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## A replication analysis of Laffitte and Toubal (2022)

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### Abstract

*We perform a robustness replication analysis of Laffitte and Toubal (2022), which considers how multinational corporations shift profit to “tax havens”, jurisdictions where they face lower tax burdens. We find that the main results of Laffitte and Toubal (2022), are fairly robust to alternative versions of three important researcher choices: i) the definition of tax havens; ii) the use of a continuous measure of tax-friendliness rather than a binary classification of tax havens; and iii) a sample that omits two small but “extreme” tax havens: Bermuda and Barbados. In all cases, results remain of the same sign and retain statistical significance, though the magnitudes are somewhat attenuated in our robustness exercises.*

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## **Introduction and summary of Laffitte and Toubal (2022)**

Laffitte and Toubal (2022) document how multinationals' sales shifting from high- to low-tax jurisdictions leads to profit shifting. Using publicly available aggregate data, the authors find that, relative to other locations, tax havens record a higher share of foreign sales to total sales. This suggests that multinationals manipulate the location where sales are recorded in response to tax incentives. Sales shifted to tax havens in the form of foreign sales increase multinationals' worldwide profits by 24 to 31 percent.

As the first paper to investigate how sales shifting plays a part in profit shifting, the findings of Laffitte and Toubal (2022) have important implications for the international corporate tax system. The current system attempts to address profit shifting based on reported sales in each country. However, the findings reiterate that multinationals tend to register sales in tax havens to avoid paying higher corporate taxes in the actual destination where the sales take place. The authors therefore suggest that the international corporate tax system should account for sales by destination to prevent tax avoidance and profit shifting. As such, the authors call for significant realignment of international corporate tax policies based on sales by destination. Given the weight of such policy implications, it is imperative that the results be reproducible, replicable, and robust to different data, definitions, and specifications.

This paper's innovation is in devising empirical tests from a simple model of multinationals' incentives to shift sales--and in the process, profits before tax--from higher corporate tax jurisdictions to tax havens. Higher corporate taxation rates in the host country incentivize multinationals to shift affiliate sales from there to tax havens, where the authors assume corporate taxes to be zero. However, sales shifting also depends on how costly it is for multinationals to reallocate sales; typically, it is harder to reallocate sales from host countries that have greater tax transparency. Thus, the tax environment in the host country relative to that in tax havens gives rise to incentives for multinationals to under-report sales/profits in the host country. The discrepancy between the host country's reported and actual sales/profits ends up as foreign sales of affiliates based in tax havens.

This analytical model gives two important predictions. Assuming multinationals do engage in sales and profit shifting to avoid higher corporate tax rates, the model illustrates that the share of foreign sales to total sales for affiliates based in tax havens will be higher than that for affiliates based in non-tax havens. However, multinationals often set up affiliates in locations that are in close proximity to large foreign markets, often referred to as export platforms. These affiliates are likely to have a high ratio of foreign sales to total sales. For instance, a car manufacturing multinational setting up such an export platform in Hong Kong might be recording a high proportion of sales from the Chinese market. In that case, even though Hong Kong is regarded as a tax haven, the high foreign to total sales ratio for affiliates there may simply be a result of Hong Kong's better access to foreign markets rather than a tax environment favorable to multinationals. The model, however, predicts that, whether affiliates based in tax havens have greater access to foreign markets or not, they are still likely to have a higher share of foreign to total sales compared to affiliates in non-tax havens.

The paper uses Bureau of Economic Analysis aggregate sector-level data on US multinational affiliates' sales, and profits before tax at each host country over 1999-2013 to test for the model predictions. The authors define the tax haven indicator following the previous studies on tax havens. The list includes Barbados, Bermuda, Hong Kong, Ireland, Luxembourg, the Netherlands, Panama, Singapore, Switzerland, Montserrat, the British Virgin Islands, the Cayman Islands and the Turks and Caicos Islands. Data on host country-specific corporate tax rates come from a variety of sources including OECD tax database, KPMG's Corporate Tax Rates Table and Corporate Tax Rate Surveys (2011–2021), and so on, while information on Double Taxation Conventions, and Tax Information Exchange Agreements come from OECD's Exchange of Information Database 2016.

