiD (incorporations per year), Bahamas (1990-2016)

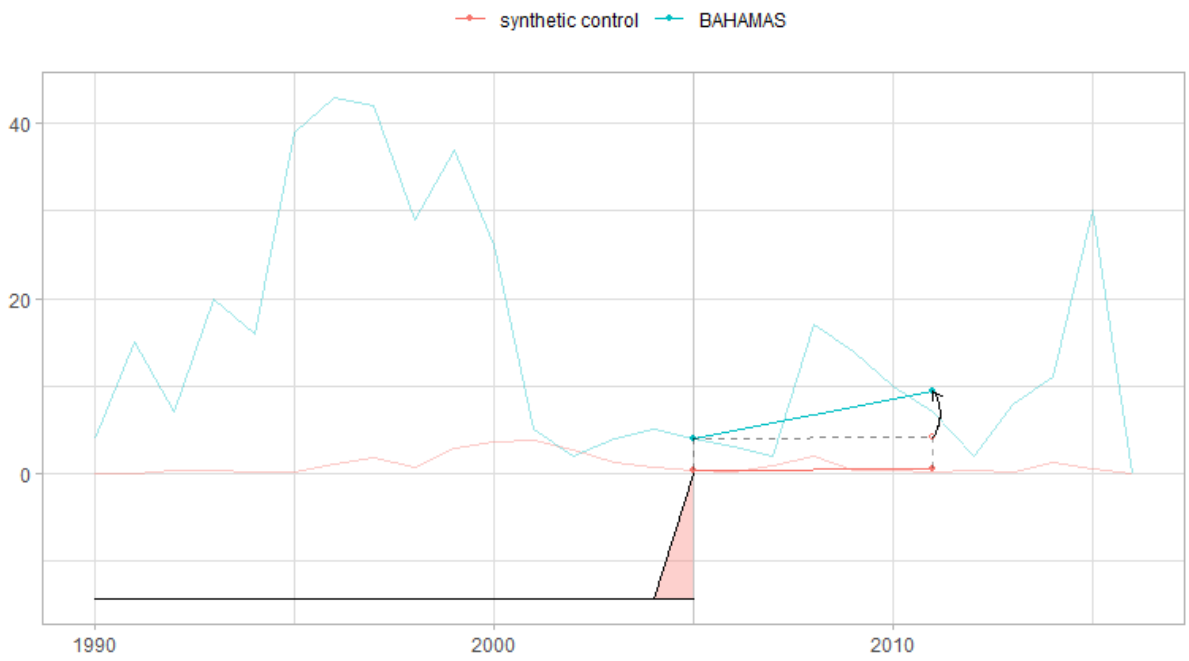


Figure 4: Synthetic DiD (incorporations per year), British Virgin Islands (1990-2016)

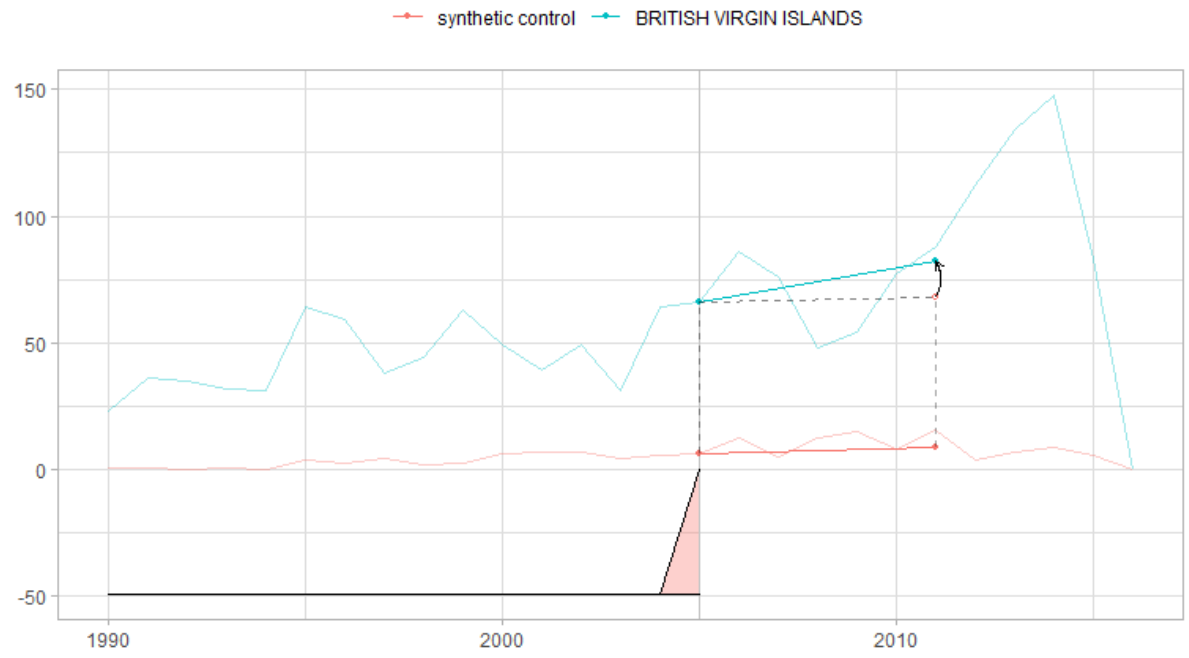


Figure 5: Synthetic DiD (incorporations per year), Cayman Islands (1990-2016)

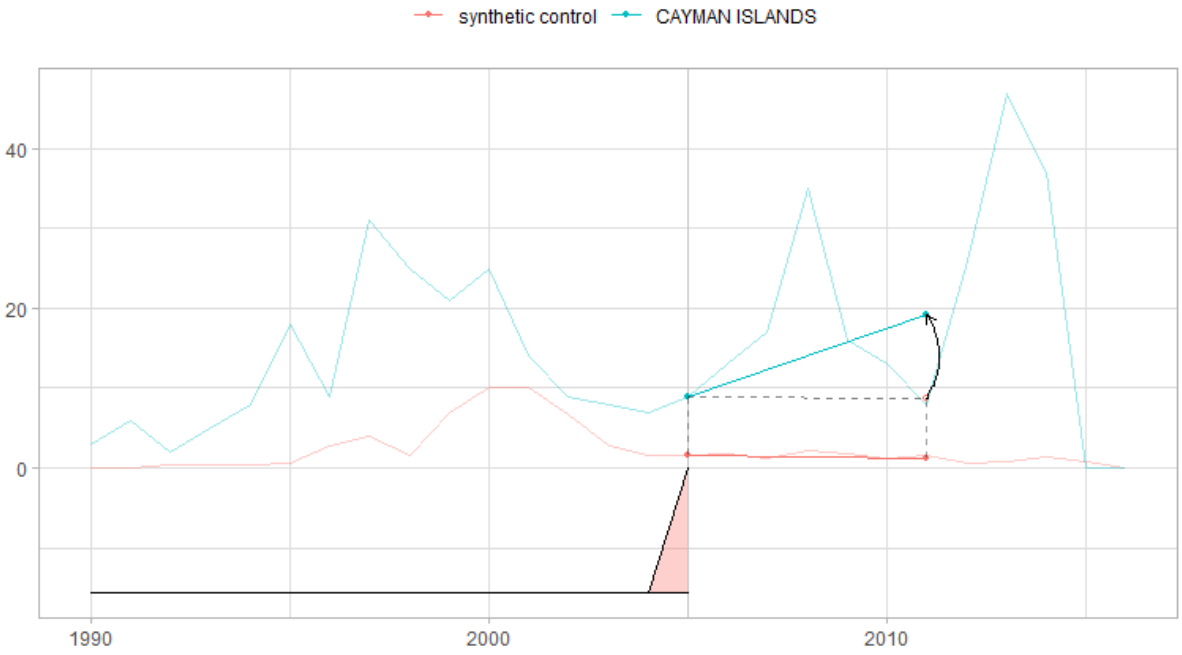
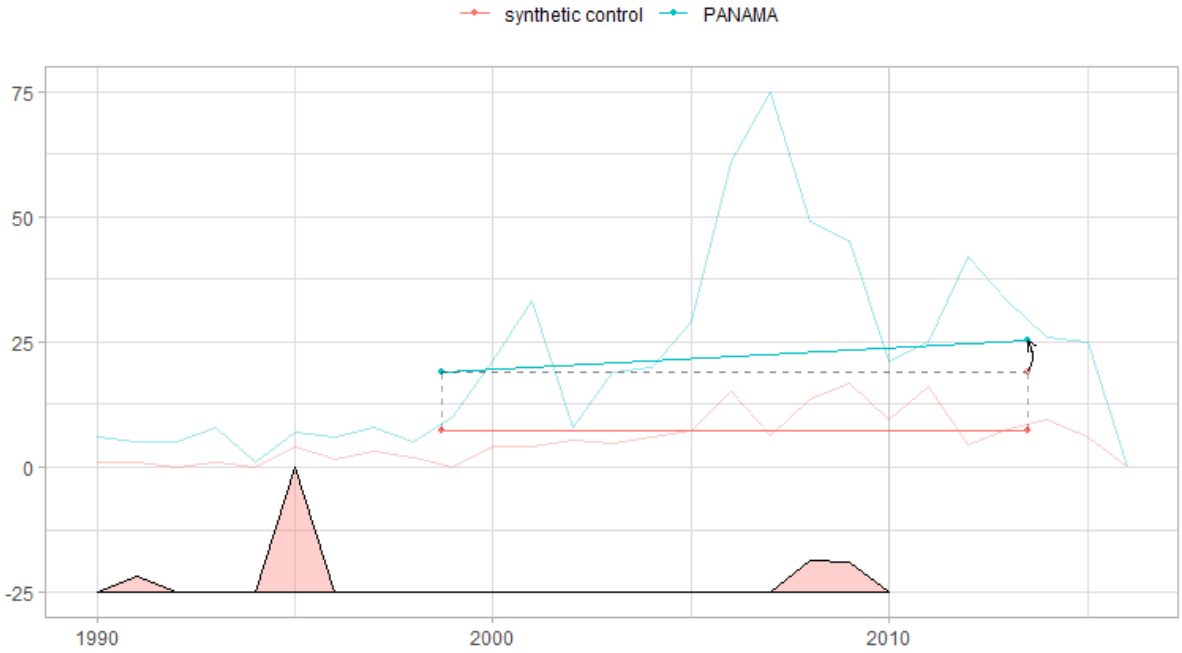


Figure 6: Synthetic DiD (incorporations per year), Panama (1990-2016)



4.2.2. Incorporation Dates as Response Variable – Monthly Data

In the monthly level of analysis, we focus on a narrower time frame[4]. This implies that more countries were able to be included in the control group. For each jurisdiction, we included in the existing control group other treatment countries that did not have a TIEA within the 2-year period. As we can see in Table 9, all the resulting estimates are positive in this case as well.

