

What determines tax havens? A historical investigation of tax haven factors

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ABSTRACT

This paper analyses the determining factors of tax haven status by investigating the factors from a historical perspective. Initially, we use tax variables, governance variables and a communication indicator to check if these factors can distinguish tax haven countries from non-tax havens, based on two data sets in 2006 and 2018. We apply principal component analysis combined with Welch's t-test and logit model analysis. We find that collectively, the historical tax haven factors are outdated for 2018 data. Individually, historical tax haven criteria are not significant in explaining tax haven status, and alternative criteria and variables, such as the financial secrecy score, are required.

JEL Classifications: F5; A14; C50; H2.

Keywords: historical criteria; tax havens; principal component analysis; Welch's t-test; logit models.

1. INTRODUCTION

Tax havens are low-tax countries or jurisdictions that investors use for tax avoidance from their home authority. They are understood a part of global finance for businesses and illicit money flows to take advantage of. Tax haven countries with more foreign capital tend to invest in their business infrastructure and facilities, creating a conducive legal environment to attract further foreign investment. This, in turn, boosts their economic growth, which has been seen in the past (Hines 2005). Tax havens have experienced a resurgence in the public eye with disdain and scrutiny in recent years due to data leaks such as the Panama Papers. These leaks disclosed tax avoidance by high-profile individuals, such as national leaders, who took advantage of anonymity and tax avoidance and the financial trials of illicit activities (ICIJ 2016; ICIJ 2021).

For the non-tax haven countries, it is also well recognised that the foregone tax revenue loss to tax havens is significant. The practice of tax avoidance results in a loss of tax revenue, contributing to increasing budget deficits and

public debt. According to the International Monetary Fund (IMF 2022), many countries were already struggling to adhere to their national and supranational fiscal rules and policies before the COVID-19 pandemic, and the pandemic exacerbated the situation, leading to a significant increase in deviation from the countries' fiscal rule limits or anchor levels. In 2020, 90 per cent of countries had deficits larger than the rule limits, and public debt exceeded the rule limits in over half of countries (IMF 2022). While the economies have been dealing with enormous challenges adhering to their fiscal rule limits, the losses to OECD tax havens accounted for approximately \$483 billion per year in foregone taxes, enough to fully vaccinate the global population over three times (Mansour 2021). The IMF (2022) further states that it would be difficult for many countries to return to their debt limits.

Studying tax havens, particularly the historical determinants and evolved factors in defining countries as tax havens, is still of the utmost importance. By elucidating contemporary determining factors, the studies in this area will facilitate policy implications and, ultimately, contribute to reducing forgone tax revenue losses and mitigating the public debt burden of the countries. Furthermore, by addressing the loopholes exploited by wealthier individuals and entities, such studies would contribute to narrowing tax disparities.

Studies of the determinants of tax haven status is not new to the literature. Commonly cited factors defining tax haven countries include small size, lower tax regimes, smaller population, and higher affluence compared to others. Older sources of literature, such as Hines and Rice (1994), collected a list of tax havens from a few sources and examined the historical tax haven factors. Much of the new literature relies on these papers, refining the criteria, such as communication indicators (Dharmapala and Hines 2009) and governance variables (Kaufmann and Kraay 2023). Another strand of literature focuses on identifying tax havens by comparing economic variables between tax haven and non-tax haven countries, often using logit/probit models to test the significance of these variables in determining tax haven status. Then, the recent literature shows the rising dominance of multinational corporations (MNCs) and world trade volumes (Desai *et al* 2006a). With more technological advancement, communication infrastructure is also used as a critical factor for a tax haven (Gonzalez 2017). In the earlier literature, the tax factors are used as the most important; however, later studies, such as Dharmapala and Hines (2009), found them insignificant.

Despite these efforts, the determining factors of being a tax haven remain understudied, with notable limitations in historical evaluation. This paper contributes to the literature in three ways. First, most empirical legal studies examine the economic factors that are associated with tax havens, such as Hines and Rice (1994) and Dharmapala and Hines (2009), within a fixed period. As the world is changing rapidly, the factors proposed in the literature may not be valid any more. Therefore, we shift the focus to examine the factors from a historical view, which is understudied. Second, studying economic factors

individually or collectively is not adequate to fit the complicated real-world situation. Therefore, we also contribute by proposing financial secrecy scores that combine different dimensional indicators, such as legal transparency, ownership registration, international standards, *etc.* This is also done through a historical comparison, which shows the changes over the past two decades. Last, we initiate the search for appropriate criteria to determine recent tax haven status based on logit models.

Our empirical analysis uses cross-sectional data covering 98 countries for 2006 and 2018, respectively. Principal Component Analysis (PCA) is used to produce a cohesive tax haven score/index, summarising all the variables we use to represent the historical tax haven criteria. We then compare the PCA scores to analyse the difference between 2006 and 2018 tax havens. Following this, we jointly compare the PCA scores between tax havens and non-tax havens based on Welch's *t*-tests on each data set individually. Then we apply the logit models to analyse the effect of the explanatory variables on the likelihood of a country or jurisdiction being a tax haven, including the addition of newly researched variables that 2006 data was unable to use for determining tax haven status.

The rest of the paper is organised as follows. This paper begins with a literature review in Section 2, followed by the Methodology in Section 3 where we explain the PCA, Welch's *t*-test and binary regressions (logit models). Section 4 describes the sample selection and data sources, while Section 5 presents and analyses all the empirical results and applies a robustness check. We then conclude our research in Section 6.

2. LITERATURE REVIEW

Two different groups are trying to determine tax havens, namely, organisations such as the OECD, and academic studies, that are seeking to address and classify the factors that define tax havens. All the studies and reports published by organisations, and academics used different methods and have different focus points while addressing the factors that define tax havens. As this study is academic in nature, it aligns with the latter category, contributing to the literature on this aspect.

In terms of tax haven factors, there is no consensus on what factors define tax havens. In 1998, the OECD used the following factors to define a tax haven – little to no real taxes for non-residents, laws which prevent the effective exchange of information with other governments, lack of transparency, and no substantial corporate activity required for the use of tax incentives (OECD 1998). In contrast, earlier literature like Harris *et al* (1993) and Hines and Rice (1994) identify additional factors, some of which overlap with those recognised by the OECD, while others differ. These studies address several factors that determine tax haven status, including low corporate or personal tax rates, legislation that supports banking and business secrecy, advanced communications facilities, and self-promotion as an offshore financial centre.

From the above analysis, we can see tax is an important factor. Many studies examine the tax and profitability of corporations affiliated with different jurisdictions, such as Harris *et al* (1993), who find that U.S. corporations with tax haven affiliates experienced significantly lower U.S. tax liabilities than those without such affiliations, from 1984 to 1988. Hines and Rice (1994) examine the profitability of U.S.-owned affiliates in 59 countries against their productive inputs and local tax rates, opening the research area to identify the tax haven jurisdictions.

Besides that, communication infrastructure has also been addressed as a critical factor for a country or territory to become a tax haven. Dharmapala and Hines (2009) use Telephone lines (per 1,000 people) as a measure of advanced communications. Gonzalez (2017) has adopted a more advanced communications facility in recent years as the use of the internet for communications has become dominant over landline calls. Therefore, internet security has become a staple for advanced communications. Agrawal (2021) applies distance data, local internet data, state internet data and Nexus data to measure the impact of the internet on tax havens. The local and national data are measured by fixed broadband subscriptions, as this is a more advanced communications facility than Telephone lines (per 1,000 people).

Another historical tax haven attribute is self-promotion as an Offshore Financial Centre (OFC). The OECD and G20 create the Base Erosion and Profit Shifting (BEPS) project to tackle tax avoidance (OECD 2013). Additionally, after the exposure of the Panama and Pandora papers in recent years, the subject of tax havens has become heavily scrutinised. Because of these issues, it is extremely rare for a jurisdiction to actively promote the use of its tax system for tax avoidance (Chohan 2016; ICIJ 2016; ICIJ 2021).

In modern literature, it is very common that tax haven factors are modified, such as Clausing's (2020) that examines profit shifting with tax havens and simply classifies a tax haven as all countries with less than ten per cent effective tax rates. Additionally, recent empirical studies, such as Crivelli *et al* (2016), use a tax haven list compiled by Gravelle (2013) based on their incomes. In contrast, Janksy's (2020) paper uses the more recent listing, including Gravelle (2015), UNCTAD (2015), Janksy and Kokes (2015) and Johannesen and Zucman (2014). In this case, Janksy has not necessarily modified an existing list but combined a collection of lists of the time. Further academic literature uses the OECD's lists from the 'Harmful Tax Practices' reports. Hampton and Christensen (2002) refer to the subsequent second report of the OECD (2000), which identifies 35 'tax havens' having involvement in Harmful Tax Practices for their discussion on tax havens; this is similar to Hishikawa's (2002) paper which discusses tax havens perceptions of being outlaw countries with small populations that promote illicit activities.

