

Financial Transparency to the Rescue: Effects of Public Country-by-Country Reporting in the EU Banking Sector on Tax Avoidance

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ONLINE APPENDIX

Table A-1
Variable Definitions (Extended)

Variable	Definition
<i>CETR</i>	Current effective tax rate of a firm, i.e. current income taxes divided by pretax income minus the statutory corporate tax rate in the headquarter country of a bank in a given year
<i>CETR unadjusted</i>	Current effective tax rate of a firm, i.e. current income taxes divided by pretax income
<i>Employees</i>	Number of a firm's full-time employees
<i>Equity</i>	Equity ratio of a firm, i.e. total equity over total assets
<i>ETR</i>	GAAP effective tax rate of a firm, i.e. total income taxes divided by pretax income minus the statutory corporate tax rate in the headquarter country of a bank in a given year
<i>ETR unadjusted</i>	GAAP effective tax rate of a firm, i.e. total income taxes divided by pretax income
<i>HAVEN</i>	Indicator variable equal to one for banks that disclose tax haven activity in their CbC-reports and zero otherwise. For this purpose we consider Cyprus, Guernsey, Ireland, Isle of Man, Jersey, Luxembourg and Malta as tax havens
<i>Intangibles</i>	Intangible assets of a firm scaled by total assets. Set to zero if missing
<i>LARGE</i>	Indicator variable equal to one for multinational EU banks that rank above the median value of <i>Size</i> in the respective sample and zero otherwise
<i>LLP</i>	Loan loss provisions of a bank scaled by income derived from interest and related income. Set to zero if missing.
<i>MANY_COUNTRIES</i>	Indicator variable equal to one for multinational EU banks that report on more than seven countries in their CbC-reports and zero otherwise (seven countries is the median number in CbC-reports)
<i>MULTI</i>	Indicator variable equal to one for EU banks with at least one subsidiary or branch in a foreign country and zero otherwise
<i>NOL</i>	Indicator variable equal to one if the firm reported negative pre-tax income in the previous year and zero otherwise
<i>POST</i>	An indicator variable equal to one for all years in which the full CbCR requirements under CRD IV are in effect (2014-2016) and zero otherwise (2010-2013)
<i>Profit</i>	A firm's annual profit in millions of €
<i>PROFITABLE</i>	Indicator variable equal to one for EU multinational banks that rank above the median value of <i>ROE</i> in the respective sample and zero otherwise
<i>ROE</i>	Return on equity, i.e. pretax income divided by total equity
<i>Size</i>	Size of a firm, i.e. logarithm of total assets
<i>STRONG_EQUITY</i>	Indicator variable equal to one for EU multinational banks that rank above the median value of <i>Equity</i> in the respective sample and zero otherwise
<i>Stat. Tax Rate</i>	Statutory corporate income tax rate of a firm's headquarter country in a given year
<i>Total Assets</i>	Total assets of a firm in billions of €
<i>Total Equity</i>	A firm's equity in millions of €

Table A-2

Multinational Bank-Headquarter Locations by Country

Sample	EU Multinational Banks	
	# of Banks	% of Banks
Austria	6	7.20%
Belgium	2	2.40%
Bulgaria	2	2.40%
Croatia	1	1.20%
Cyprus	2	2.40%
Denmark	5	6.00%
Finland	2	2.40%
France	6	7.20%
Germany	13	15.70%
Hungary	1	1.20%
Iceland	1	1.20%
Latvia	1	1.20%
Liechtenstein	2	2.40%
Netherlands	3	3.60%
Norway	2	2.40%
Poland	2	2.40%
Portugal	1	1.20%
Slovenia	1	1.20%
Spain	4	4.80%
Sweden	7	8.40%
United Kingdom	19	22.90%
Total	83	100.00%

Notes. The baseline sample contains 83 multinational banks with their headquarters in the EEA. In total, the sample covers 21 of all 31 EEA countries.