Table 9: Synthetic DiD, month-by-month incorporations [-12, +12]

Agreement	Date	Jurisdiction	DiD	Error
TIEA	2006-01	BAHAMAS	0.190	0.977
TIEA	2006-03	CAYMAN ISLANDS	0.289	0.817
TIEA	2006-03	BRITISH VIRGIN ISLANDS	0.970	0.802
TIEA	2011-04	PANAMA	0.887	0.039

For the monthly data, the difference-in-difference results are found to be relatively lower than those found in the year-by-year analysis, indicating smaller changes compared to the yearly data.

In this case, as well, we can observe from Figures 7 and 10 that the Bahamas and Panama datasets are behaving similarly. Although the control group is different for both jurisdictions and the trends are almost horizontal, they both produce a very slight expected increase. Both Bahamas and Panama as treated units show a greater increase than the expected projection. The trends for both jurisdictions hold close resemblance to their control group with Panama's difference with the control group being less than 2 and Bahamas's less than 0.5 incorporations.

For the Cayman Islands and the British Virgin Islands, on the other hand, the control group trend is horizontal as seen in Figures 8 and 9, meaning that these jurisdictions do not expect any change in their offshore entities in the absence of a TIEA within a 2-year time range. Both treated jurisdictions display a clear increase. British Virgin Islands as the treated unit bears less resemblance to its control group compared to the Cayman Islands with the former having a difference in trends of about 4-6, and the latter less than 0.25 incorporations.

[4] To use the monthly data, we first extracted the month and year values from the incorporation dates from the main data. We then applied a similar method to create data sets for each jurisdiction, where a subset of 12 months before and 12 months after the month of its TIEA date was selected. This means that although the datasets all include a 2-year period (25 data points), the starting and ending points are now different for each jurisdiction.

Considering the treated group's resemblance with the control group in each of these cases, all the results can be considered reliable. However, the overall results point towards the same conclusion as found by the year-by-year analysis, which is an increase in the number of entities after TIEA enforcement, this being inconsistent with H_1. Therefore, the monthly analysis only confirms our previous results from the year-by-year analysis but does not add any further significant value to its conclusion.

Figure 7: Synthetic DiD (incorporations per month), Bahamas [-12, +12]

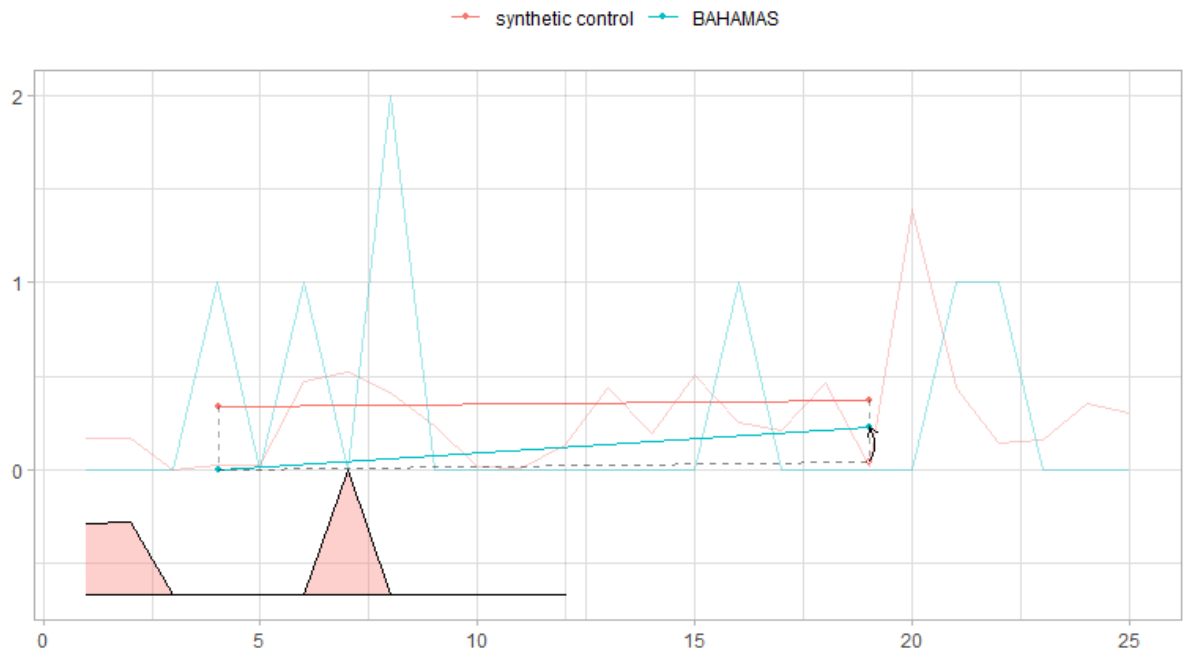


Figure 8: Synthetic DiD (incorporations per month), British Virgin Islands [-12, +12]

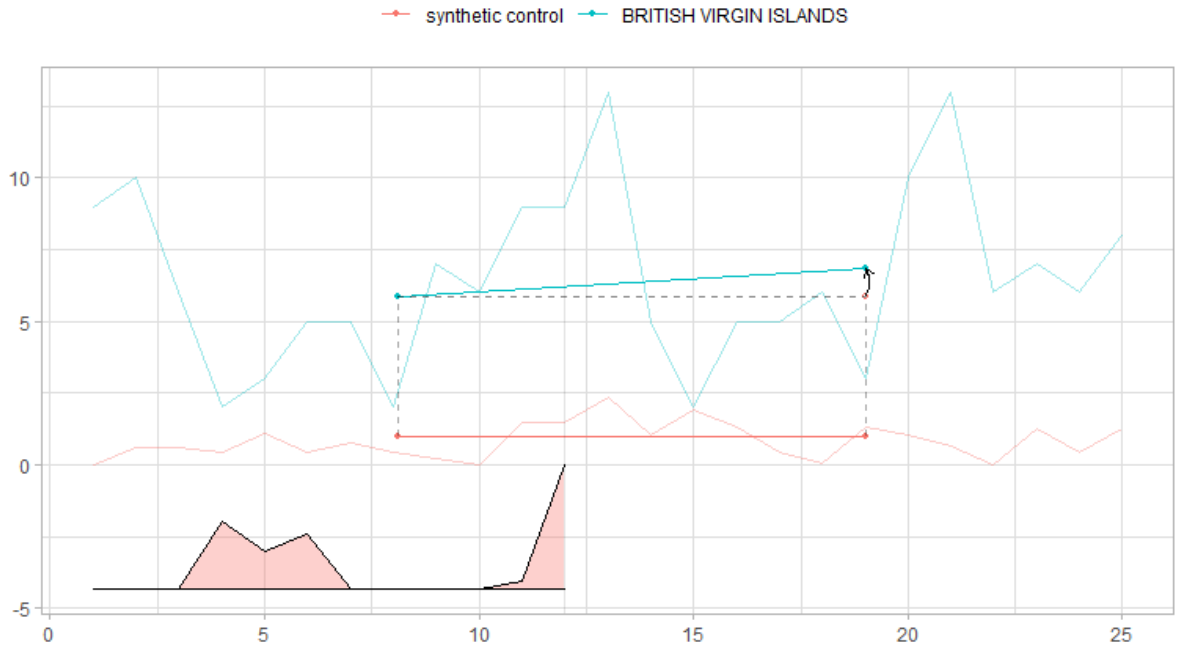


Figure 9: Synthetic DiD (incorporations per month), Cayman Islands [-12, +12]

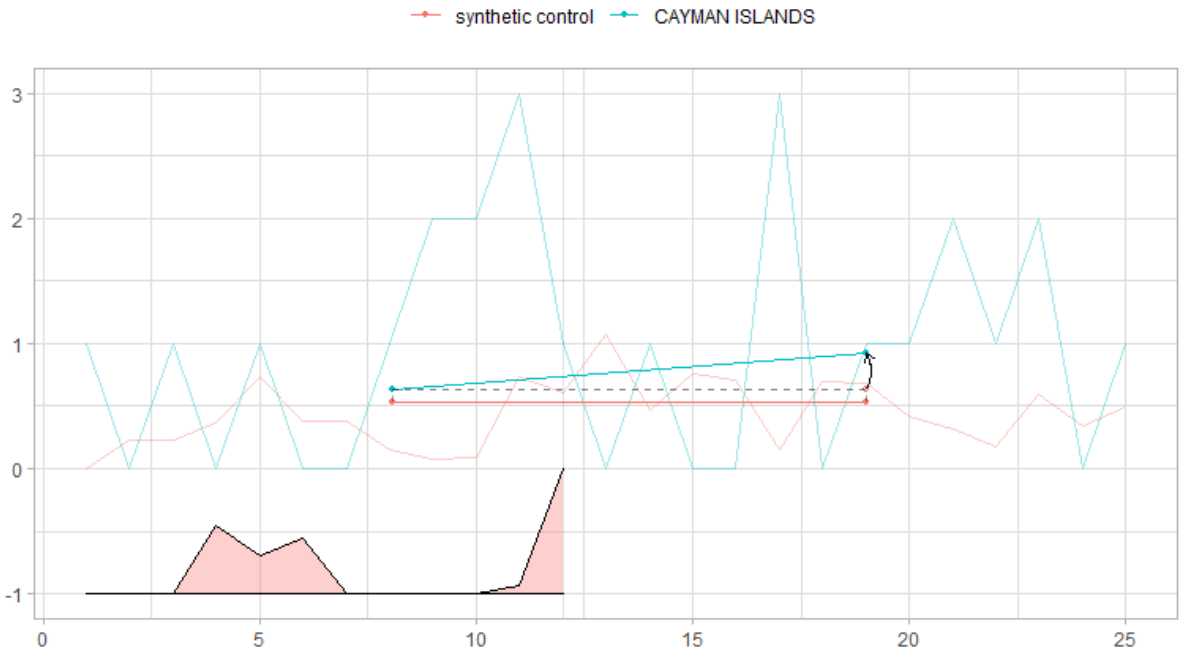
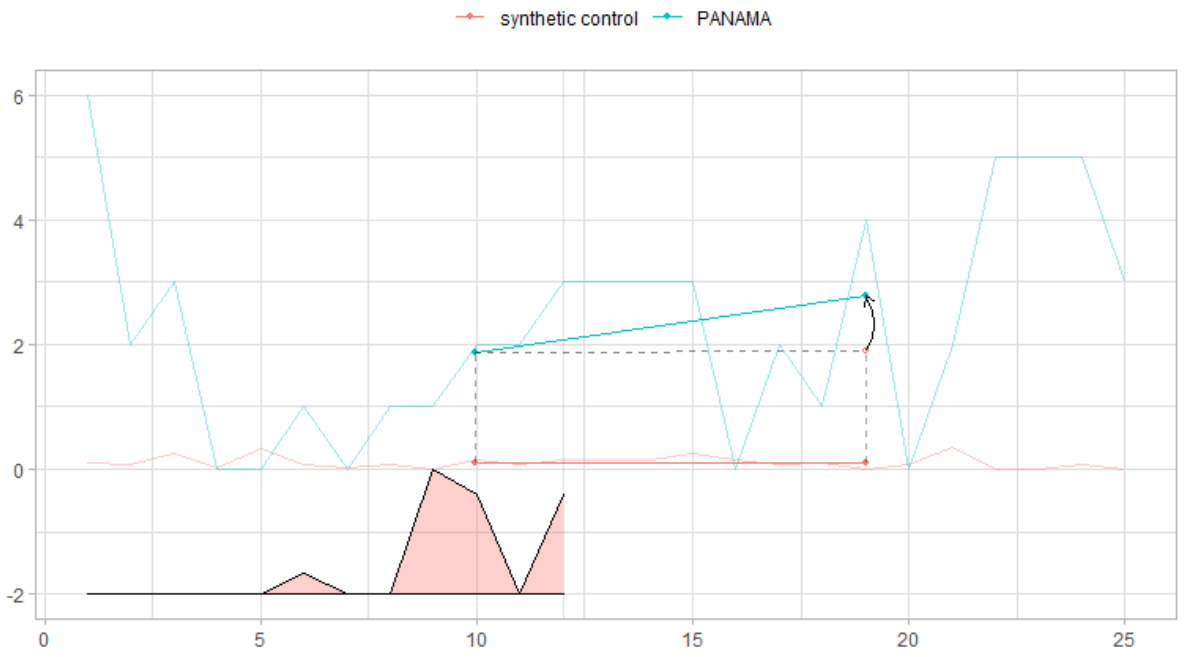