There are many perceptions of a tax haven that have evolved. The popular view within the literature is that they are outlaw countries with small populations that disregard international normality and promote the use of

illicit activities (Hampton and Christensen 2002; Hishikawa 2002; Diamond and Diamond 2004; and Kudrle and Eden 2005). Recent literature shows the rising dominance of MNCs and world trade volumes (Desai et al 2006a). There are many shifts in the factors in the literature. However, many studies focusing on a static period analysis (Hines and Rice 1994; Dharmapala and Hines 2009) are not sufficient any more, as the world and studies are changing rapidly. Therefore, we contribute to the literature by providing a historical view of the factors. It could also shed light on future research using panel data analysis.

Besides the quantitative factors, there are also qualitative factors, such as legislation supporting banking and business, looking at the quality of governance (Hampton and Christensen 2002; Slemrod 2004; Kenny and Winer 2006; Hines 2007; Dharmapala and Hines 2009). Hampton and Christensen (2002) and Dharmapala and Hines (2009) observe that tax havens have high political stability and are well-governed, reporting a well-governed country would receive a larger total FDI to total GDP ratio in reducing its tax rates than that of a poorly governed country. This suggests that well-governed countries have a higher incentive to become tax havens than poorly governed countries. It follows Diamond and Diamond's (2004) report that a strong government is a highly weighted attribute for tax havens, as it can be associated with additional attributes such as government cooperation, double taxation treaties and political and economic stability. Additionally, Dharmapala (2008) analyses the effect that governance has in characterising tax havens and finds that tax havens tend to have stronger governance when compared to non-havens, which is developed later in Dharmapala and Hines (2009), where it is found that it is more often jurisdictions with stronger governance that become tax havens. Kaufmann and Kraay (2023) look at six dimensions of governance that aggregate the views of large enterprises, citizens and experts: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, the rule of law and control of corruption.

Other qualitative-related factors, such as financial secrecy, play an important role in the usage of tax havens. The financial secrecy score, conceived in 2007 and published every two years since 2009, is a ranking of jurisdictions most complicit in helping individuals hide their finances from the rule of law. A secrecy score is calculated by 20 Key Financial Secrecy Indicators (KFSI), including rules on transparency on ownership of companies, trusts and foundations, public access to annual accounts, and compliance with anti-money laundering standards, many of which are qualitative factors. The perception of illicit activities utilising these attributes still stands (Soviana 2015; Radu 2016). This is likely why the OECD's (2015) harmful tax practices progress report looked to implement a new framework for improving transparency to help tackle the continuing problem of financial secrecy.

Recent literature by Flystveit and Øyna (2020), Sharafutdinova and Lokshin (2020), and Kusumadewi and Kristanto (2022) suggest that financial secrecy is a determinant for a country or jurisdiction being a tax haven and can be

closely connected to the original variable of legislation supporting banking and business. The Panama and Pandora data leaks have only raised the importance of financial secrecy variables for researchers and policymakers. In attempts to tackle the tax fairness disparity this causes and, in turn, aid in the classification of tax havens and subsequent policy implementation to reduce the issue that tax havens cause on tax fairness. Additionally uncovered was an array of illicit money streams, which were only possible due to low financial transparency in these jurisdictions. This is where financial secrecy variables would benefit in the classification methods as they can specifically help tackle these jurisdictions with low financial transparency that are facilitating illicit money streams by both publicising that they facilitate this as well as helping target policy change to reduce this ability.

Although there are efforts to include financial secrecy scores in determining tax haven status, this remains a gap. Flystveit and Øyna (2020) did not directly examine the impact of the financial secrecy score. Instead, they used a governance index and found no significant relationship with tax haven status. Sharafutdinova and Lokshin (2020) and Kusumadewi and Kristanto (2022) did not apply any proper models.

Therefore, there is a need for a composite index to determine tax haven status. Simply studying economic factors individually or collectively is not adequate to fit the complicated real-world situation. We contribute to the literature by providing an empirical analysis that examines the role of the financial secrecy score, which combines 20 different dimensional indicators, such as legal transparency, ownership registration, international standards, etc. This is also done by using a historical comparison, which shows the changes during the past two decades.

In terms of the tax haven factors, we proposed three groups of variables based on the review above. The first of these factors is low corporate or personal tax rates. For legislation supporting banking and business, we have used data from Kaufmann and Kraay (2023) covering a wide range of governance variables: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, the rule of law and control of corruption. Although independently important, we have used all six variables in our analysis to ensure a cohesive outlook on the governance of countries and territories. For advanced communications facilities, we use fixed broadband subscriptions available from the World Bank. The final historical tax haven variable being tested is self-promotion as an Offshore Financial Centre (OFC). Data for this variable is minimal due to the international pressures of tackling loopholes in the international tax system. As a result, this historical tax haven variable has been left out of this report due to data collection issues. Outside of these nine variables, we additionally investigate a newly released variable, the financial secrecy score produced by Tax Justice Network (2022), which produces a cohesive secrecy score formed from 20 indicators that can be broadly grouped into the following dimensions mentioned above. In cohesion,

the financial secrecy score produces a score between zero and 100, where zero presents no scope for financial secrecy, and 100 presents unrestrained scope.

3. METHODOLOGY

To evaluate how well the historical factors related to tax havens, we first construct an overall score to measure the degree of the haven factors from all the nine variables for both 2006 and 2018, including corporate tax rate, personal income tax rate, voice and accountability, political stability, government effectiveness, regulatory quality, the rule of law, control of corruption and fixed broadband subscriptions. Then we compare PCA scores individually to see the difference between 2006 and 2018. We use these scores to calculate Welch's *t*-statistics to test if tax havens are jointly significantly different from non-tax havens. Finally, we apply the logit models to search for the best criteria to identify tax havens in 2018. We also calculate the correlation coefficients to support logit models to avoid potentially strong multicollinearities.

3.1. Principal Component Analysis (PCA)

As we have nine historical variables collected, it is impossible to compare each across tax and non-tax havens. PCA is an appropriate method to summarise all variables into scores that can be easily processed and visualised while maintaining the data's originality. The summarising scores are called principal components. The first component explains the most variation, the second component the second most, *etc.* In our analysis, we need an overall score to represent all the historical criteria. Therefore, we only select the first principal component, which indicates most of the data information.

The PCA is an old method of multivariate linear analysis, which was first proposed by Pearson (1901) and developed by Hotelling (1933). Similar to the regression analysis, PCA finds lines in the multi-dimensional space that approximate the original data as closely as possible. There are many advantages of PCA, including reducing the data dimensions used in the regressions. PCA is also a useful technique that enables the dataset's analysis, which may include missing values, multicollinearity, categorical data, imprecise measurements, *etc.*

After we have the PCA scores, we can test if the historical attributes can distinguish tax and non-tax haven countries. This can be done by Welch's *t*-test, which was developed by Welch (1947). As we have different sample sizes for tax and non-tax havens, Welch's *t*-test is more reliable when applied to two unequal sample sizes and unequal variances. Compared with the commonly used student's *t*-test, Welch's *t*-test allows for unequal population variances rather than equal variances in the student *t*-test.

Our aim is to test the null hypothesis that PCA scores between tax havens and non-tax havens are equal on average. If the absolute value of *t*-statistics is higher than the critical value of *t*-distribution, we reject the null hypothesis, which implies the nine historical criteria in tax havens cannot produce the same

mean as the non-tax havens. Therefore, historical attributes can distinguish tax and non-tax haven countries. Therefore, if we reject the null hypothesis, using these factors is adequate to identify tax havens and vice versa.

In this paper, we calculate Welch's t -statistics by the equation as follows,

$$t = \frac{\overline{PCA}_{tax} - \overline{PCA}_{ntax}}{\sqrt{s_{\overline{PCA}_{tax}}^2 + s_{\overline{PCA}_{ntax}}^2}} \quad (1)$$

where \overline{PCA}_{tax} and \overline{PCA}_{ntax} are the sample means of PCA scores for tax havens and non-tax havens, respectively. $s_{\overline{PCA}_{tax}}^2$ and $s_{\overline{PCA}_{ntax}}^2$ are the corrected sample standard deviation, normalised by sample size (N_{ntax}) as follows,

$$s_{\overline{PCA}_{tax}}^2 = \frac{s_{tax}^2}{N_{tax}} \text{ and } s_{\overline{PCA}_{ntax}}^2 = \frac{s_{ntax}^2}{N_{ntax}} \quad (2)$$

The t -statistics approximately follow t -distribution with the degrees of freedom (d.o.f) defined by the following formula:

$$d.o.f = \frac{(\frac{s_{tax}^2}{N_{tax}} + \frac{s_{ntax}^2}{N_{ntax}})^2}{\frac{s_{tax}^4}{N_{tax}(N_{tax} - 1)} + \frac{s_{ntax}^4}{N_{ntax}(N_{ntax} - 1)}} \quad (3)$$

3.2. Binary regression

Based on the t -test above, we shall see if the historical nine factors can still explain the tax haven status in 2018 using those 2018 variables. If not, we will apply the logit model to search for the best factor to determine the relevant recent tax haven status.