Table A-3
Descriptive Statistics for Domestic Banks

Sample: Domestic Banks	N	Mean	Median	SD	Min	P25	P75	Max	PRE CRD IV	POST CRD IV	Δ
									(2010-2013)	(2014-2016)	in Means
<i>ETR unadjusted</i>	737	24.936	23.830	9.990	0.007	19.721	30.467	80.538	26.017	23.457	-2.56***
<i>ETR</i>	737	-1.475	-1.180	8.240	-30.808	-4.779	1.080	50.338	-0.631	-2.630	-1.99***
<i>CETR unadjusted</i>	737	24.857	23.823	10.12	0.010	18.491	32.246	80.538	25.906	23.422	-2.48***
<i>CETR</i>	737	-1.554	-1.230	8.350	-30.120	-6.232	2.750	50.338	-0.742	-2.666	-1.92***
<i>Size</i>	737	14.760	14.945	2.169	6.164	13.447	16.303	19.770			
<i>ROE</i>	737	0.132	0.109	0.120	0.001	0.073	0.155	1.192			
<i>Equity</i>	737	0.128	0.106	0.111	0.010	0.078	0.134	0.991			
<i>Stat. Tax Rate</i>	737	26.412	25.000	6.317	10.00	20.00	30.20	38.00			
<i>NOL</i>	737	0.050	0.000	0.221	0.000	0.000	0.000	1.000			
<i>LLP</i>	727	0.001	0.000	0.002	-0.001	0.000	0.001	0.021			
<i>Intangibles</i>	633	0.007	0.002	0.017	0.000	0.000	0.005	0.161			
<i>Employees</i>	415	3074	1273	4690	8	461	3477	21121			

Notes. Table A-1 contains all variable definitions. We truncate *ETR* and *CETR* (both adjusted and unadjusted) at the 1st and 99th percentile and remove firm-year observations with negative reported pre-tax income from the sample. We set missing values of *LLP*, *Intangibles* and deferred taxes to zero. *** represents significance at the 1% level.

Table A-4
ETR Comparisons in the European Banking Sector

Sample	Multinational Banks				Multinational and Domestic Banks								
	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>CETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>CETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>CETR</i>
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
<i>HAVEN</i>	-1.026 (1.852)	0.937 (2.133)			-1.972 (1.412)	0.750 (1.608)							
<i>HAVEN x POST</i>	3.927** (1.729)	3.701** (1.844)	3.642** (1.832)	3.798** (1.857)	4.63*** (1.179)	3.57*** (1.193)	3.17*** (1.150)	3.12*** (1.155)				3.54** (1.776)	3.69** (1.802)
<i>MULTI</i>									-1.818* (1.081)	-0.448 (1.083)			
<i>MULTI x POST</i>									3.01*** (1.032)	1.931* (1.070)	1.492 (1.064)	-0.493 (1.594)	-0.745 (1.619)
<i>Size</i>		-0.160 (0.479)	-0.0448 (0.686)	-0.0135 (0.680)		-0.519* (0.313)	0.277 (0.633)	0.283 (0.633)		-0.352 (0.304)	0.207 (0.676)	0.316 (0.614)	0.340 (0.606)
<i>ROE</i>		-5.658* (3.315)	-6.900* (3.502)	-6.738* (3.480)		-6.83** (2.889)	-8.60** (3.953)	-8.08** (3.835)		-6.4** (2.908)	-8.7** (3.969)	-8.6** (3.941)	-8.1** (3.818)
<i>Equity</i>		-0.165 (5.313)	0.931 (5.579)	1.910 (5.518)		-8.51** (4.340)	0.703 (5.103)	1.998 (5.089)		-7.372* (4.363)	1.434 (5.399)	0.563 (5.268)	1.787 (5.272)
<i>NOL</i>		-1.565 (3.508)	-0.207 (3.762)	-0.200 (3.769)		-3.731 (2.281)	-3.268 (2.775)	-3.542 (2.815)		-3.774* (2.286)	-3.326 (2.779)	-3.273 (2.772)	-3.550 (2.810)
<i>LLP</i>		-0.256 (0.188)	-0.51** (0.250)	-0.51** (0.250)		-0.228 (0.169)	-0.54** (0.227)	-0.54** (0.227)		-0.247 (0.177)	-0.59** (0.236)	-0.54** (0.227)	-0.54** (0.226)
<i>Intangibles</i>		0.147 (4.420)	-9.942 (8.326)	-10.88 (8.784)		0.651 (4.558)	-16.81 (10.31)	-18.02* (10.64)		-1.965 (4.373)	-19.37* (10.33)	-16.32 (10.94)	-17.29 (11.31)
Observations	467	428	428	428	1,204	1,051	1,051	1,051	1,204	1,051	1,051	1,051	1,051
Controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes	Yes
Adj. R-squared	0.0177	0.0229	0.00584	0.00613	0.0128	0.0268	0.0053	0.0057	0.0125	0.016	0.0026	0.006	0.0059