Figure 10: Synthetic DiD (incorporations per month), Panama [-12, +12]



4.2.3. Inactivation Dates as Response Variable

Upon applying the synthetic difference-in-difference method to the inactivation dates, we observe a similar trend as in the analysis with the incorporation dates. As seen in Table 10, although fewer in number, all jurisdictions return a positive estimate, among which the British Virgin Islands is the highest.

Table 10: Synthetic DiD, year-by-year inactivations (1990-2015)

Agreement	Date	Jurisdiction	DiD	Error
TIEA	2006-01	BAHAMAS	6.753	3.372
TIEA	2006-03	BRITISH VIRGIN ISLANDS	39.345	3.432
TIEA	2011-04	PANAMA	18.579	2.628

Unlike the incorporation dates, the data for inactivation dates show similar behaviour for the Bahamas and the British Virgin Islands. For both jurisdictions, the control group is almost parallel with a very slight increase. The treatment units are seen to have a close resemblance to the control group in terms of the difference between the control group and the expected projection of the treatment. As shown in Figure 11, the lines are almost overlapping for the Bahamas, indicating

that the control group is very well constructed. In Figure 12, we can see the difference between the British Virgin Islands as a treated unit and its control group is less than 5 incorporations. Both jurisdictions show a clear positive slope, with the one for the British Virgin Islands showing a higher increase over the same period.

Panama, in terms of inactivation dates, shows slightly different behaviour. Although the pre-treatment period, in this case, is longer (since the TIEA is more recent, i.e., enforced in 2011), the treated group has a much lower resemblance to its control group. Figure 13 shows the difference being about 12-14. Nonetheless, like the other jurisdictions, Panama, also shows a steep increase but over a shorter period.

Considering all the abovementioned inactivation analyses, we can conclude that the number of inactivations increases following the enforcement of a TIEA, consistent with H_2.

Figure 11: Synthetic DiD (inactivations per year), Bahamas (1990-2015)

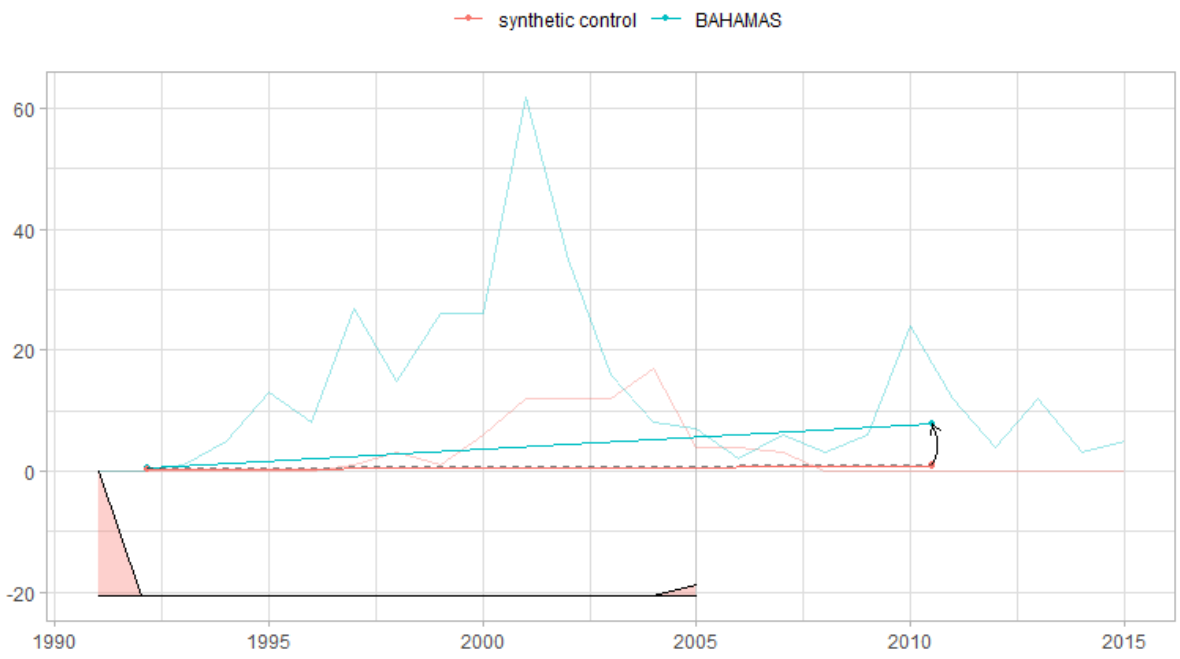


Figure 12: Synthetic DiD (inactivations per year), British Virgin Islands (1990-2015)

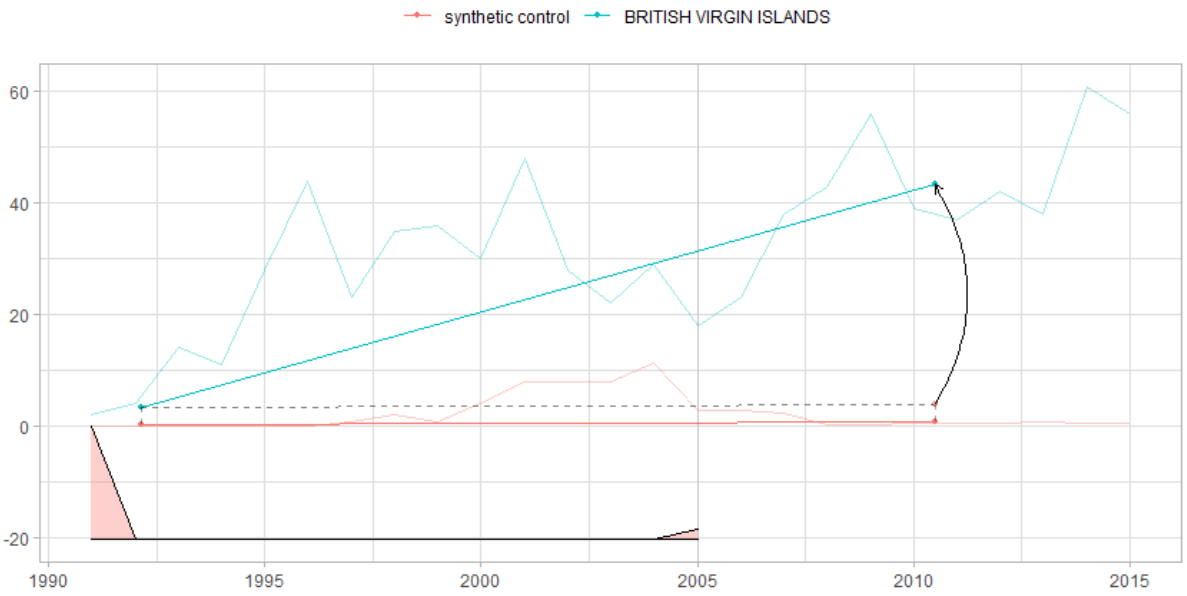
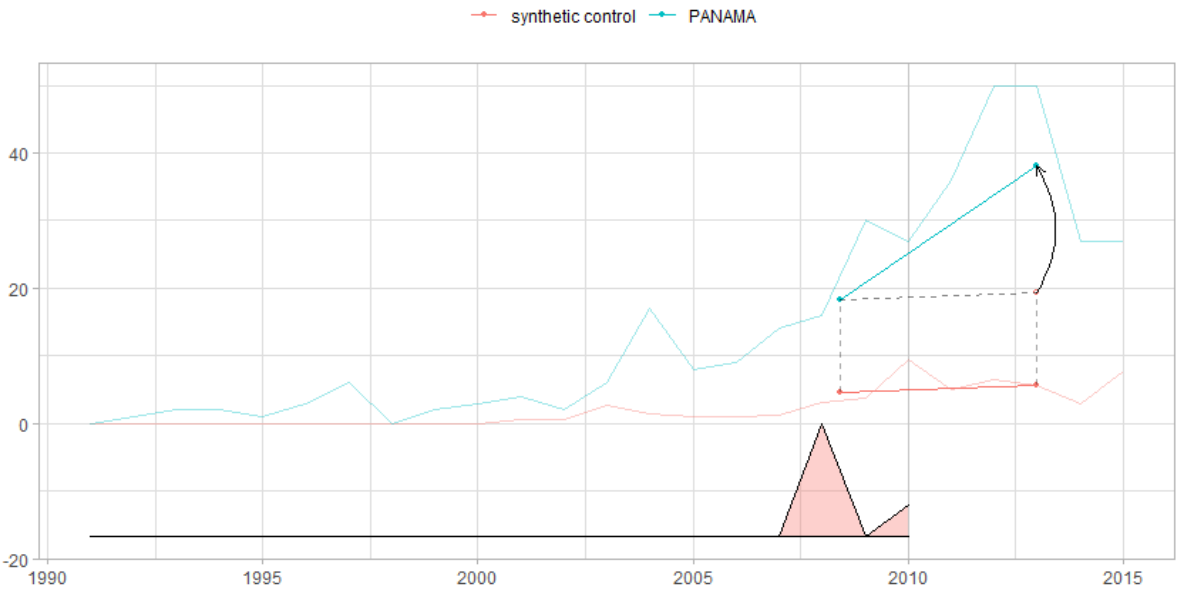


Figure 13: Synthetic DiD (inactivations per year), Panama (1990-2015)



4.3. Robustness Check – Poisson Regression

To check the robustness of our model, we also performed Poisson regression on the same data. As shown in Table 11 below, unlike the linear regression results, all the results here are found to be significant. However, we can see one negative (Bahamas) and three positive results, the signs being consistent with the linear regression results.

The fit for the year-by-year incorporation models, based on results displayed in Table 11, is better for the Bahamas and the Cayman Islands, with higher values for Log-Likelihood and lower values for Akaike Information Criterion.