3.2.1. Modelling principles

The logit model used in this analysis has commonly been used within literature where the dependent variable is binary (Desai *et al* 2006a; Desai *et al* 2006b; Dischinger and Riedel 2011). As our dependent variable is binary, the logit model is an appropriate method to be used.

The logit model estimates the probability that the presence or movement of an explanatory variable can have the likelihood of the dependent variable equaling one. This removes the issues that a standard linear regression model would have when the dependent variable is binary, this being that linear regressions provide a continuous output. Additionally, binary dependent variables result in the violation of heteroskedasticity, which is one of the OLS assumptions, whereas logistic models do not have this assumption and are therefore better suited to binary dependent variables (Gomila 2021). The logit model is based upon the cumulative distribution function for the logistic distribution, calculated using the following equation [4], where the logistic regression models the probability

of an outcome based on given explanatory variables due to probability being a ratio, what will be modelled is the logarithm of the probability (Rai 2020):

$$\text{Log} \left(\frac{p(y)}{1-p(y)} \right) = \text{Logit}(p(x)) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots + \beta_i X_i \quad (4)$$

where $p(y)$ indicates the probability of an event, β_i refers to regression coefficients for each explanatory variable denoted as X_i . This is often referred to as the logit.

$$p(y) = \frac{e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots + \beta_i X_i}}{1 + e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \dots + \beta_i X_i}} \quad (5)$$

Transformation to make $p(y)$ the subject provides the probability of an event, $p(y)$, given the explanatory variables. β_i has meaningful interpretations where e^{β_i} is the odds ratio for a one-unit difference in X_i . The logit model additionally provides the McFadden (Pseudo-) R-Squared value, which originated from McFadden's earlier (1974) paper and denoted a value similar to the R-Squared values that are given in linear regression models (Miles 2005), where the value lies between zero and one. It is calculated by the ratio of the likelihood function for a model with no predictors and the likelihood function for the specified model (Allison 2014). The goodness-of-fit tests in Hosmer and Lemeshow (1980) were also undertaken to see how well the model works for the data.

3.2.2. Our application of models

Initially, we run a logit model with PCA scores constructed from the nine criteria (Model 1), including corporate tax rate, personal income tax rate, voice and accountability, political stability, government effectiveness, regulatory quality, the rule of law, control of corruption and fixed broadband subscriptions. Model 2 estimates another logit model with PCA scores calculated from the ten criteria, including also the financial secrecy score. Comparing Model 1 and Model 2 will enable us to see if the financial secrecy variable is important.

As the coefficients of PCA scores are difficult to interpret, we add an analysis of individual variables to the logit models. In Model 3, we only use the financial secrecy score in the regression. We then proceed with the individual criteria by selecting one from each group, considering the potential multicollinearities between the governance variables (Model 4, 5, 6).

3.2.3. Selection of control variables in the logit models

Control variables are also required within our empirical analysis using logit models. Therefore, we add controls to represent the underlying economy and characteristics that countries or jurisdictions have, which do not directly interfere with the tax haven variables being tested.

The first control variable⁴ used in this paper is GDP per capita as the indicator for economic growth. Acemoglu *et al* (2001) and Temple and Woessmann (2006) found GDP per capita (Current US\$) to be a valid indicator for economic growth, with it additionally having been used within alternative tax haven

literature such as Rose and Spiegel (2007). The second control variable is the total population, obtained and used within the tax haven literature, such as Rose and Spiegel (2007), Dharmapala and Hines (2009) and Hines (2010). The final control variable used is whether the country or jurisdiction is an island, represented in dummy variable form with 1 = island and 0 = not an island. Previous tax haven literature has used island dummy variables within their control variables, such as Rose and Spiegel (2007) and Dharmapala and Hines (2009).

4. DATA

4.1. Sample selection: tax haven status

There is no commonly recognised list of tax havens, however, it mainly reflects two ways of defining tax havens. First, tax havens are defined by organisations such as the OECD, which uses lower taxes and additional factors, such as favourable laws and measures that benefit investors in evading or avoiding the tax laws and regulations of other jurisdictions. Given this, tax havens often have laws and regulations specifically designed to appeal to individuals and corporations. This marked the creation of the 'Harmful Tax Practices' report by the OECD's Committee on Fiscal Affairs, which provides updated attributes on defining a jurisdiction as a tax haven, additionally specifying current tax havens at the time of the reports. In addition, frequent progress reports identify definition changes and jurisdictions that are not compliant and need to act, or have shown substantial improvements to no longer be considered a tax haven. Second, there are academic studies related to the classifications of tax havens, such as Hines and Rice (1994), who define/combine a list of tax havens from three different sources. Many studies later adopted this list for their studies. However, Dharmapala and Hines (2009) use the OECD (2000) list, given the consistency of the results.

Table 1 displays a collection of countries and jurisdictions that were considered tax havens in 2006 and 2018. The total sample, including non-havens, is 98, with complete data available for 2006 and 2018. It should be noted that initially, we collected all 160 countries. However, given data availability issues with some variables, we have had to reduce the sample to ensure both the 2006 and 2018 data match.

The two data sets, 2006 and 2018, are selected for several reasons. The first is that the collection of older literature that classifies tax havens is around this year, these being OECD (2000), Diamond and Diamond (2004) and Dharmapala and Hines (2009). The second is that of the datasets associated with this period, 2006 provided the complete dataset. The selection for the comparator, 2018, is because of the COVID-19 pandemic, given which data collection and publication have experienced reporting lags, and the pandemic also caused disparate data, which causes pitfalls in otherwise standardised approaches (Badker *et al* 2021). Therefore, 2018 was the last year of undisturbed data before COVID-19. Additionally, the financial secrecy score is a newly published

variable with just 2018, 2020, and 2022 data available. Therefore 2018 is the newest dataset to use, which is undisturbed by COVID-19 data limitations whilst being able to use the financial secrecy score. From this, we concluded that access to a larger sample size would be more beneficial to the integrity and reliability of the results than using the more recent 2020 and 2022 reports, which have a smaller sample size and have been disrupted by the COVID-19 data.

Our tax haven dummy variable is defined as equaling one if the jurisdiction is identified as a tax haven and equaling zero for non-havens. Table 1 shows

Table 1: List of Tax Havens

<i>Country</i>	<i>2006</i>	<i>2018</i>	<i>Country</i>	<i>2006</i>	<i>2018</i>	<i>Country</i>	<i>2006</i>	<i>2018</i>
Afghanistan	0	0	Greece	1	0	Panama	1	1
Angola	0	0	Hungary	0	0	Peru	0	0
Aruba	1	0	Iceland	0	0	Philippines	1	0
Australia	0	0	India	0	0	Poland	0	0
Austria	0	0	Indonesia	0	0	Portugal	0	0
Azerbaijan	0	0	Iraq	0	0	Qatar	0	0
Bahrain	1	1	Ireland	1	0	Romania	0	0
Barbados	1	1	Israel	0	0	Rwanda	0	0
Belarus	0	0	Italy	0	0	Samoa	1	1
Belgium	0	0	Japan	0	0	Saudi Arabia	0	0
Bolivia	0	0	Jordan	1	0	Senegal	0	0
Botswana	0	0	Kazakhstan	0	0	Serbia	0	0
Brazil	0	0	Kuwait	0	0	Seychelles	1	0
Cameroon	0	0	Latvia	0	0	Singapore	1	0
Canada	0	0	Lebanon	1	0	Slovenia	0	0
Chile	0	0	Liechtenstein	1	0	South Africa	0	0
China	0	0	Lithuania	0	0	Spain	0	0
Colombia	0	0	Luxembourg	1	0	Sri Lanka	0	0
Costa Rica	1	0	Madagascar	0	0	Sudan	0	0
Croatia	0	0	Malaysia	1	0	Sweden	0	0
Cyprus	1	0	Malta	1	0	Switzerland	1	0
Denmark	0	0	Mauritania	0	0	Thailand	0	0
Dominican Republic	0	0	Mexico	0	0	Trinidad and Tobago	0	1
Ecuador	0	0	Moldova	0	0	Tunisia	0	1
Equatorial Guinea	0	0	Mongolia	0	1	Ukraine	0	0
Estonia	0	0	Morocco	0	0	United Arab Emirates	0	1
Fiji	0	0	Mozambique	0	0	United Kingdom	1	0
Finland	0	0	Namibia	0	1	United States	0	0
France	0	0	Netherlands	1	0	Uruguay	0	0
Gabon	0	0	New Zealand	0	0	Uzbekistan	0	0
Georgia	0	0	Norway	0	0	Vietnam	0	0
Germany	0	0	Oman	1	0	Zimbabwe	0	0
Ghana	0	0	Pakistan	0	0			

that the majority of the countries retained the same status in both the 2006 and 2018 data. There are more changes from tax havens to non-tax havens than the opposite. Some countries that were identified as tax havens in 2006 were not any more in 2018, such as Aruba, Cyprus, Jordan, *etc.* Some countries that used to be non-tax havens, such as Mongolia, Namibia and the United Arab Emirates, have become tax havens in 2018. It should be noted that this paper does not focus on the identification of tax havens in the first place. We take the tax haven status as given and investigate the factors that can determine this tax haven status.