The authors find empirical support for their model predictions and illustrate two main results. First, they examine the degree to which foreign to total sales ratios are different for affiliates in tax havens relative to those in non-tax havens for US multinational affiliates across industries using a fractional logit model. These results are presented in Table 2. Column 4 shows the main regression of interest. The data set is at the sector-host country-year level. The authors regress foreign to total sales ratio on a measure of foreign market access, an indicator representing whether the host country is a tax haven, controls

representing the tax environment in the host country such as the statutory tax rate and tax information treaties with the U.S., and the size of the host country's market proxied by its GDP. They also control for sector-year trends and cluster standard errors at the country level. The results indicate that tax havens have higher foreign to total sales ratios compared to non-tax havens even after controlling for access to foreign markets. The coefficient on the tax haven indicator is 0.126 with a standard error of 0.047. Second, they investigate to what extent multinationals' sales shifting to tax havens determines profit shifting by controlling for determinants emphasized in the literature, as in equation 8. The results are reported in Table 4. Profits are increasing in sales. Hence, affiliates in tax havens would be reporting higher profits than usual if they report sales shifted from other locations, which they record as foreign sales. The interaction term of foreign to total sales ratio with tax haven status represents the extent to which tax havens report higher profits as multinationals shift sales there from non-tax havens. The authors use an OLS estimator in column 1, Gamma GLM estimator in column 2, and a cubic-root transformation of the reported profits in column 3. The coefficient of the interaction term is 1.708 (0.501), 2.485 (0.550), and 4.706 (1.523) in columns 1, 2, and 3, respectively. Based on results in Table 4, the authors approximate the amount of profit shifted to tax havens as follows. They use the estimated coefficients of equation 8 but set the interaction term coefficient to zero to compute counterfactual profits in the absence of sales shifting to tax havens. The difference between these counterfactual profits and the observed profits represents the contribution of sales shifting to profit shifting, which the authors report in Table 5.

### **Robustness to alternative definitions/measures of a “tax haven”**

In this section, we perform two tests to assess the direct replicability of the main results in Laffitte and Toubal (2022). In both cases, we find that the results are qualitatively unchanged.

First, we use an alternative classification of tax havens to Laffitte and Toubal (2022), which we construct on the basis of their Corporate Tax Haven Index (CTHI) reported by the Tax Justice Network. There is no consensus on the criteria for defining tax havens. For example, a study by Wright and Zucman (2018) lists only seven countries

and territories as tax havens, namely Ireland, Luxembourg, the Netherlands, Switzerland, Singapore, Bermuda, and the Caribbean. These differences in the tax haven concept may lead to different results. Laffitte and Toubal (2023) identified thirteen jurisdictions as tax havens, namely Barbados, Bermuda, British Virgin Islands, Cayman Islands, Hong Kong, Ireland, Luxembourg, Montserrat, the Netherlands, Panama, Singapore, Switzerland and Turks and Caicos Islands. We re-code the variable "Haven" on the basis of the CTHI score. In our tests, we classify the ten countries and regions with the highest tax haven scores as tax havens and the rest as non-tax havens.

In a second exercise, we modify the regression model to use the continuous CTHI score itself instead of a dichotomous classification of countries/regions as tax havens. Although the magnitude of the tax score is not meaningful in itself, its sign may indicate the association between tax havens and the outcome variables.

### Regression model

We rely on the same specifications as Laffitte and Toubal (2022) but replace the original dummy variable "*Haven*" and its interaction with the new set of variables and its interactions, respectively.