Table 11: Poisson regression (incorporations), all years (1990-2016)

	Dependent variable:			
	Incorporations per year			
	Bahamas	Cayman Islands	British Virgin Islands	Panama
	(1)	(2)	(3)	(4)
TIEA	-0.678***	0.433***	0.600***	0.179*
	(0.114)	(0.099)	(0.050)	(0.094)
Intercept	2.925***	2.526***	3.811***	3.047***
	(0.058)	(0.071)	(0.037)	(0.048)
TIEA introduced	2006-01-01	2006-03-10	2006-03-10	2011-04-18
Observations	27	27	27	27
Log Likelihood	-192.151	-172.087	-246.439	-269.392
Akaike Inf. Crit.	388.303	348.173	496.879	542.785
Note:				*p<0.1; **p<0.05; ***p<0.01

As we have already seen in our analysis so far, the monthly data does not produce much significance for the results, with half of the values being negative. We see in Table 12 that although Panama is the only jurisdiction with a significant estimate, it is not the best-fitted model based on Log-Likelihood and Akaike Information Criterion. Hence, it is difficult to reach a definitive conclusion from these figures.

Table 12: Poisson regression (incorporations), 12 months before and after a TIEA

	Dependent variable:			
	Incorporations per month			
	Bahamas	Cayman Islands	British Virgin Islands	Panama
	(1)	(2)	(3)	(4)
TIEA	-0.368	-0.080	0.118	0.459*
	(0.764)	(0.408)	(0.158)	(0.275)
Intercept	-1.099**	0.000	1.806***	0.560**
	(0.500)	(0.289)	(0.117)	(0.218)

TIEA introduced	2006-01-01	2006-03-10	2006-03-10	2011-04-18
Observations	25	25	25	25
Log Likelihood	-16.487	-31.317	-62.857	-46.916
Akaike Inf. Crit.	36.973	66.633	129.713	97.831
Note:				*p<0.1; **p<0.05; ***p<0.01

As shown in Table 13, the inactivation dates produce the same results with Poisson regression as with linear regression. Since all the results are found to be significant with only one negative value, Bahamas, this can be interpreted as a false negative. The Bahamas also has the least fitted model compared to the other jurisdictions based on Log-Likelihood and Akaike Information Criterion.

Table 13: Poisson regression (inactivations), all years (1990-2015)

	Dependent variable:		
	Inactivations per year		
	Bahamas	British Virgin Islands	Panama
	(1)	(2)	(3)
TIEA	-0.768***	0.557***	1.603***
	(0.130)	(0.071)	(0.109)
Intercept	2.809***	3.211***	2.035***
	(0.063)	(0.052)	(0.081)
TIEA introduced	2006-01-01	2006-03-10	2011-04-18
Observations	25	25	25
Log Likelihood	-181.173	-137.791	-137.022
Akaike Inf. Crit.	366.346	279.582	278.044
Note:			*p<0.1; **p<0.05; ***p<0.01

Based on the above, we confirm the signs of estimates from the linear regression and find all the results excluding monthly analysis to be statistically significant and robust.

4.4. Extension – Study on China

To ensure that our results were not specific to the U.S. dataset, we applied our model and the same method to another dataset. China was chosen for these purposes since the global costs of tax avoidance are the second highest in this country (Statista, 2017). We filtered all the entities connected to China and conducted the same year-by-year study using incorporation and

inactivation dates. Since the monthly analysis in our study did not provide any additional insight, we now limit our analyses to yearly data only.

Before discussing the result, it is interesting to take a look at the data we extracted for China. As observed in the U.S. dataset, the number of new entities connected to China also shows an increase from the early 2000s, with a slow decline from around 2008 to 2012, after which it rises again (Appendix 4). The trend for inactivation dates, on the other hand, seems to grow exponentially until 2009, then slowly fall in the next two years and has somewhat stagnated afterwards (Appendix 5).

A total of 16 jurisdictions were found to have entities connected to China, of which 5 have over 100 observations. Similar to the U.S., the distribution of observations is quite uneven for China, with 4 of the jurisdictions having just 1 observation (Appendix 7). Most of these observations were found from two leaks, namely, Panama Papers and Paradise Papers (Appendix 6), which was also the case for the U.S. data.

Of the jurisdictions found to have more than 100 observations, China had an existing TIEA only with the three jurisdictions, displayed in Table 14 – the Cayman Islands, Seychelles, and the British Virgin Islands. Hence, these are the ones we could use for our analysis.

Table 14: Synthetic DiD (China), year-by-year incorporations (1990-2016)

Jurisdiction	DiD	Error	Agreement	Date
BRITISH VIRGIN ISLANDS	-93.778	6.968	TIEA	2010-07-30
CAYMAN ISLANDS	-0.959	8.084	TIEA	2012-07-15
SEYCHELLES	32.344	7.859	DTC	2000-07-17

Our results from linear regression on incorporation dates (Appendix 8) show positive results for all three, similar to the U.S. data. This means that after the enforcement of a TIEA, the number of new offshore entities increased in all these jurisdictions. Between the two of these three (the Cayman Islands and Seychelles) that produced statistically significant values, Seychelles resulted in the highest value. This means that Seychelles would have a larger number of entities created per year compared to the other jurisdictions. In comparison to the U.S. data, the estimated values are greater for China overall.

The linear regression results for the inactivation dates (Appendix 9) also produced all positive values, indicating an increase in the deactivation of entities after the enforcement of a TIEA. Two jurisdictions were found to have inactivation dates with over 100 observations and only one of them, the British Virgin Islands, showed a statistically significant estimate.

Applying our model to the China dataset, we find that the estimates from the regression are all uniformly positive. However, the situation is not the same when it comes to the synthetic difference-in-difference method. For the incorporation dates, the difference-in-difference results are negative for the British Virgin Islands and the Cayman Islands but positive for Seychelles (Table 14).

Of these three, the British Virgin Islands dataset has the least resemblance to its control group (Figure 14), and it is the only one that has shown a decrease. The estimate is not only lower than the expected rate of the control group, but also a negative slope where the expected trend was positive. The results are surprisingly the same for inactivation dates in this jurisdiction (Appendix 10 and 11).

Figure 14: Synthetic DiD (China, incorporations per year), British Virgin Islands (1990-2016)

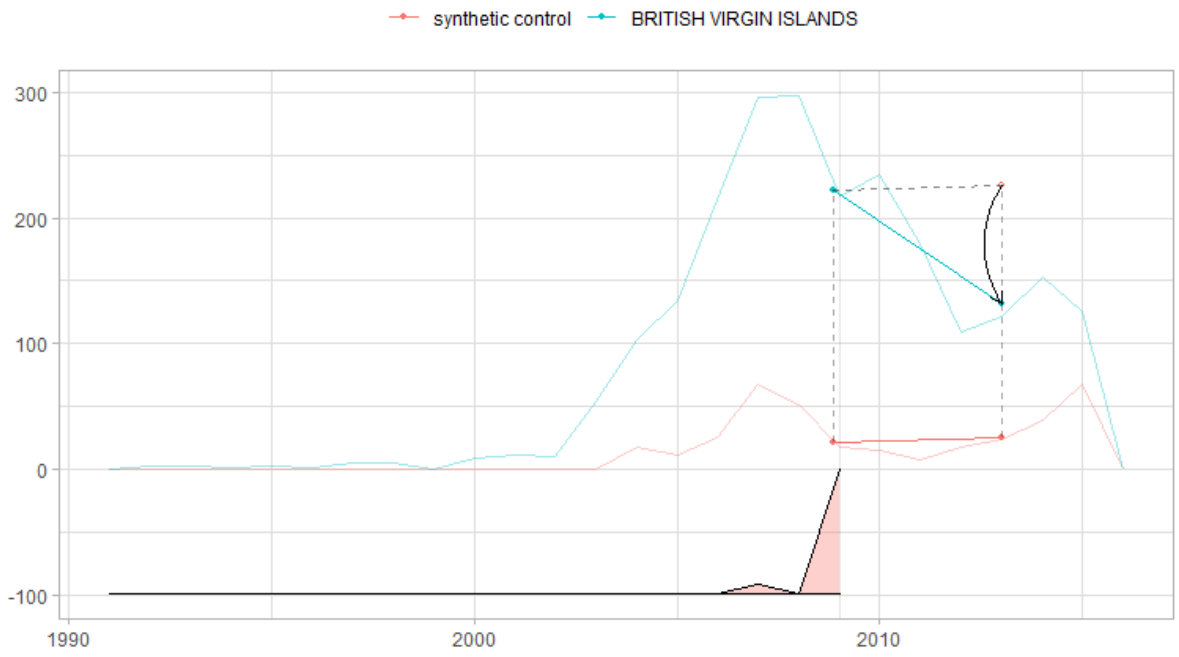


Figure 15: Synthetic DiD (China, incorporations per year), Cayman Islands (1990-2016)