4.2. Data sources

There are three types of data used in this research: tax haven status, tax haven indicators and control variables for the logit models. Firstly, we define 2006 tax haven status based on the listing around 2006, including the OECD (2000), Diamond and Diamond (2004) and Dharmapala and Hines (2009). The 2018 tax status is defined according to the EU list of non-cooperative countries and jurisdictions for tax purposes (Council of the European Union 2017), which is also known as the European Union tax haven blacklist. This list implements the OECD standard, namely BEPS (the Base Erosion and Profit Shifting). Please note that the tax haven lists in this paper are not the only lists available. To be consistent with the main EU standard, we have to choose the most consistent lists.⁵

Secondly, the tax variables, including corporate and personal tax rates, are collected from Trading Economics. All the governance variables, including voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, the rule of law, and control of corruption, originated from the World Bank under The Worldwide Governance Indicators (WGI) project by Kaufmann and Kraay (2023). The communication variable measured by fixed broadband subscriptions (per 100 people) is collected from the World Bank. The additional financial secrecy score is available from the Tax Justice Network (2022). Lastly, the control variables, including GDP per capita and total population, are collected from the World Bank, while the island dummy is available from the United Nations (2020).

5. EMPIRICAL ANALYSIS

5.1. Summary statistics

Table 2 shows summary statistics of tax haven variables and the control variables for both tax havens and non-tax havens. The total sample is 98, covering 22 tax haven countries in 2006 but only nine in 2018. Across the two tax variables (corporate income tax rate and personal income tax rate), they all present a higher mean than that of non-havens, for both 2006 and 2018. The gap in corporate tax rate between tax havens and non-tax havens in 2006 is larger than that in 2018, while personal income tax exhibits the opposite. The gaps between all governance variables are much larger in 2006 than in

Table 2: Descriptive statistics

	2006: Tax haven (= 1)				2006: Non-haven (= 0)					
	Mean	Max	Min	S.D.	Obs.	Mean	Max	Min	S.D.	Obs.
Corporate tax rate (%)	23.68	40.00	0.00	11.09	22	28.29	55.00	0.00	8.42	76
Personal income tax rate (%)	29.07	60.10	0.00	14.84	22	31.62	62.30	0.00	14.48	76
Voice and accountability	0.54	1.55	-1.16	0.89	22	0.07	1.57	-2.07	1.06	76
Political stability	0.54	1.40	-1.80	0.93	22	0.00	1.50	-2.83	0.99	76
Government effectiveness	0.96	2.21	-0.15	0.76	22	0.19	2.22	-1.73	1.01	76
Regulatory quality	0.88	1.84	-0.27	0.68	22	0.19	1.80	-1.93	0.97	76
Rule of law	0.85	1.80	-0.60	0.75	22	0.10	1.98	-1.88	1.05	76
Control of corruption	0.81	2.17	-1.00	0.93	22	0.19	2.46	-1.45	1.08	76
Fixed broadband subscriptions	10.54	31.58	0.00	10.30	22	6.68	31.87	0.00	9.20	76
Island	0.50	1.00	0.00	0.51	22	0.12	1.00	0.00	0.33	76
Log (GDP)	9.67	11.65	7.28	1.21	22	8.67	11.21	5.57	1.52	76
Log (population)	14.55	18.29	10.46	2.14	22	16.41	20.99	12.62	1.63	76
	2018: Tax haven (= 1)				2018: Non-haven (= 0)					
	Mean	Max	Min	S.D.	Obs.	Mean	Max	Min	S.D.	Obs.
Corporate tax rate (%)	21.00	32.00	0.00	12.17	9	23.41	35.00	7.50	6.65	89
Personal income tax rate (%)	22.11	40.00	0.00	15.30	9	31.66	57.30	0.00	14.48	89
Voice and accountability	0.14	1.09	-1.42	0.85	9	0.21	1.70	-1.88	1.02	89
Political stability	0.34	1.17	-0.87	0.74	9	0.09	1.53	-2.76	0.92	89
Government Effectiveness	0.33	1.42	-0.22	0.48	9	0.42	2.22	-1.61	0.95	89
Regulatory quality	0.18	0.93	-0.48	0.42	9	0.42	2.13	-1.64	0.97	89
Rule of law	0.27	0.95	-0.26	0.42	9	0.34	2.07	-1.79	1.02	89
Control of corruption	0.22	1.41	-0.59	0.72	9	0.32	2.21	-1.52	1.09	89
Fixed broadband subscriptions	14.44	31.40	0.86	11.70	9	19.62	45.56	0.04	14.91	89
Island	0.44	1.00	0.00	0.53	9	0.18	1.00	0.00	0.39	89
Log (GDP)	9.28	10.69	8.21	0.91	9	9.35	12.08	6.19	1.39	89
Log (population)	14.49	16.26	12.19	1.40	9	16.33	21.06	10.54	1.87	89

2018. The communication variable, fixed broadband subscriptions, shows the opposite pattern between 2006 and 2018. As these three variables show larger differences than their non-haven counterparts, so the control variables also show large differences. The largest variable is the island variable, with over one standard deviation higher than that of non-havens, which agrees with Dharmapala and Hines (2009). Also, tax havens are more affluent in 2006, with a mean GDP per capita of over 1.1 times the size of non-havens. But in 2018, the GDP of both types of countries are similar. Table 2 also validates some of findings of the previous literature; for example, tax havens have significantly smaller populations than non-havens (Rose and Spiegel 2007; Dharmapala and Hines 2009).

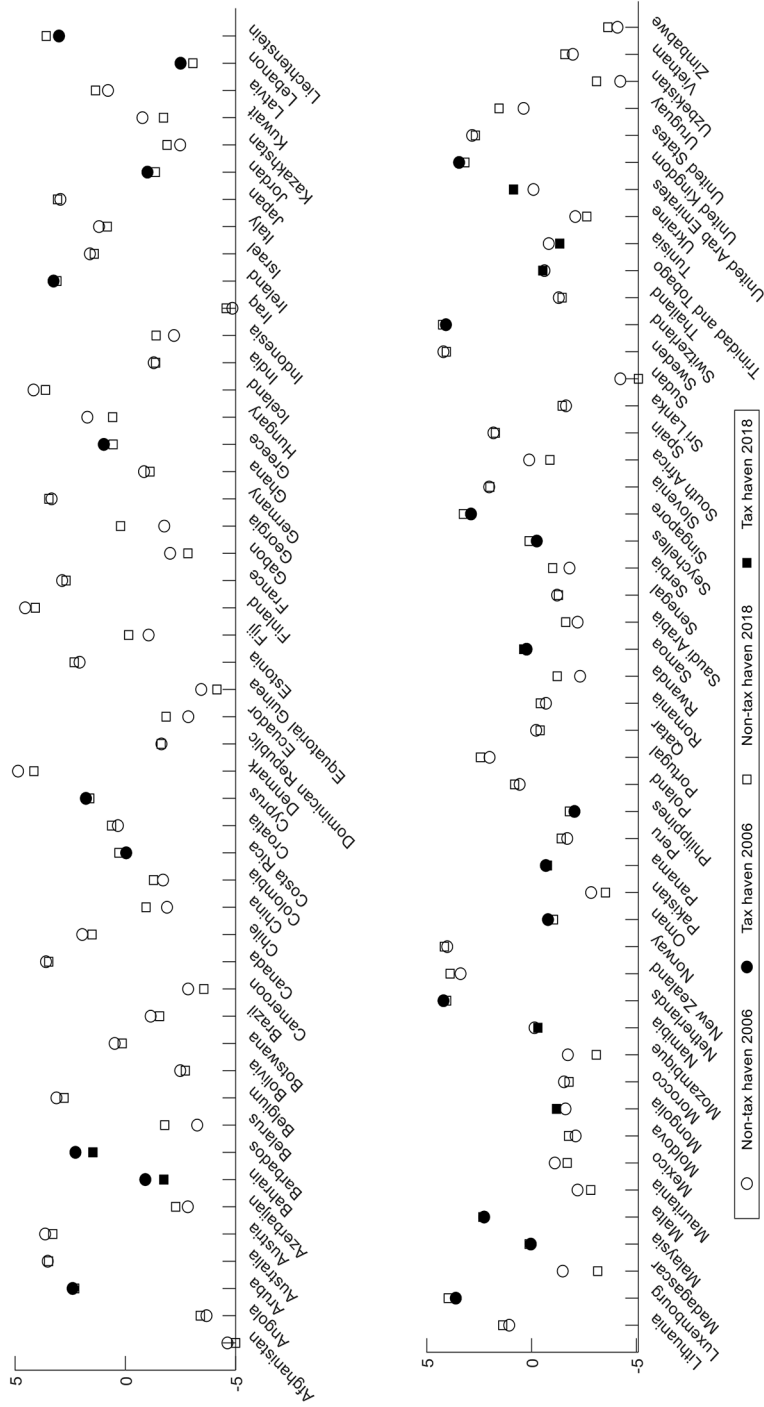
Following these summary statistics, we can see that most explanatory variables show large differences, particularly in 2006: denoting a country as a tax haven cannot be attributed to just the three types of historical tax haven variables when using summary statistics. However, whether these differences overall can be statistically significant in explaining tax havens needs further analysis.