### Data

The Tax Justice Network's Corporate Tax Haven Index (CTHI) provides a comprehensive ranking of jurisdictions that facilitate the underpayment of corporate tax by multinational companies. It conducts an assessment of each jurisdiction's tax and financial systems to identify the key enablers of global corporate tax abuse, and highlights actions that policymakers can take to reduce their jurisdiction's contribution to corporate tax abuse.

The ranking of jurisdictions is based on their CTHI score, which combines their Haven Score and Global Scale Weight. The Haven Score assesses the extent to which a jurisdiction's tax and financial systems facilitate corporate tax abuse by examining 20 indicators. The Global Scale Weight quantifies the financial activity of multinationals in a given jurisdiction. Together, these two factors attempt to provide a comprehensive assessment of a jurisdiction's contribution to the global financial activity of companies at risk of tax abuse. However, we believe that the Global Scale Weight is a consequence of



the Haven Score. For example, a jurisdiction with a high Haven Score tends to attract more multinational financial activity. We therefore focus solely on the Haven Score.

The CTHI has only been published for two years: 2019 and 2021. We use the average score for each country over these two years.

## Results

***Alternative classification of tax havens.*** We first examine whether the recoding of “Haven” changes the original results. The new tax havens are the United Arab Emirates, Bermuda, Switzerland, Hong Kong, Ireland, Luxembourg, the Netherlands, Panama, Singapore and the British Virgin Islands. Table 1 shows the results for the new tax havens. The main variable of interest is “FS times new haven”. The point estimates remain statistically significant at the 5 per cent level in all three regressions. The size of the point estimates is smaller than in the original regressions. However, the change in magnitude might be explained by excluding some countries and territories of the Caribbean in our classification. Wright and Zucman (2018) point out that U.S. multinationals derive a disproportionate amount of their profits from Ireland, Switzerland, Bermuda and the Caribbean.

***Continuous tax haven score.*** We incorporated the continuous variable of tax haven score and its interactions into the original regression models, thereby eliminating the original tax haven dummies and interactions. The outcomes of this analysis are shown in Table 2. Of particular interest is the coefficient on the “FS times haven score” variable, whose point estimates are significant at the five percent level and possess the same sign as in the original regressions. However, it should be noted that the magnitude of the coefficients may lack economic interpretation.

## Robustness to an alternative sample

Using the authors’ definition of tax havens, we also look at how sensitive the estimates are to the countries with the highest average profit per employee which is an indicator used by the authors to determine whether the country is a tax haven or not. In Figure 4 of Lafitte and Toubal (2022), the authors show that the top two countries that have the highest average profits per employee are Bermuda and Barbados. We replicate Table 4

of Laffitte and Toubal (2022) using the same specification used by the authors but exclude Bermuda and Barbados from the original sample. Table 3 below reports the estimates. In all 3 columns the main variable of interest, interaction between foreign sales and country's indicator for a tax haven, does not change sign compared to the original Table 4 from Laffitte and Toubal (2022). Our point estimates are slightly smaller than what the authors find, but they are not statistically different. Overall we can say that the results are not sensitive to the top two countries.

## Conclusion

In this report, we have found that the main results of Laffitte and Toubal (2022) are fairly robust to alternative versions of three important researcher choices: i) the definition of tax havens; ii) the use of a continuous measure of tax-friendliness rather than a binary classification of tax havens; and iii) a sample that omits two small but “extreme” tax havens: Bermuda and Barbados.