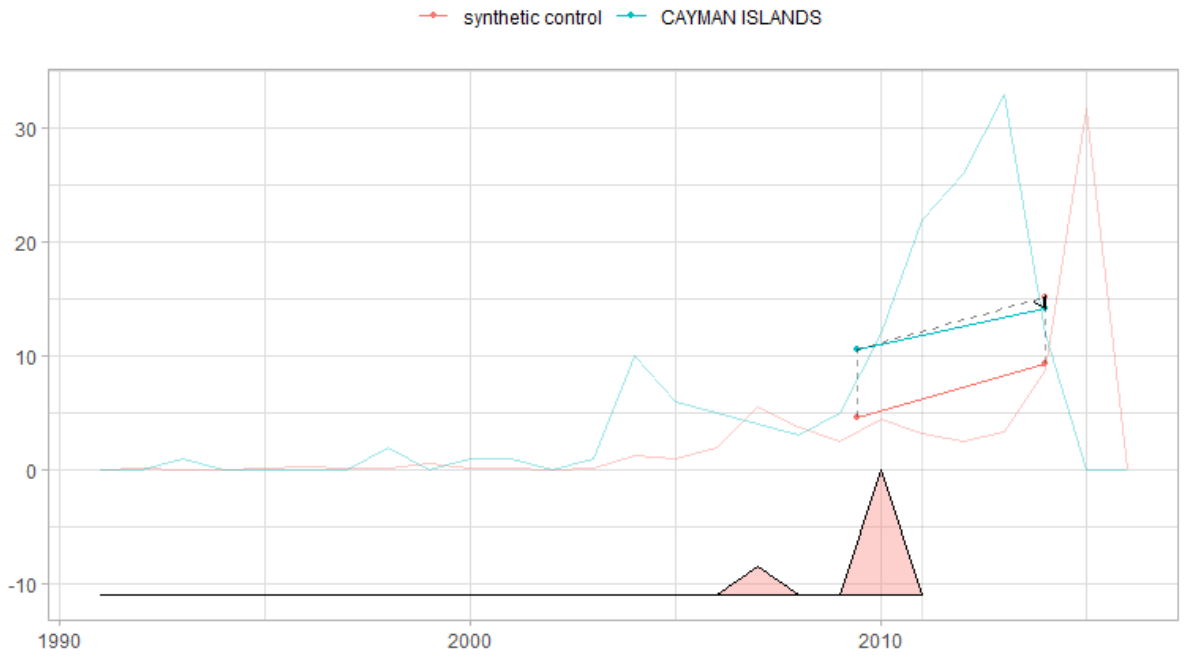
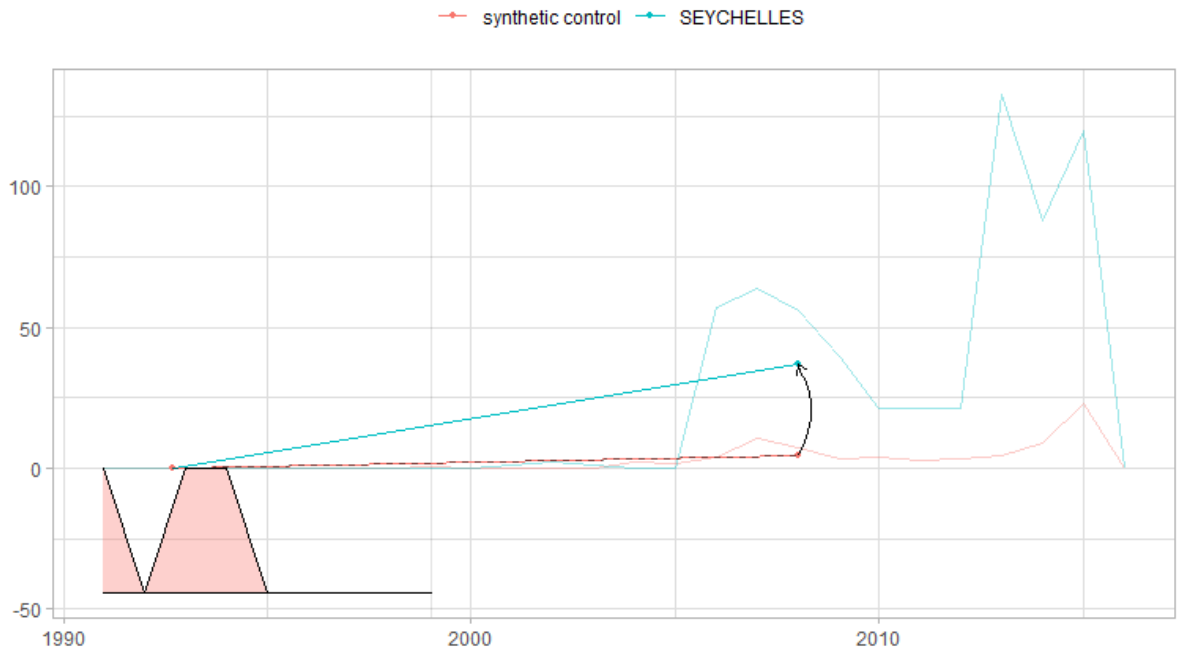


Figure 16: Synthetic DiD (China, incorporations per year), Seychelles (1990-2016)



The difference-in-difference results for Seychelles are positive for both incorporation and inactivation dates. Although the linear regression for inactivation dates did not return significant

results, the DiD results are more reliable. As we can see in Figure 16, the control group graph and expected estimate are almost overlapping, meaning that Seychelles as the treated group has a very close resemblance with the control group. The results for Seychelles support the conclusions we drew from our main analyses, which is a notable increase in activity in terms of both creation of new entities and deactivation of old ones. Therefore, there is evidence that the results from the U.S. analysis are not specific to the U.S. alone.

4.5. Limitations

More than anything else, the limitations of this study are related to data availability. However, utilization of a different method or inclusion of additional data could improve the results of our analysis. Generally, the ICIJ database reveals a lot of information that cannot be accessed by conventional methods (from public records). The nature of this data makes it useful for tracing a specific company or individual. The overall study of an entire jurisdiction with it is however challenging and any results found by analysing it are more indicative and not absolute.

There are also limitations to our applied model and method. The model of our study is far from perfect. The absence of any other predictor variable in our panel data limited our conclusions. This also disallowed the use of model variation as a robustness test of the model.

In the synthetic difference-in-difference analysis, there is considerable uncertainty in the construction of the control group. From our full set of data, the countries included in the control group appeared to have the least number of observations. Given that the introduction of a TIEA is often stimulated by the extensive use of a tax haven, it seems probable that the ones with no TIEA (control group jurisdictions) would be the ones that have fewer offshore activities anyway.

The construction of the control group was carried out with the synthetic difference-in-difference. Despite all the units in the control group being tax havens, they vary in other features such as popularity, level of secrecy, taxation laws, accessibility to foreigners, etc. These other factors are not available in the data we worked with, and therefore not taken into consideration. This might have resulted in a misrepresented control group. The resulting groups could be constructed in a more sophisticated manner if more comprehensive data were available.

In general, regarding the errors across all three levels of analysis, we find the errors to be relatively large for both the regression analysis and the difference-in-difference evaluation study. This

means, that the errors in some cases may mean the mitigation of our results, if there is a chance of a positive result becoming negative or vice versa, due to the relatively large size of the error.

The ICIJ database is constantly being updated. However, some of the additions made might be historical data. Since most of the data from offshore leaks have been published in or after 2016, the variable we have used for our analysis, the incorporation date of entities, has an upper limit of 2016. Therefore, even though the team is constantly adding more data, it is still difficult to describe the current scenario (in 2022) using this study.

5. Discussion

The aim of this thesis was to find out whether the enforcement of a TIEA has a causal effect on taxpayers' use of tax havens and to investigate the nature of this effect. An overall increase in tax haven activity, both in terms of entering and exiting companies was discovered.

Regarding H_1, we, therefore, reject the null hypothesis for the studied jurisdictions. The alternative hypothesis, based on literature, expected a negative coefficient. This expectation however is not confirmed based on our analysis, since we have found an overall positive coefficient for β.

Regarding H_2, we also reject the null hypothesis and accept the alternative hypothesis for the studied jurisdictions, since we found an overall positive coefficient for β. The expected increasing effect in terms of inactivations of existing entities can be observed in both linear regression and difference-in-difference results.

For the jurisdictions that had both incorporation and inactivation dates present in the data, the combination of behaviour that was expected based on the hypotheses was not present in any of our results, meaning that jurisdictions that satisfied H_1 did not satisfy H_2 and vice versa. The trends of both incorporations and inactivations for any jurisdiction as seen in the difference-in-difference results were corresponding in all cases (both either positive or negative).

Firstly, the implementation of a simple linear regression model mostly did not result in statistically significant estimations. The ones found significant were the Bahamas and the British Virgin Islands for the analysis that was based on yearly incorporation dates. Additionally, the British Virgin Islands and Panama were found significant in the analysis of inactivation dates. Out of the significant tax havens, each gave a positive estimate for the TIEA dummy variable. The analysis based on the monthly level was not found statistically significant.

Secondly, the synthetic difference-in-difference study also showed us positive signs for the TIEA estimate. The only negative trend found was the Bahamas, for the incorporation dates on yearly basis. Considering the overall high statistical significance found in the robustness check, there is a chance that the Bahamas could be a false negative. However, in comparison with the regression analysis for incorporation dates, the corresponding inactivation date regression result for the Bahamas was not found significant.

The results can be said to be the most accurate for the British Virgin Islands, which have the largest sample size. This tax haven showed consistently a positive trend over the effect of a TIEA, both for incorporations and inactivations. The results may be the least conclusive for the Bahamas, given that we see very different behaviour in regression compared to difference-in-difference results.

The results from our quantitative analysis cannot conclude a general trend for how taxpayers react to TIEAs. Therefore, the external validity of our results is relatively low. Internally, the validity may have suffered from the control group in the synthetic difference-in-difference analysis, which in most cases consisted mostly of just a few jurisdictions with a small number of observations. This may also be the case because of the limited data that we used in the analysis. In the yearly difference-in-difference analysis for Panama, we cannot make strong conclusions due to the shorter post-treatment period available for the jurisdiction.

Our findings correspond to findings from earlier research that shows TIEAs have an impact on companies' choice to locate in a tax haven. However, as opposed to Braun and Weichenrieder (2015), we cannot infer that a TIEA would lead to a decreased activity in a tax haven.

The Effect of TIEA Agreements

The finding of a positive coefficient for the TIEA dummy variable in the analysis of incorporation dates is unexpected and against the theoretical foundations of this thesis. There are several possible explanations as to why we have observed this increase in tax haven activity.

Firstly, an important thing to note is that whereas a TIEA adds transparency between jurisdictions by enabling an exchange of information, they "do not eliminate the externalities that follow from legislation in secrecy jurisdictions," and even if any information is exchanged, there may not be enough of it, or it may not be accurate. Additionally, TIEAs allow authorities from other countries to access information only in case they have enough evidence that the company or person under suspicion is linked to the tax haven in question. Therefore, there may exist incentives for tax havens "not to spill evidence," which may in fact lead to a further decreased transparency in the tax haven. (Schjelderup, 2015). These can partly explain the ineffectiveness of TIEAs.

Additionally, the nature of this agreement allows these jurisdictions some exploitable rights. There are multiple occasions when one party holding a TIEA may decline the other party's request to

acquire information, such as, “where the requesting Party has not pursued all reasonable means available in its own territory to obtain the information” (‘Agreement Between the Government of the United States of America and the Governmentof the Republic of Panama for Tax Cooperation and the Exchange of Information Relating to Taxes’, 2010). Hence, despite the existence of such an agreement, there may not be any real information exchange even when both parties are compliant, which consequently adds to the ineffectiveness of TIEAs.

In Article 7 of the TIEA between the U.S. and Panama, it is stated that the information acquired by exercising the rights in this agreement is confidential and can only be disclosed “in public court proceedings or in judicial decisions”. This makes it difficult for third parties, e.g., investigating authorities to know with any certainty if the information exchange has occurred at all.

Furthermore, jurisdictions listed in OECD’s blacklist of non-cooperative jurisdictions must sign at least twelve TIEAs to be excluded from this blacklist. The blacklisted jurisdictions are those that do not meet OECD’s formal requirements of transparency and information exchange (Sawyer, 2011). Sawyer also points out that this OECD initiative was shortly followed by around 100 new TIEAs signed, resulting in the previously blacklisted jurisdictions now meeting OECD’s criteria and being excluded from the list. This raises the question of whether these agreements only exist on paper and are not implemented as they should be.

Regardless of their ineffectiveness, we might still assume that TIEAs encourage taxpayers to move their offshore entities to a seemingly safer location. We can observe from the graphical representations for each jurisdiction (Appendix 2 & 3) that some of the trends change concurrently, for example, in the period when the Bahamas goes through a decline, Panama is seen to go through a peak. This can be indicative of a possible relocation, which may have then given rise to the enforcement of a TIEA in the latter country. However, at the same time, the British Virgin Islands is also seen to go through an increase even though both the Bahamas and the British Virgin Islands have TIEA enforcements dates in the same year. Since many other TIEA dates also fall in the same year, it is difficult to make concrete conclusions regarding relocation tendencies from this data.