5.2 PCA: a historical comparison of PCA scores between tax and non-tax haven countries

We can see from the summary statistics that there are differences in those indicators between tax havens and non-tax havens. Some variables exhibit larger differences, but others do not. Therefore, we are not able to see the difference jointly. PCA is used to summarise all the variables into one score, which is the best representation of all nine criteria.

Figure 1 presents the difference in PCA scores of individual countries (compare dots with solid squares). Some countries, such as Bahrain, Georgia, and Uruguay, show big gaps between 2006 and 2018, while some countries have similar PCA scores, like Australia, Malaysia, Spain, *etc.* These bigger gaps can be seen in both scenarios: 1) tax haven status in 2006 and 2018 has not changed, and 2) tax haven status in 2006 and 2018 has changed. For example, if we compare the circles (non-tax havens in 2006) with the empty squares (non-tax havens in 2018) of Belarus, we can see that the PCA scores are large even though the tax status has not changed. Therefore, tax factors for some countries in 2006 are not the same as those in 2018. If with the same tax status, it means that the tax factors are incapable of explaining tax haven status in either 2006 or 2018 or even both, which calls for further investigation. Secondly, Figure 1 also shows a clear difference between PCA scores of tax havens and non-tax havens in 2006 but not in 2018. If we focus on 2006, we can also see the PCA scores of tax havens (circles) are relatively larger than non-tax havens (solid dots). However, in the 2018 data, it isn't easy to see this obvious difference. Again, this also implies a statistical method is needed to check if there is a significant difference in the scores between tax havens and non-tax havens.

Figure 1: Individual PCA scores of tax havens and non-tax havens in 2006 and 2018



Note: Figure 1 shows the difference in PCA scores of individual countries (compare dots with squares). Some countries show big gaps between 2006 and 2018, while some countries have similar PCA scores. These bigger gaps can be seen in both scenarios: 1) tax haven status in 2006 and 2018 is not changed and 2) tax haven status in 2006 and 2018 is changed. It also shows a clear difference between PCA scores of tax havens and non-tax havens in 2006 but not in 2018.

As stated above, there are some differences in terms of the PCA scores between tax and non-tax haven countries in 2006 but not in 2018; we can now use Welch’s *t*-test to check if this difference is statistically significant. If there is a significant difference, it means that using the nine traditional criteria can distinguish the tax and non-tax haven countries. This also implies that the nine criteria are still valid, and vice versa. Table 3 presents the results of this difference using Welch’s *t*-test. We can see that tax havens have a larger mean than non-tax havens in 2006, but the opposite is true in 2018. The gap in 2006 is much larger than that in 2018, which confirms the conclusion from Figure 1. The standard deviation in 2006 is quite similar, while non-tax havens vary much more than tax havens in 2018. Overall, Welch’s *t*-test in 2006 rejects the null hypothesis that PCA scores are the same across both years at a one per cent significance level, which implies using the historical nine factors is enough to distinguish tax havens and non-tax havens. However, in 2018, Welch’s *t*-test failed to reject the null hypothesis. It means that if we use the same criteria applied to 2018 data, we cannot find a significant difference between tax and non-tax havens, even at the ten per cent significance level. Therefore, we can conclude that using the nine historical factors can only explain the tax havens in 2006 but not current data, such as 2018.

Table 3: Difference of PCA scores in 2006 and 2018

	2006		2018	
	Tax haven	Non-tax haven	Tax haven	Non-tax haven
Observations	22	76	9	89
Mean	1.196	-0.346	-0.350	0.035
S.D.	2.065	2.500	1.069	2.574
T-statistics	2.934***		-0.858	
d.o.f	41		20	

Note: Significance level indicators are 10% (*), 5% (**) and 1% (***).

5.3. What criteria should be used?

Based on Welch’s *t*-tests above, we understand we cannot use the historical nine factors to explain tax haven status in 2018. Then the question would be what we shall use to determine the current tax haven status. One widespread criterion proposed is the financial secrecy scores used in Flystveit and Øyna (2020), Sharafutdinova and Lokshin (2020), and Kusumadewi and Kristanto (2022). As it is used in recent literature as a variable regarding illicit and secret money streams, that tax havens are known for having. We add it to our empirical analysis to see if it can help determine if the level of financial secrecy is a viable variable for the classifications of tax havens.

5.3.1. Is financial secrecy score important?

Table 4 recalculates the PCA scores with an extra financial secrecy score. Then we compare the difference between tax and non-tax havens in 2018. The PCA scores, on average, this time are very different across the two groups. The gap between the two standard deviations is also greater. Overall, Welch's *t*-statistic is significant at the ten per cent significance level, indicating that a PCA score with financial secrecy scores can capture the difference between the two types of countries. It also implies that using financial secrecy scores is an important measure that cannot be ignored based on more current data.

Table 4: Difference of PCA scores with financial secrecy scores in 2018⁶

	<i>Tax haven</i>	2018	<i>Non-tax haven</i>
Observations	6		61
Mean	-1.098		0.108
S.D.	1.321		2.522
T-statistics		-1.919*	
d.o.f		9	

Note: Significance level indicators are 10% (*), 5% (**) and 1% (***).

5.3.2. What individual factors are still important?

Based on the *t*-test above, we know that collectively the financial secrecy score gains its important role with more recent data. We then proceed with more testing and estimations using logit models to examine the individual factors. Model 1 and Model 2 in Table 5 show the difference in estimating tax haven status on PCA scores between nine factors and ten factors. It shows that all the nine PCA scores cannot significantly determine tax haven status in 2018, even controlling for the island, population and GDP. This confirms the *t*-test results in Section 5.3. When adding financial secrecy scores, PCA becomes significant at the five per cent level. Financial secrecy scores prove to be an important indicator in determining tax haven status in 2018, confirming the conclusion in Section 5.4. There are a few reasons that the original nine factors are not significant any more with more recent data. First, regarding communications, there was a large difference in broadband subscriptions at the beginning of the 2000s. This difference tends to be small in 2018 due to technological advancements. Second, the most widely accepted variable, the corporate tax rate, does not show a clear difference between tax and non-tax havens any more. This could be due to a lower corporate tax gap between the two types of countries. Although originally tax havens were selected due to their preferential tax benefits, low taxation is not enough for a country to be a tax haven with more recent data, consistent with the main finding of Mara (2015). Last, some variables, such as political stability, are in a similar global environment in 2018, which is a year considered to be the turning point and a peaceful and prosperous period.

Table 5: Binary logit models with 2018 data

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>	<i>Model 6</i>
C	6.925	-4.196	-25.380	-11.435	-11.019	-7.570
PCA_9	-0.280					
PCA_10		-0.893**				
Financial secrecy scores			0.278**	0.225*	0.223*	0.250*
Corporate tax rate				-0.098	-0.099	-0.109
Political stability					0.085	0.124
Fixed broadband subscriptions						0.066
Island	0.767	1.796	3.050*	3.064*	3.034*	3.350*
Log (GDP)	-0.056	0.912	0.097	-0.090	-0.500	-1.222
Log (population)	-0.582**	-0.541*	0.074	-0.457	-0.082	-0.063
McFadden R-squared	0.178	0.354	0.502	0.529	0.578	0.580
H-L Statistic	3.556	3.700	1.353	0.893	0.919	1.143
Goodness-of-fit tests	Yes	Yes	Yes	Yes	Yes	Yes

Note: Significance level indicators are 10% (*), 5% (**) and 1% (***). PCA_9 includes all the nine indicators and PCA_10 adds an extra variable of financial secrecy scores.