## References

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## Tables

Table 1: alternative classification of tax havens

VARIABLES	(1) Log Profit	(2) GPML	(3) MLL
ln(Foreign Market Acc.)	-0.018 (0.043)	0.073 (0.068)	-0.019 (0.105)
Foreign sales ratio	0.223 (0.241)	0.273 (0.287)	-0.801 (0.716)
Tax rate	-0.568 (0.994)	-2.962 (2.182)	-2.545 (2.303)
Treaty of info. exchange	0.125 (0.123)	-0.086 (0.137)	0.170 (0.292)
Double tax. agreement	0.098 (0.144)	0.125 (0.153)	0.221 (0.320)
#DTC / 100	0.250 (0.246)	-0.418 (0.318)	0.190 (0.839)
ln(GDP)	0.014 (0.056)	0.095 (0.083)	0.012 (0.202)
ln(1+ Employment)	0.422 (0.093)	0.209 (0.124)	1.313 (0.254)
ln(1 + Productive Assets)	0.532 (0.051)	0.596 (0.076)	0.444 (0.148)
New Tax Haven	0.150 (0.270)	-0.412 (0.420)	0.463 (0.687)
FS times new haven	1.454 (0.514)	1.845 (0.386)	4.698 (1.710)
Observations	2,939	3,287	3,692
R-squared	0.776	0.673	0.466
Sector x Year FE	Yes	Yes	Yes
Country FE	no	no	no
Countries	33	33	33
Sectors	11	11	11

Robust standard errors in parentheses

Table 2: continuous measure of tax havens

VARIABLES	(1) Log Profit	(2) GPML	(3) MLL
ln(Foreign Market Acc.)	0.008 (0.054)	0.128 (0.072)	0.055 (0.137)
Foreign sales ratio	-1.685 (0.820)	-0.968 (0.898)	-5.753 (2.017)
Tax rate	-0.643 (0.761)	-2.868 (2.251)	-2.558 (1.712)
Treaty of info. exchange	-0.050 (0.122)	-0.291 (0.194)	-0.395 (0.314)
Double tax. agreement	0.135 (0.160)	0.209 (0.155)	0.338 (0.409)
#DTC / 100	-0.450 (0.326)	-1.303 (0.466)	-1.950 (1.045)
ln(GDP)	0.106 (0.061)	0.208 (0.074)	0.306 (0.161)
ln(1+ Employment)	0.371 (0.088)	0.173 (0.126)	1.156 (0.222)
ln(1 + Productive Assets)	0.555 (0.049)	0.637 (0.073)	0.492 (0.150)
Tax Haven Score	0.009 (0.006)	0.007 (0.012)	0.033 (0.014)
FS times haven score	0.038 (0.013)	0.030 (0.012)	0.104 (0.033)
Observations	2,939	3,287	3,692
R-squared	0.776	0.666	0.463
Sector x Year FE	Yes	Yes	Yes
Country FE	no	no	no
Countries	33	33	33
Sectors	11	11	11

Robust standard errors in parentheses

Table 3: alternative sample

VARIABLES	(1) Log Profit	(2) GPML	(3) MLL
In(Foreign Market Acc.)	-0.044 (0.044)	0.079 (0.053)	0.025 (0.121)
FS x haven	0.829 (0.495)	2.144 (0.459)	3.378 (1.697)
Tax Haven	0.256 (0.196)	-0.757 (0.325)	0.455 (0.628)
Foreign sales ratio	0.169 (0.167)	0.310 (0.232)	-0.395 (0.557)
Tax rate	0.030 (0.929)	-1.240 (1.643)	-0.295 (2.100)
Treaty of info. exchange	-0.016 (0.106)	-0.268 (0.130)	0.007 (0.279)
Double tax. agreement	0.076 (0.099)	0.126 (0.109)	0.003 (0.302)
#DTC / 100	0.363 (0.253)	-0.333 (0.331)	-0.214 (0.811)
In(GDP)	-0.003 (0.053)	0.010 (0.088)	-0.009 (0.133)
In(1+ Employment)	0.170 (0.067)	0.202 (0.088)	1.170 (0.161)
In(1 + Productive Assets)	0.828 (0.034)	0.661 (0.054)	0.571 (0.098)
Observations	5,005	5,547	6,211
R-squared	0.835		0.490
Sector x Year FE	Yes	Yes	Yes
Country FE	no	no	no
R2	0.835	0.668	0.490
Countries	54	54	54
Sectors	11	11	11