The Persistent Rise in the Usage of Offshore Entities

When we observe an increase not only where it is expected (increased inactivations) but also where it is unexpected (increased incorporations), it cannot be ignored that such an overall increase may also be a result of something else than the ineffectiveness of agreements trying to increase the

transparency in secrecy havens. While looking into descriptive statistics, there were smaller numbers of observations before the late 1990s and the year 2000, after which the number of incorporations and inactivations observed was overall higher. One reason for this could simply be the advancements in technology, and the internet bringing the possibilities of owning an offshore entity closer to people. The ease of moving your assets to a tax haven can certainly add traffic and explain why we constantly observed increases instead of decreases for incorporations.

The above technology aspect implies, that the expenses of tax avoidance and tax evasion are decreased. One does not have to reside or be in a tax haven in order to open a local bank account, and assets can be electronically transferred from any part of the world without reporting to tax authorities (Congressional Research Service, 2015).

Most of the common tax avoidance strategies adopted by individuals involve reporting expenses in different forms (Fonville, 2021). Compared to those, investment in an offshore entity is an easier and more beneficial option for high-income earners. Hence, using offshore entities to reduce taxation is a lucrative idea not only due to the amount saved in taxes, but the additional gain taxpayers can enjoy as foreign investors. Many countries around the globe, including the U.S., assign a lower tax rate to foreign investors compared to domestic investors. Not only does this encourage citizens to invest in foreign locations, but also to invest in their own countries from a foreign offshore entity (Kemme, Parikh and Steigner, 2017). On top of that, it is often very difficult for authorities to detect tax evasion, let alone follow through to ensure that the offenders are appropriately penalized. This means that for a businessman handling funds in millions, the incentive of using an offshore entity surpasses the risk of getting penalized for tax evasion.

Overall, the use of tax havens has been experiencing a clear increase over the last couple of decades. The increase observed from our results could potentially be due to this boom simply overshadowing any favourable effects created by a TIEA. Given the ease of creating offshore entities, the reduced taxation and the level of secrecy provided by tax havens, the growing usage of tax havens, although unfortunate, is not entirely unanticipated.

The secrecy these havens provide is tempting for companies and individuals who wish to maximize their incomes by avoiding taxes. Ideally, instruments like the one that was focused on in this study, TIEA, should serve as a solution to reduce this practice. However, in light of the evidence found

in ours as well as previous related research, it can be concluded that governments and authorities need to revise the instruments used to increase bilateral transparency or opt for better alternatives.

6. Implications & Future Research

For a taxpayer, tax avoidance merely refers to reducing one's taxable income to reduce the taxes paid. However, for the authorities collecting taxes, it implies concealment and misrepresentation of wealth by the taxpayer. This means that when realized, tax avoidance can easily become tax evasion, which is a punishable offence. This study focused on the use of offshore entities, which is believed to be a common tax avoidance strategy.

It is important to contribute to the field of tax avoidance due to its detrimental implications for societies' welfare. This thesis took a simplistic approach to the number of new incorporations in tax havens, using the existence of a TIEA as an independent variable. Previous studies have shown both the effectiveness and ineffectiveness of such agreements. The main implication from our study is similar to the latter: TIEAs may not have the effect that OECD might have desired with the 2002 Agreement on Exchange of Information on Tax Matters.

Our findings shed light on the potential ineffectiveness of TIEAs considering the vastly increased use of tax havens. While many have been able to prove the agreements being able to reduce tax haven usage, we support the minority of literature that questions whether the agreements can accomplish what they intend to. This can be of substantial importance to future policymakers in order to assess bilateral transparency between two countries and consequently, improve compliance in the public finance sector.

There is substantial scope for future research regarding offshore activities. The investigations by ICIJ have revealed an astonishing amount of data giving the general public an idea of the magnitude of this issue. However, the best approach for further research using their data should involve combining other relevant data to the ICIJ database.

In case more data leaks occur in the future and as the ICIJ database is updated, using the ICIJ data may lead to more rigorous results than what it has in the case of this thesis. Many observations needed to be excluded from our study due to missing values as well as undetermined jurisdiction and country details. In case the missing values could be determined, there would be more potential for the use of offshore data leaks as the data source in a study like ours.

The most recent publication by ICIJ, Pandora Papers, has revealed the names of more than 300 current and past heads of state, world leaders and politicians (NPR, 2021). Most of them have successfully maintained the secrecy using an intermediary or going through channels. Since it has been possible to link these names to their offshore entities, there is scope to track the source of this wealth as well as where this wealth ends up. This, in turn, can potentially be a significant starting point for investigations of financial crimes.

The conclusions that are drawn from this study point toward two possible explanations for the increase in offshore activity. Both explanations can serve as a basis for future research. Firstly, the possibility of relocating within tax havens following the enforcement of a TIEA can be studied to identify other factors (e.g., incentives from tax havens) influencing this behaviour. Secondly, further research could be carried out on how TIEAs are designed and how they can be improved to be more effective.

7. Conclusion

This research aimed at looking into the effect of increased bilateral transparency on offshore activity. U.S. companies in offshore data leaks were taken under focus. Based on earlier literature, we hypothesised that tax information exchange agreements (TIEA) would have a positive impact on the transparency of tax havens, whose high level of secrecy encourages tax avoidance. We expected that the increased transparency would imply a decreased number of new offshore entities created per year and an increased number of existing entities being closed per year.

Linear regression, as well as synthetic difference-in-difference, were applied to data from offshore data leaks gathered from the ICIJ. Four tax haven jurisdictions (Bahamas, British Virgin Islands, Cayman Islands and Panama) that had more than 100 incorporation observations between 1990 and 2016 as well as had signed a TIEA with the U.S. were analysed. Yearly and monthly levels of analysis were applied using the signature day of the TIEA as the event.

The results from such analysis show, first and foremost, that although we expect there to be a decrease in the number of companies incorporated in a tax haven per year as a result of a TIEA, this does not seem to be the case in most of our studied data. From the regression results, statistical significance was found for two out of the four jurisdictions studied. Most results, with the exception of Bahamas, were positive, whereas for the synthetic difference-in-difference all jurisdictions showed an increasing trend.

Regarding the short-term monthly level of linear regression analysis, we do not observe a statistically significant increase or decrease in the trend in incorporations. This implies that an introduction of a TIEA does not result in significant changes in the behaviour of companies within the following year. In the synthetic difference-in-difference analysis, all results showed increasing trends with a good fit to the control group.

We repeated the analysis for inactivation dates. Here, the hypothesis was that a TIEA agreement and the subsequent increase in transparency would lead to more companies leaving the tax havens and therefore resulting in an expected increase in inactivations. From the linear regression, we found statistically significant results for two out of the three jurisdictions studied with both showing a positive trend. Bahamas' regression result was again negative, yet insignificant. Again, the synthetic difference-in-difference results were found positive for all jurisdictions.

To test the generalizability of our results, the same process was repeated with China. In this case, the jurisdictions examined were the British Virgin Islands, Cayman Islands and Seychelles (incorporations). For the analysis of inactivations, British Virgin Islands and Seychelles were studied. In China's case as well, synthetic difference-in-difference gave mostly positive results for the studied jurisdictions.

Our thesis shows that at least, the desired effects of a TIEA cannot clearly be pointed out by our analysis that utilized offshore leaks data. Limitations are present in our research in the form of data availability issues as well as the model description.

The paper contributes to the study of tax avoidance and secrecy jurisdictions and can also be valuable for policymakers in the public finance sector. Future research might include a closer look into the definition and design of a TIEA, to find out whether the agreements could be improved to be more effective. Research could also be carried out on whether these agreements are practised the way they should.

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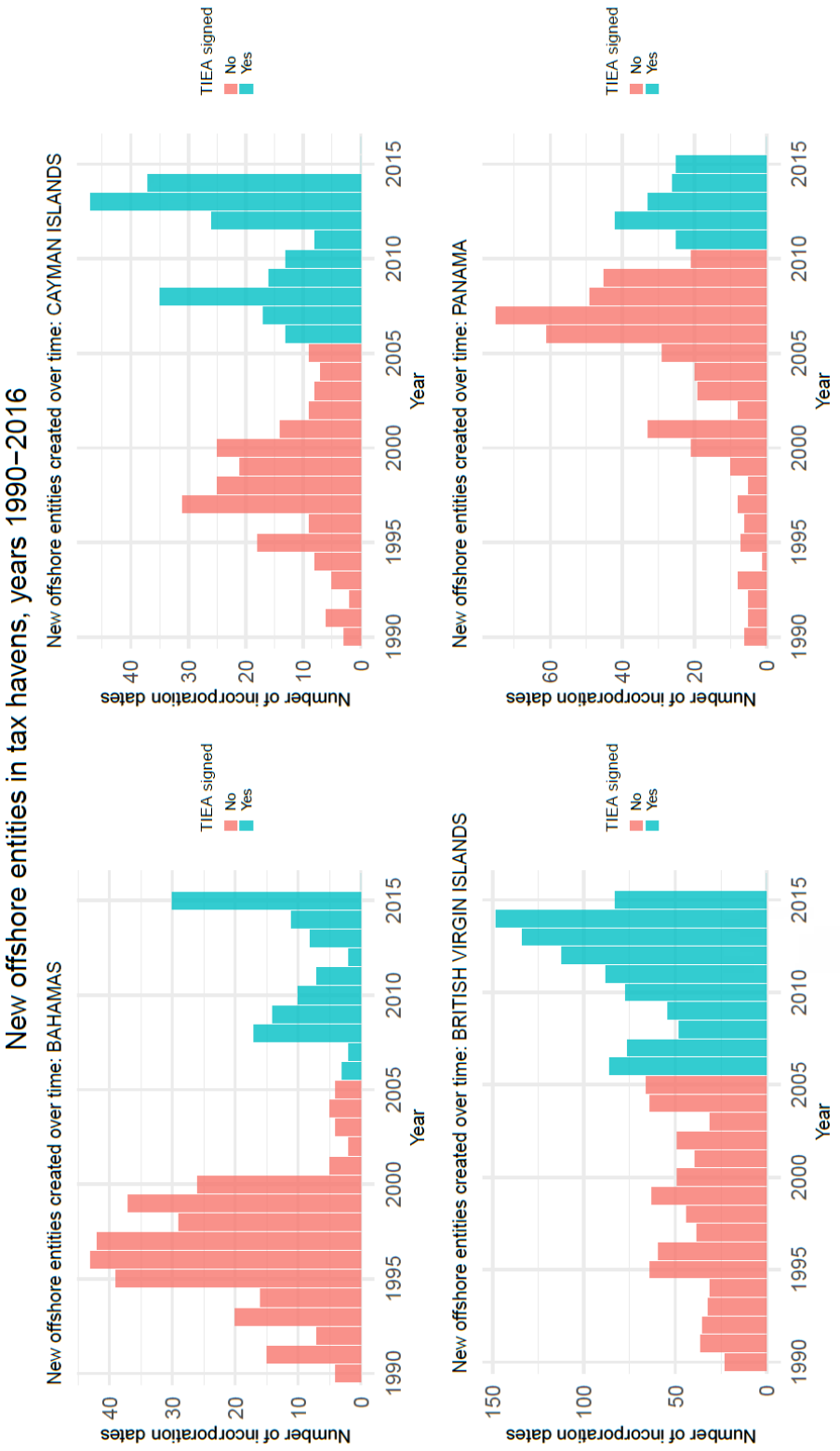
Appendix