Although we can see the significance in Model 2, we cannot interpret the coefficients of PCA scores. The disadvantage of PCA is that it is difficult to interpret its original meaning. Then we proceed with Model 3 by regressing tax haven status on financial secrecy scores only, where we found it is significant at the five per cent significance level.

We then select one variable from each group, including tax, governance, and communication variables. Model 4 to Model 6 are only selective and representative examples of logit models with individual variables. Regarding the two tax variables, we select the corporate tax rates as the indicator⁷, as they are more representative in the literature. For the governance variables, GDP has high correlations with almost all of them except voice and accountability, and political stability (see Table 6). To avoid multicollinearity, we then pick political stability as the indicator for governance⁸. Table 6 also shows the pairwise correlation coefficients of all the other variables. For example, all the governance variables have high correlations with each other, which is another reason to simply use one of them. Overall, Table 6 shows that the correlations of the selected variables in Models 4, 5 and 6 are relatively low.

We can see that the results from Model 3 to Model 6 are quite robust in terms of significance. The variable of financial secrecy scores is always significant, varying between 0.223 and 0.278, indicating that the financial secrecy score leads to around 25.0 per cent⁹-32.1 per cent¹⁰ more probability of being a tax haven. This is consistent with Diamond and Diamond (2004) who provide a reference that financial secrecy is still an attribute often associated with tax

Table 6: Correlations of all variables

Corporate tax rate	1.00	0.42	0.32	0.00	-0.05	-0.04	-0.03	0.02	-0.06	-0.01	0.06	-0.12	0.18
Personal income tax rate	0.42	1.00	0.52	0.27	0.39	0.36	0.41	0.40	0.37	-0.34	0.00	0.28	0.12
Voice and accountability	0.32	0.52	1.00	0.65	0.66	0.75	0.73	0.72	0.62	0.10	0.11	0.64	-0.29
Political stability	0.00	0.27	0.65	1.00	0.73	0.69	0.76	0.78	0.61	0.06	0.22	0.67	-0.52
Government effectiveness	-0.05	0.39	0.66	0.73	1.00	0.93	0.96	0.93	0.78	0.11	0.16	0.87	-0.20
Regulatory quality	-0.04	0.36	0.75	0.69	0.93	1.00	0.95	0.91	0.79	0.11	0.15	0.89	-0.20
Rule of law	-0.03	0.41	0.73	0.76	0.96	0.95	1.00	0.95	0.77	0.07	0.16	0.87	-0.27
Control of corruption	0.02	0.40	0.72	0.78	0.93	0.91	0.95	1.00	0.75	0.09	0.19	0.85	-0.31
Fixed broadband subscriptions	-0.06	0.37	0.62	0.61	0.78	0.79	0.77	0.75	1.00	-0.06	0.03	0.86	-0.19
Financial secrecy scores	-0.01	-0.34	0.10	0.06	0.11	0.11	0.07	0.09	-0.06	1.00	0.17	0.19	-0.31
Island	0.06	0.00	0.11	0.22	0.16	0.15	0.16	0.19	0.03	0.17	1.00	0.13	-0.32
Log (GDP)	-0.12	0.28	0.64	0.67	0.87	0.89	0.87	0.85	0.86	0.19	0.13	1.00	-0.32
Log (population)	0.18	0.12	-0.29	-0.52	-0.20	-0.20	-0.27	-0.31	-0.19	-0.31	-0.32	-0.32	1.00

havens within their broad factors list. All other historical factors are no longer significant, possibly a result of the reasons offered above.

In terms of the control variables, the island variable is another significant variable across Model 3 to Model 6. The size of the parameters is quite similar, indicating that being an island will increase the probability of a tax haven by a large amount, which agrees with the existing literature such as Dharmapala (2008) and Hines (2010). This is mainly because island countries normally have a low tax system. However, even if we control the island variable, tax variables are still not significant. There must be another channel that island countries can offer, such as capital gains tax or property tax. The population is not significant when we consider financial secrecy scores individually in Model 3 to Model 6, but it is significant in Models 1 and 2 with overall PCA scores. In Models 1 and 2, the higher the population a country has, the lower the probability it becomes a tax haven. This is consistent with the popular view within the literature that countries with small populations disregard international normalities and promote the use of illicit activities (Hampton and Christensen 2002; Hishikawa 2002; Diamond and Diamond 2004; and Kudrle and Eden 2005). GDP is not significant across all models.

Regarding model fitness, the R-squared figures are reasonable. We also undertake the Hosmer-Lemeshow Goodness-of-Fit test. The H-L statistic follows an approximate Chi-Squared distribution. All of the H-L statistics failed to reject the null hypothesis, indicating that the number of countries which are tax havens (=1) does not significantly differ from those predicted by the model. Therefore, the model is a good fit for the data.

5.5. Robustness checks of 2018 tax haven list

The tax haven list for 2018 discussed above is not the only list. In this subsection, we combined the 2018 list with the top ten tax haven countries defined in Hines (2010), Phillips *et al* (2017) and Zucman *et al* (2018). It should be noted that not all the top 10 countries are included due to data availability of the tax haven factors. Table 7 below shows that the *t*-statics is still insignificant, consistent with Table 3, where using the nine historical factors can only explain the tax havens in 2006 but not the 2018 data.

Table 7: Difference of PCA scores with a robust tax haven list in 2018

	2018	
	<i>Tax haven</i>	<i>Non-tax haven</i>
Observations	14	84
Mean	1.106	-0.018
S.D.	2.212	2.478
<i>T</i> -statistics	1.730	
d.o.f	19	

Note: Significance level indicators are 10% (*), 5% (**) and 1% (***).

5.6. Discussion of findings

Our results show a different pattern of the PCA scores in 2006 and 2018. In the data of 2006, the PCA scores of tax havens are relatively larger than non-tax havens. However, in the 2018 data, it is not easy to see an obvious difference. This is confirmed by Welch's *t*-tests, that using the historical nine factors is enough to distinguish tax havens from non-tax havens in 2006 but not in 2018. Then the question is what factors determine the current tax haven status. We then proceed with six models by investigating the role of the financial secrecy scores based on logit models. Collectively, it shows that Hines and Rice's (1994) historical tax haven factors cannot be used to determine tax havens for 2018 data, even in the logit models. Instead, adding financial secrecy scores is significant for classifying tax havens with more recent data.

Model 2 to Model 6 indicate that movements in these explanatory variables do not result in significant probability changes in the country or jurisdiction being a tax haven. There was, however, significance at the 10 per cent level observed when the financial secrecy score variable was added to the PCA score. We follow this by undertaking logit analyses, which further support the significance of financial secrecy in determining tax havens. This relationship is supported by the OECD's (1998) report, which defined one of the tax haven factors as laws or administrative practices that prevent the effective exchange of relevant information with other governments. Although this variable was not one of the seven primary factors that Diamond and Diamond (2004) denoted, they did, however, provide a reference that financial secrecy is still an attribute often associated with tax havens within their broad factors list. An interesting finding was that corporate income tax was not significant in defining tax havens across all logit models in Table 5. A reason for this could be due to the increase in public distaste for MNCs using tax havens to dodge taxes, pushing less use of tax havens for tax avoidance reasons (Murad 2013) and more towards financial secrecy (Batros 2018). Another potential reason for this is that low corporate income tax has become so saturated and competitive with the range for non-havens found in Table 2 overlapping with tax havens, therefore suggesting that this is no longer a significant determinant in the probability of a jurisdiction being a tax haven. This saturation will only increase from these results due to the Global Corporate Tax Deal, which aims to set a 15 per cent minimum tax rate for MNCs in 136 of the 140 countries of the OECD Inclusive Framework on Base Erosion and Profit Shifting (OECD 2021).

However, there is an alternative factor found to be significantly related to defining tax havens, which is whether the country or jurisdiction was an island or not. Being an island is an advantage to being a tax haven country, which agrees with existing literature such as Dharmapala (2008) and Hines (2010), who found most tax havens are islands. Therefore, although the results show that financial secrecy scores are significant, this does not mean alternative explanatory variables should be disregarded in the probability of a jurisdiction being a tax haven. It does not exclude the possibility of other factors that can

be developed to explain the tax haven status, as there is still room to improve R-squared. However, it is beyond the scope of this paper.

Based on the findings above, there are theoretical implications for the framework of determining tax havens. First, organisations should hold a dynamic view to determine the tax haven status. As the world is changing quickly, many commonly recognised factors may not be important any more, such as corporate tax rates. Second, it is not sufficient to use one or more factors in the model to determine tax havens. Many other indices combine the policy-related factors and other quantitative indicators that turn out to be significant, such as the financial secrecy scores. Therefore, it calls for the need to construct an index using many indicators. By doing so, people can see the difference between countries in terms of the probability of being a tax haven rather than the two categories of tax havens and non-tax havens.