Notes. The Table shows OLS estimates of the following equation: $ETR_{it} = \beta_0 + \beta_1 HAVEN_i + \beta_2 HAVEN_i x POST_t + Year_t + \beta_j X_{it} + u_{it}$. The dependent variable is either the adjusted GAAP ETR (*ETR*); or in columns (4), (8) and (13), the adjusted Current ETR (*CETR*). The estimates in columns (1)-(4) rely on the subsample of multinational EU banks. The estimates in columns (5)-(13) rely on the sample of all EU banks. Table A-1 contains all variable definitions. The coefficient of the constant is omitted for brevity. Robust standard errors are clustered on the firm level and are shown in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

Table A-5
Additional Comparisons

Panel	A			B			C		
Sample	Exposed EU Banks & U.S. Multinational Banks			Exposed EU Banks & EU Financial Services			Exposed EU Banks & EU Manufacturing Firms		
Identification	Full Sample	Entropy Balanced	Matched (PSM)	Full Sample	Entropy Balanced	Matched (PSM)	Full Sample	Entropy Balanced	Matched (PSM)
Dependent Variable	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>
Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>EU_BANK x POST</i>	4.935*** (1.742)	4.242** (1.590)	4.400** (1.705)	2.968*** (1.143)	4.317*** (1.481)	3.981** (1.904)	3.127*** (1.130)	2.568** (1.188)	4.117** (1.530)
<i>Size</i>	-0.0406 (0.549)	-0.627 (1.110)	-0.014** (0.00560)	0.117 (0.495)	-0.631 (0.428)	-1.469 (0.899)	-0.167 (0.404)	-1.569 (1.198)	-1.755 (1.310)
<i>ROE</i>	-7.38*** (2.170)	-5.92*** (1.350)	-2.880 (11.44)	-1.417** (0.686)	-5.27*** (1.996)	-6.55*** (2.296)	-0.127 (0.104)	-0.228 (0.198)	-10.69* (6.434)
<i>Equity</i>	-9.307 (14.38)	-4.758 (8.283)	0.002 (0.005)	-7.10*** (2.190)	-20.3*** (6.373)	-21.1** (8.256)	-13.9*** (1.591)	-17.6*** (3.702)	-26.9*** (10.15)
<i>NOL</i>	-5.238 (3.964)	-4.899 (4.063)	4.523** (1.948)	-5.117 (3.669)	-4.975 (3.715)	-3.021 (3.928)	-5.371 (3.774)	-5.080 (3.813)	-5.957 (4.167)
<i>LLP</i>	165.7 (133.3)	101.3 (109.0)	60.64 (85.57)	- -	- -	- -	- -	- -	- -
<i>Intangibles</i>	-0.36*** (0.131)	-0.32*** (0.107)	-0.209* (0.116)	6.449 (4.632)	7.114 (6.640)	8.513 (10.71)	6.432*** (2.005)	-4.314 (4.977)	-4.057 (8.843)
Observations	324	324	180	5,993	3,888	367	15,789	12,511	687
Number of EU Banks	42	42	15	42	42	35	42	42	37
Number of Control Firms	15	15	15	2041	789	32	3069	2313	81
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.0196	0.0277	0.0599	0.00646	0.0412	0.0162	0.00672	0.00819	0.00347