Appendix 1: Snippet of the raw ICIJ data

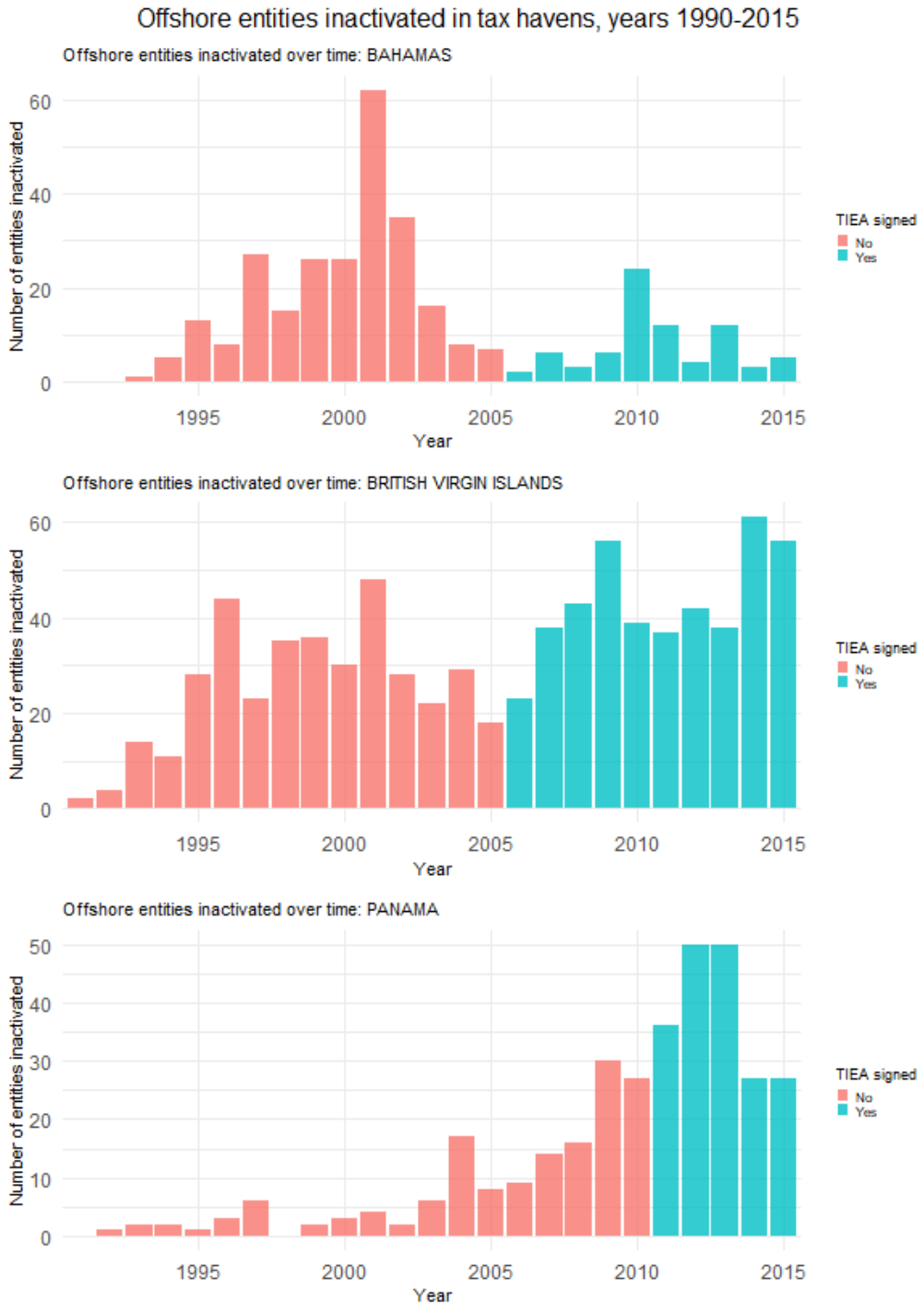
X_id	167549	167650	167729	168088
node_id	10167430	10167532	10167609	10167970
name	AL DAWLIA MASKHARA LTD.	GUNTER INTERNATIONAL S.A.	PENTON HOLDINGS INC.	REMINGTON INVESTMENTS LTD.
original_name	AL DAWLIA MASKHARA LTD.	GUNTER INTERNATIONAL S.A.	PENTON HOLDINGS INC.	REMINGTON INVESTMENTS LTD.
former_name				
jurisdiction	BAH	BAH	BAH	BAH
jurisdiction_description	BAHAMAS	BAHAMAS	BAHAMAS	BAHAMAS
company_type				
address	LAW OFFICES NOTARO & MICHALOS P.C. EMPIRE STATE BUILDING 350 FIFTH AVENUE; SUITE 6902 NEW YORK; NEW YORK 10118-6985 U. S. A.	MR. CARLOS LOZANO P.O. BOX 923 HIDALGO , TX 78557; U.S.A. *S.I.*	ESQUEA & VALENZUELA 1500 BROADWAY NEW YORK, NEW YORK 10036 UNITED STATES OF AMERICA	MR. PETER S. SHEDDEN C/O KIDDER; PEABODY 10 HANOVER SQUARE NEW YORK; N.Y. 10005 U.S.A
internal_id	801194	800009	800212	800219
incorporation_date	22-03-93	15-01-90	02-01-91	02-01-91
inactivation_date	07-Jun-95	02-Jan-98	05-Apr-94	
struck_off_date	31-Dec-95	31-Dec-91	31-Dec-92	31-Dec-94
dorm_date				
status	Defaulted	Defaulted	Trash company	Defaulted
service_provider	Mossack Fonseca	Mossack Fonseca	Mossack Fonseca	Mossack Fonseca
ibcRUC	13743-B	9	3790B	3791-B
country_codes	USA	USA	USA	USA
countries	United States	United States	United States	United States
sourceID	Panama	Panama	Panama	Panama
valid_until	The Panama Papers data is current through 2015	The Panama Papers data is current through 2015	The Panama Papers data is current through 2015	The Panama Papers data is current through 2015
note				
type	NA	NA	NA	NA
closed_date	NA	NA	NA	NA

Source: https://offshoreleaks.icij.org/pages/database

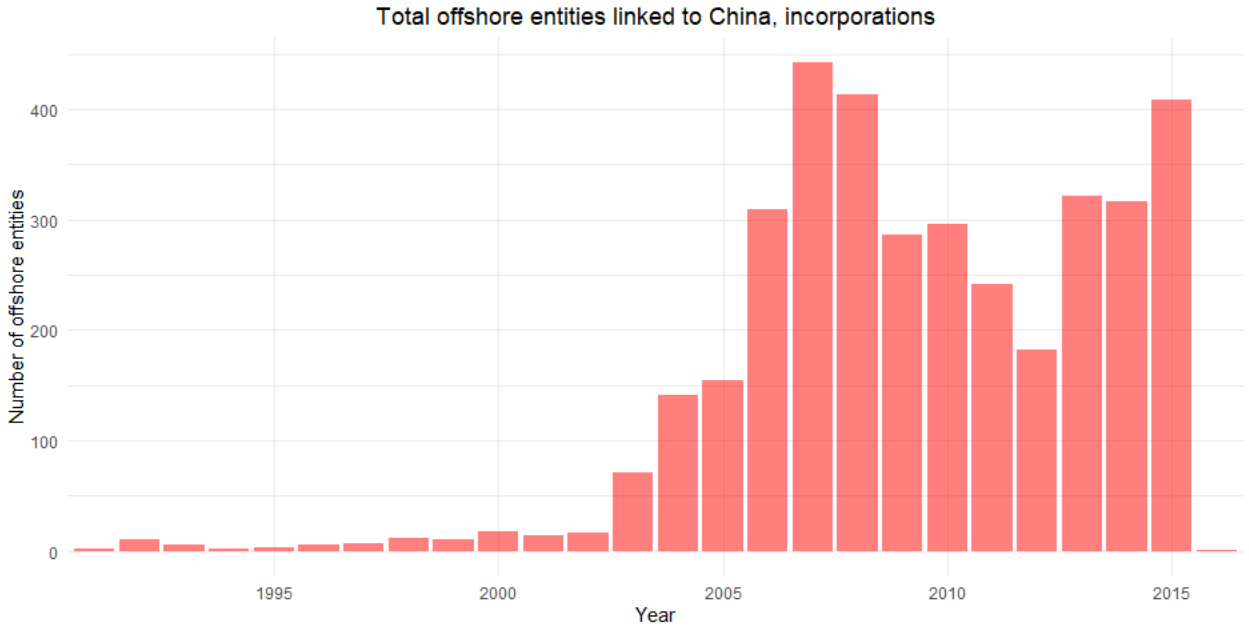
Appendix 2: Number of incorporations across 1990-2016 in selected jurisdictions



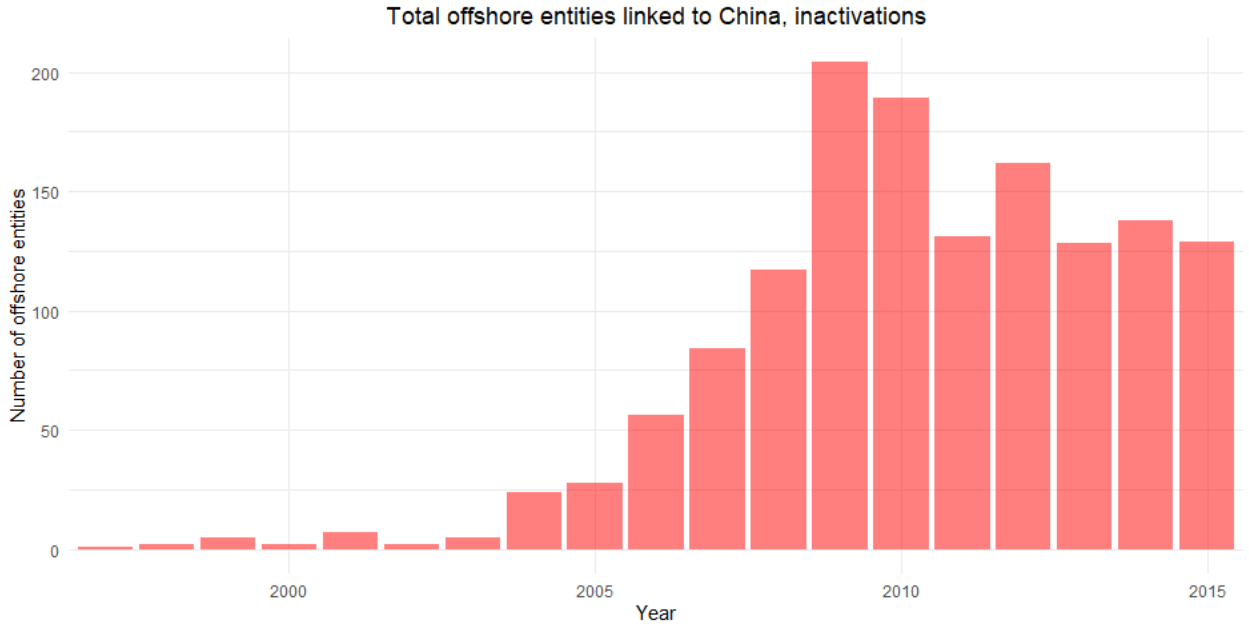
Appendix 3: Number of inactivations across 1990-2015 in selected jurisdictions