There are also practical policy implications. First, in terms of the international level, there have been concerns over the possible implications of international tax competition created by these tax haven countries. Finding the determinants of tax havens will enable governments to consider international cooperative efforts to preserve their ability to tax mobile business income at an earlier stage. Additionally, following the Panama papers, the OECD and Joint International Taskforce on Shared Intelligence and Collaboration (JITSIC) created an action plan to restore the public's confidence in tax systems, with changes to the rule of law being highlighted (Fitzgibbon 2017). This is being further developed with the Global Corporate Tax Deal, which sets the minimum tax rates to 15% for MNCs from 2023, having been agreed upon by 136 of the 140 countries included in OECD (2021). Second, at the country level, tax havens benefit from attracting a large amount of foreign investment and capital. With a well-funded government, GDP tends to be higher. Non-tax havens are competitors in the financial market. Therefore, it is not enough to know which countries are tax havens. Instead, non-tax countries can learn the difference between them, which can be beneficial to their economy. This research enables policymakers to see the difference between them. Last, in terms of firms and investors, knowing how to determine tax haven status is more critical, affecting their investment decisions, profit and further development. If a firm is looking for an investment plan, they need to know what might be changed in the longer term. As can be seen from the tax haven countries in 2006 and 2018, many of the tax havens in 2006 were not tax havens in 2018. Therefore, learning the important factors of the current situation will greatly impact firms' long-term planning.

6. CONCLUSION

The motivation of this paper is to examine what tax haven factors can determine tax haven from a historical perspective. We begin by providing an overall score for the historical factors using PCA. We then use Welch's *t*-test to compare tax havens against non-havens jointly. Following this, we finish our empirical analysis by testing for the most suitable models, with the addition of financial secrecy scores mentioned in recent literature.

We found that using the nine historical factors can only explain the tax havens in 2006 but not the current data. We then proceed with six models by investigating what factors should be used in six logit models. Collectively, it shows that Hines and Rice's (1994) historical tax haven factors cannot be used to determine tax havens for 2018 data. Instead, adding financial secrecy scores is significant for classifying tax havens. We also find that corporate income tax was not significant in defining tax havens across all logit models, which also calls for the need to evaluate countries frequently. There are other control variables significantly related to defining tax havens, that whether the country or jurisdiction was an island or not. Being an island is an advantage to being a tax haven country, which agrees with existing literature such as Dharmapala (2008) and Hines (2010), who found most tax havens are islands.

There are different implications. Theoretically, organisations should be aware that the factors used need to be updated frequently, as many commonly used factors may not be useful any more. It also calls for the need to construct indices which combine the policy-related factors and other quantitative factors, such as the financial secrecy scores. Practically, in terms of the international level, finding the determinants of tax havens enables governments to consider international cooperative efforts to preserve their ability to tax mobile business income at an earlier stage. Second, at the country level, tax havens benefit from attracting a large amount of foreign investment and capital. Non-tax havens are competitors in the financial market. Therefore, it is not enough to know which countries are tax havens. Instead, non-tax countries can learn the difference between them, which can be beneficial to their economy. Last, it also benefits firms and investors in understanding tax haven status to affect their investment decisions, profit and further development.

A limitation is that the recent data analysis was for only 2018 data; therefore, we cannot know if these results are constant for recent data or just for 2018. Based on our analysis, we can see that for 2018 data, the historical factors cannot collectively be used for the identification of tax havens; however, the financial secrecy score can be seen to be significant at 5 per cent. There was an opportunity to analyse just a couple of the 20 Key Financial Secrecy Indicators (KFSI) that the financial secrecy score is made up of, however, due to the financial secrecy score being a more coherent variable (Tax Justice Network 2022). Additionally, as mentioned above, there is still scope to develop and investigate further those factors that are most relevant to today's situation. We verify empirically a new measure for determining tax havens, similar to the research from the Tax Justice Network's (2007) paper, which concludes that a single definition for tax havens cannot exist because of varying criteria for the type of investors they seek to attract, which agrees with Diamond and Diamond (2004), who created a broader list of factors and state that the weighting of these factors varies from haven to haven.

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ENDNOTES

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4. It should be noted that we also considered other control variables, such as trade openness. However, many remain insignificant. Therefore, we only include the ones most popular in the literature.
5. In Section 5.5, we have performed robustness checks with a new list, which shows the results are robust.
6. Please note that samples are reduced due to the availability of financial secrecy scores.
7. We also applied Model 3 to Model 6 using personal income tax. The results are almost the same as those in Table 5.
8. It should be noted that we also run the same regressions with voice and accountability and find the results are robust.
9. $e^{0.223} - 1 \approx 25.0\%$.
10. $e^{0.278} - 1 \approx 32.1\%$.

REFERENCES

- Acemoglu D, Johnson S and Robinson J (2001) 'The Colonial Origins of Comparative Development: An Empirical Investigation', *American Economic Review*, 91(5), 1369-1401.
- Agrawal D R (2021) 'The Internet as a Tax Haven?', CESifo Working Paper, No. 8924.
- Allison P D (2014) 'Measures of Fit for Logistic Regression' [Online], Pennsylvania: *Statistical Horizons*. Available at: <https://support.sas.com/resources/papers/proceedings14/1485-2014.pdf> [Accessed 6 March 2022].
- Badker R, Miller K, Pardee C, Oppenheim B, Stephenson N, Ash B, Philippsen T, Ngoon C, Savage P, Lam C and Madhav N (2021) 'Challenges in reported COVID-19 data: best practices and recommendations for future epidemics', *BMJ Global Health*, 6(5), e005542.
- Batros B (2018) 'To Tackle Inequality, We Need New Thinking on Tax Havens' [Online], Available at: <https://www.justiceinitiative.org/voices/tackle-inequality-we-need-new-thinking-tax-havens> [Accessed 6 March 2022].
- Chohan U W (2016) 'The Panama Papers and Tax Morality', Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2759418 [Accessed 6 March 2022].
- Clausing K A (2020) 'Profit Shifting Before and After the Tax Cuts and Jobs Act', *National Tax Journal*, 73(4), 1233-1266.

- Crivelli E, de Mooij R A and Keen M (2016) 'Base Erosion, Profit Shifting and Developing Countries' [Online], IMF Working Paper WP/15/118. Available at: <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Base-Erosion-Profit-Shifting-and-Developing-Countries-42973> [Accessed 6 March 2022].
- Desai M A, Foley C F and Hines J R (2006a) 'The demand for tax haven operations', *Journal of Public Economics*, 90(3), 513-531.
- Desai M A, Foley C F and Hines J R (2006b) 'Do tax havens divert economic activity?', *Economic Letters*, 90(2), 219-224.
- Dharmapala D (2008) 'What Problems and Opportunities are Created by Tax Havens?', Working Papers 0820, Oxford University Centre for Business Taxation.
- Dharmapala D and Hines J R (2009) 'Which countries become tax havens?', *Journal of Public Economics*, 93(9-10), 1058-1068.
- Diamond W H and Diamond D B (2004) *Tax Havens of the World*, Newark NJ: LexisNexis.
- Dischinger M and Riedel N (2011) 'Corporate taxes and the location of intangible assets within multinational firms', *Journal of Public Economics*, 95(7-8), 691-707.
- Council of the European Union (2017) 'Taxation: EU list of non-cooperative jurisdictions'. <https://www.consilium.europa.eu/en/policies/eu-list-of-non-cooperative-jurisdictions> [Accessed 22 February 2023].
- Fitzgibbon W (2017) 'Tax Agencies Draw Up 'Target List' of Offshore Enablers' [Online], Washington DC: ICIJ. Available at: <https://www.icij.org/investigations/panama-papers/20170120-oecd-target-list/> [Accessed 6 March 2022].
- Flystveit V and Øyna H (2020) 'The obscure truth about governance quality and tax havens : an empirical analysis of the effect of governance and institutional quality on the nancial secrecy index', Norwegian School of Economics. Available at: <https://openaccess.nhh.no/nhh-xmlui/handle/11250/2735891>
- Gomila R (2021) 'Logistic or linear? Estimating causal effects of experimental treatments on binary outcomes using regression analysis', *Journal of Experimental Psychology: General*, 150(4), 700-709.
- Gonzalez C (2017) 'Improving Security by Using Secure Servers Communicating via Internet with Standalone Secure Software', *International Journal of Computer and Information Engineering*, 11(6), 741-745.
- Gravelle J G (2013) '*Tax Havens: International Tax Avoidance and Evasion*', Congressional Research Service. <http://fas.org/sgp/crs/misc/R40623.pdf> [Accessed 22 February 2023].
- Gravelle J G (2015) '*Tax Havens: International Tax Avoidance and Evasion*', Congressional Research Service. https://digitalcommons.ilr.cornell.edu/key_workplace/1378 [Accessed 22 February 2023].
- Hampton M P and Christensen J (2002) 'Offshore Pariahs? Small Island Economies, Tax Havens, and the Re-configuration of Global Finance', *World Development*, 30(9), 1657-1673.
- Harris D, Morck R, Slemrod J, and Yeung B (1993) 'Income Shifting in U.S. Multinational Corporations'. NBER Chapters, in Giovannini R, Hubbard G, and Slemrod J (eds) *Studies in International Taxation*, Chicago: University of Chicago Press, 277-302.