Appendix 4: Development of offshore entity creation (China)



Appendix 5: Development of offshore entity inactivations (China)



Appendix 6: Sources for observations (China)

Incorporation date sources for the most abundant jurisdictions (Chinese entities)

Jurisdiction	Bahamas Leaks	Offshore Leaks	Panama Papers	Paradise Papers	Pandora Papers	Total
BRITISH ANGUILLA	0	0	148	0	0	148

BRITISH VIRGIN ISLANDS	0	27	2,134	129	0	2,290
CAYMAN ISLANDS	0	0	0	144	0	144
SAMOA	0	0	363	0	0	363
SEYCHELLES	0	0	528	97	0	625

Appendix 7: Descriptive statistics (China)

Descriptive statistics, tax havens present in the Chinese data (1990-2016)

Jurisdiction	Number_of_entities	Mean	Modal_value	Modal_Year	Std.Dev
BRITISH VIRGIN ISLANDS	2,290	88.077	298	2008	100.590
SEYCHELLES	625	24.038	133	2013	39.099
SAMOA	363	13.962	68	2007	20.931
BRITISH ANGUILLA	148	5.692	94	2015	18.609
CAYMAN ISLANDS	144	5.538	33	2013	8.851
BERMUDA	69	2.654	12	2003	3.199
PANAMA	13	0.500	3	2007	0.812
NIUE	12	0.462	4	1999	0.905
HONG KONG	9	0.346	3	2013	0.797
NEVADA	9	0.346	2	2005	0.689
BAHAMAS	5	0.192	1	1993	0.402
SAINT KITTS AND NEVIS	2	0.077	1	2009	0.272
BARBADOS	1	0.038	1	2016	0.196
BELIZE	1	0.038	1	2014	0.196
CHINA	1	0.038	1	1999	0.196
ISLE OF MAN	1	0.038	1	2006	0.196

Appendix 8: Linear regression results (China, incorporations)

Linear regression (China, incorporations), all years (1990-2016)

	Dependent variable:		
	Incorporations per year		
	British Virgin Islands	Cayman Islands	Seychelles
	(1)	(2)	(3)
TIEA	59.910	10.724**	36.765**
	(43.714)	(3.926)	(14.639)
Intercept	71.947***	3.476*	0.000
	(22.682)	(1.722)	(11.837)

TIEA introduced	2010-07-30	2012-07-15	2000-07-17
Observations	26	26	26
R^2	0.073	0.237	0.208
Adjusted R^2	0.034	0.205	0.175
Residual Std. Error (df = 24)	98.869	7.890	35.511
F Statistic (df = 1; 24)	1.878	7.460**	6.307**
Note:			*p<0.1; **p<0.05; ***p<0.01

Appendix 9: Linear regression results (China, inactivations)

Linear regression (China, inactivations), all years (1990-2015)

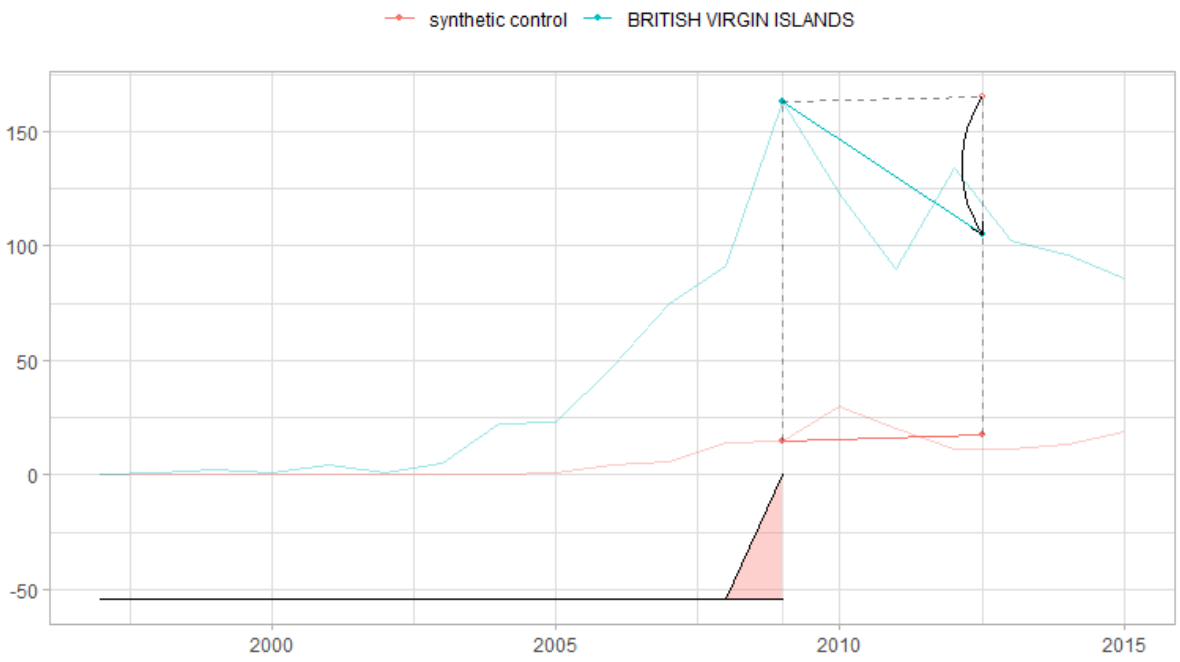
	Dependent variable:	
	Inactivations per year	
	British Virgin Islands	Seychelles
	(1)	(2)
TIEA	71.705***	10.000
	(21.086)	(6.538)
Intercept	33.462**	0.000
	(11.849)	(6.000)
TIEA introduced	2010-07-30	2000-07-17
Observations	19	19
R^2	0.405	0.121
Adjusted R^2	0.370	0.069
Residual Std. Error (df = 17)	42.724	10.392
F Statistic (df = 1; 17)	11.564***	2.339
Note:		*p<0.1; **p<0.05; ***p<0.01

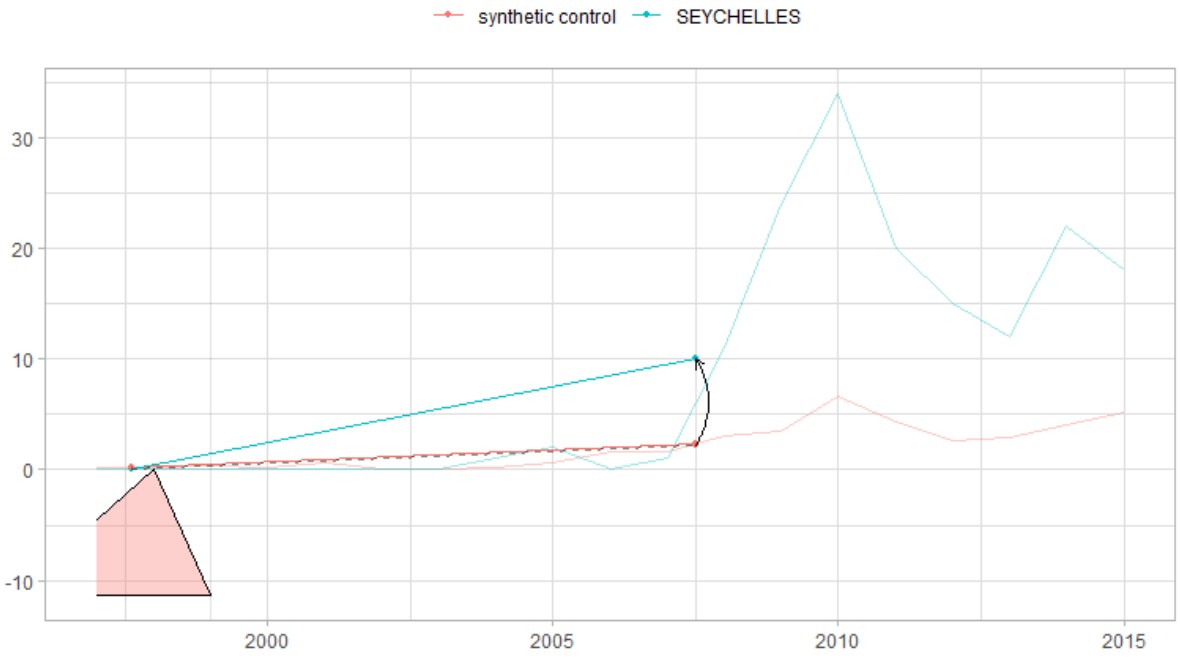
Appendix 10: Synthetic DiD results (China, inactivations)

Synthetic DiD (China), year-by-year inactivations (1990-2015)

Jurisdiction	DiD	Error
BRITISH VIRGIN ISLANDS	-60.167	7.220
SEYCHELLES	7.870	4.755

Appendix 11: Synthetic DiD illustrations (China, inactivations)





List of functions and variables used in the R code

Variables and data frames in the analysis of the U.S.[5]

- full.df – Data frame containing everything extracted from ICIJ
- tiea_dates – List of TIEA dates, for countries having TIEA with the U.S.
- usa.df, usa.df2 – All entities connected to the U.S. (incorporations and inactivations)
- count.entities, count.entities2 – Count for incorporation dates of entities
- inact_count.entities – Count for inactivation dates of entities
- over.100, namelist, inact_over.100, inact_namelist – List of jurisdictions with over 100 observations
- all_jur – List of all the jurisdictions found in our data
- yes_tiea – List of countries found in our data that have TIEAs with the U.S.
- no_tiea – List of countries found in our data that do not have TIEAs with the U.S.
- source.df, des_stats – Tables used for descriptive statistics
- all, all.monthly, all.inact – List of all the data frames for each jurisdiction

Functions

- clean_table1 – Extracts and cleans table for TIEA dates from the text in pdf file
- jur_df, jur_df_monthly – Creates data frame for each jurisdiction (yearly and monthly)
- count.data – Creates count for incorporation and inactivation dates
- control – Creates panel control dataset for a given list of jurisdictions
- get.plot.data – Creates data frame for plot
- bar.graph – Creates bar plot for individual jurisdictions

[5] All the above variables and data frames (with the added suffix *_chn*) have also been used for the analysis on China.