- Hines J R (2005) 'Do Tax Havens Flourish?' in J M Poterba (ed) *Tax Policy and the Economy*, 19, Cambridge, MA: MIT Press, 65-99.
- Hines J R (2007) 'Corporate Taxation and International Competition'. in Auerbach AJ, Hines J R and Slemrod J eds. *Taxing Corporate Income in the 21st Century*, Cambridge, UK: Cambridge University Press.
- Hines J R Jr (2010) 'Treasure Islands', *Journal of Economic Perspectives*, 24(4), 103-126.
- Hines J R and Rice E (1994) 'Fiscal Paradise: Foreign Tax Havens and American Business', *The Quarterly Journal of Economics*, 109(1), 149-182.
- Hishikawa A (2002) 'The death of tax havens', *Boston College International and Comparative Law Review*, 25, 389-418.
- Hosmer D W and Lemeshow S (1980) 'Goodness of fit tests for the multiple logistic regression model', *Communications in Statistics – Theory and Methods*, 9(10), 1043-1069.
- Hotelling H (1933) 'Analysis of a complex of statistical variables into principal components', *Journal of Educational Psychology*, 24, 417-441.
- ICIJ (2016) 'Panama Papers Source Offers Documents To Governments, Hints At More To Come' [Online]. Washington, D.C.: International Consortium of Investigative Journalists. Available at: <https://www.icij.org/investigations/panama-papers/20160506-john-doe-statement/> [Accessed 6 March 2022].
- ICIJ (2021) An ICIJ 'Investigation: Pandora Papers' [Online]. Washington, D.C.: International Consortium of Investigative Journalists'. Available at: <https://www.icij.org/investigations/pandora-papers/> [Accessed 6 March 2022].
- IMF (2022) 'Fiscal Rules and Fiscal Councils: Recent Trends and Performance during the COVID-19 Pandemic', International Monetary Fund Working Paper, WP/22/11.
- Janský P (2020) 'European banks and tax havens: evidence from country-by-country reporting', *Applied Economics*, 52(54), 5967-5985.
- Janský P and Kokes O (2015) 'Corporate tax base erosion and profit shifting out of the Czech Republic', *Post-communist economies*, 27(4), 537-546.
- Johannesen N and Zucman G (2014) 'The end of bank secrecy? An evaluation of the G20 tax haven crackdown', *American Economic Journal*, 6(1), 65-91.
- Kaufmann D and Kraay A (2023) 'Worldwide Governance Indicators', 2023 Update (www.govindicators.org), Accessed on 10/19/2023.
- Kenny LW and Winer S L (2006) 'Tax Systems in the World: An Empirical Investigation into the Importance of Tax Bases, Administration Costs, Scale and Political Regime', *International Tax and Public Finance*, 13, 181-215.
- Kudrle R T and Eden L (2005) 'Tax havens: Renegade states in the international tax regime?', *Law & Policy*, 27(1), 100-127.
- Kusumadewi C and Kristanto A (2022) 'The Influence of Financial Secrecy and National Culture towards Tax Compliance', *Jurnal AKSI (Akuntansi dan Sistem Informasi)*, 7(1), 19-30.
- McFadden D (1974) 'The measurement of urban travel demand'. *Journal of Public Economics*, 3(4), 303-328.

- Mansour M B (2021) 'Losses to OECD tax havens could vaccinate global population three times over, study reveals'. Tax Justice Network Blog [Online], 16 November 2021. Available at: <https://taxjustice.net/2021/11/16/losses-to-oecd-tax-havens-could-vaccinate-global-population-three-times-over-study-reveals/> [Accessed 6 March 2022].
- Mara E R (2015) 'Determinants of tax havens', *Emerging Markets Queries in Finance and Business*, 32, 1638-1646.
- Miles J (2005) 'R-squared, adjusted R-squared', *Encyclopedia of Statistics in Behavioral Science*.
- Murad A (2013) 'Resisting the tax haven siren song'. BBC Worklife [Online], 2 August 2013. Available at: <https://www.bbc.com/worklife/article/20130801-tax-haven-tango> [Accessed 6 March 2022].
- OECD (1998) 'Harmful Tax Competition: An Emerging Global Issue' [Online]. Paris: OECD Publishing. Available at: <https://www.oecd.org/ctp/harmful/1904176.pdf> [Accessed 6 March 2022].
- OECD (2000) 'Report to the 2000 Ministerial Council Meeting and Recommendations by the Committee on Fiscal Affairs' [Online]. Paris: OECD Publishing. Available at: <https://www.oecd.org/ctp/harmful/2090192.pdf> [Accessed 6 March 2022].
- OECD (2013) 'Action Plan on Base Erosion and Profit Shifting' [Online]. Paris: OECD Publishing. Available at: <https://www.oecd.org/ctp/BEPSActionPlan.pdf> [Accessed 6 March 2022].
- OECD (2015) 'Countering Harmful Tax Practices More Effectively, Taking into Account Transparency and Substance'. Action 5 – 2015 Final Report [Online]. Paris: OECD Publishing. Available at: https://read.oecd-ilibrary.org/taxation/countering-harmful-tax-practices-more-effectively-taking-into-account-transparency-and-substance-action-5-2015-final-report_9789264241190-en#page2 [Accessed 6 March 2022].
- OECD (2021) 'International community strikes a ground-breaking tax deal for the digital age'. [Online]. Available at: <https://www.oecd.org/tax/international-community-strikes-a-ground-breaking-tax-deal-for-the-digital-age.htm> [Accessed 6 March 2022].
- Pearson K (1901) 'On lines and planes of closest fit to systems of points in space', *Philosophical Magazine*, 6(2), no. 11, 559-572.
- Phillips R, Gardner M, Robins A and Surka M (2017) '*Offshore Shell Games 2017*'. Institute on Taxation and Economic Policy.
- Radu M E (2016) 'Perfect Tax Haven Between Myth and Truth', *Knowledge Horizons – Economics*, 8(1), 93-95.
- Rai K (2020) 'The math behind Logistic Regression' [Online]. Available at: <https://medium.com/analytics-vidhya/the-math-behind-logistic-regression-c2f04ca27bca> [Accessed 6 March 2022].
- Rose A K and Spiegel M M (2007) 'Offshore Financial Centres: Parasites or Symbionts?', *The Economic Journal*, 117(523), 1310-1335.
- Sharafutdinova G and Lokshin M M (2020) 'Hide and Protect: A Role of Global Financial Secrecy in Shaping Domestic Institutions'. IDEAS Working Paper Series.
- Slemrod J (2004) 'Are Corporate Tax Rates, Or Countries, Converging?', *Journal of Public Economics*, 88, 1169-1186.

Soviana R (2015) 'Tax haven in tax have country under perspective Islamic law'. Undergraduate Thesis, Universitas Islam Negeri Maulana Malik Ibrahim.

Tax Justice Network (2007) 'Identifying Tax Havens and Offshore Finance Centres' [Online]. Available at: https://www.taxjustice.net/cms/upload/pdf/Identifying_Tax_Havens_Jul_07.pdf [Accessed 6 March 2022].

Tax Justice Network (2022) 'Financial Secrecy Index' [Online]. Available at: <https://fsi.taxjustice.no/secrecyscore/top> [Accessed 6 March 2022].

Temple J and Woessmann L (2006) 'Dualism and cross-country growth regressions', *Journal of Economic Growth*, 11, 187-228.

United Nations (2020) 'The World' [Online]. Available at: <https://www.un.org/Depts/Cartographic/map/profile/world.pdf> [Accessed 6 March 2022].

UNCTAD (2015) 'World Investment Report 2015 – Reforming International Investment Governance'. *United Nations*.

Welch B L (1947) 'The generalisation of "Student's" problem when several different population variances are involved', *Biometrika*, 34 (1-2), 28-35.

Zucman G, Torslov T and Wier L (2018) 'The Missing Profits of Nations'. National Bureau of Economic Research Working Paper, No. 24701. Available at: <https://www.nber.org/papers/w24701> [Accessed 14 November 2023].