Notes. Table A-5 shows OLS estimates of the following regression model: $ETR_{it} = \beta_0 + \beta_1 EU_BANK_i x POST_t + Year_t + Firm_i + \beta_j X_{it} + u_{it}$. The dependent variable is always the adjusted GAAP ETR (*ETR*). The estimation takes place on samples that include four different control groups for EU banks with tax haven activities from 2010-2016: First, U.S. multinational banks in columns (1)-(3); second, EU financial services providers such as insurers and investment firms in columns (4)-(6); last, EU manufacturing firms in columns (7)-(9). The second column in each panel ((2), (5), (8)) shows the OLS results adjusted for weights from Entropy Balancing. Balancing constraints are the means of selected variables. The third column in each panel ((3), (6), (9)) uses PS-matched samples. The balancing and matching variables are identical and explained in detail in Table A-6. Table A-1 defines all variables. The coefficient of the constant is omitted for brevity. Robust standard errors are clustered on the firm level and are shown in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

Table A-6
Propensity Score Matching Quality

Matching exposed EU Multinational Banks & unexposed EU Multinational Banks (Table 3, Column 4)

Nearest Neighbor		N	Mean		Bias (%)	Bias Reduction (%)	t-test	
			Exp. EU Banks	Non Exp. EU Banks			t	p>t
1:1								
<i>ROE</i>	Unmatched	467	0.171	0.158	5.1	74.3	0.23	0.816
	Matched	387	0.126	0.123	1.3		0.20	0.838
<i>Equity Ratio</i>	Unmatched	467	0.078	0.146	-44.3	48.0	-2.02	0.046
	Matched	387	0.079	0.115	-23		-1.62	0.109

Matching exposed EU Multinational Banks & US Multinational Banks (Table A-5, Column 3)

Nearest Neighbor		N	Mean		Bias (%)	Bias Reduction (%)	t-test	
			Exp. EU Banks	US Banks			t	p>t
1:1								
<i>Total Assets</i> (bn. €)	Unmatched	339	498.42	272.15	-41.1	77.4	-1.27	0.211
	Matched	188	323.20	272.15	-9.3		-0.28	0.781
<i>ROE</i>	Unmatched	339	0.171	0.142	-17.1	57.3	-0.47	0.642
	Matched	188	0.126	0.142	7.3		1.10	0.283

Matching exposed EU Multinational Banks & EU Financial Service Providers (Table A-5, Column 6)

Nearest Neighbor		N	Mean		Bias (%)	Bias Reduction (%)	t-test	
			Exp. EU Banks	EU Fin. Services			t	p>t
1:2								
<i>Profit</i> (m. €)	Unmatched	5642	2,130	220	84.2	92.2	9.53	0.000
	Matched	374	1,100	970	6.6		0.32	0.751
<i>Total Equity</i> (m. €)	Unmatched	5621	20,056	1,690	96.1	74.9	11.09	0.000
	Matched	374	11,590	6,972	24.1		1.04	0.300
<i>Employees</i>	Unmatched	5,137	43,017	3,066	88.3	98.9	10.23	0.000
	Matched	374	20,601	20,163	1.0		0.05	0.946

Matching exposed EU Multinational Banks & EU Manufacturing Firms (Table A-5, Column 9)

Nearest Neighbor		N	Mean		Bias (%)	Bias Reduction (%)	t-test	
			Exp. EU Banks	EU Manufacturing			t	p>t
1:3								
<i>Profit</i> (m. €)	Unmatched	8,928	2,130	260	83.4	86.2	11.21	0.000
	Matched	708	1,600	1,300	11.5		0.62	0.685
<i>Employees</i>	Unmatched	6,314	43,017	12,011	63.1	77.6	5.17	0.000
	Matched	665	34,894	42,578	-14.1		-0.57	0.681

Notes.

Table A-6 shows the matched samples from the main analysis (Table 3) and the additional comparisons (Table A-5) and their respective attributes after PSM was applied. For each comparison we show the number of nearest neighbor matched firms, the variables of interest, the number of observations, and most importantly, the attribute-means for both groups, which do not show a statistically significant difference (*t*-tests) after matching. The bias in mean values is expressed as a percentage of the EU multinational banks' mean. Observations are from the years 2010 – 2013, the pre-CRD IV period. Standard caliper values are set to 0.03 for all matching procedures, which is in accordance with existing literature on the methodology (Austin, 2011; Lunt, 2014; Rosenbaum and Rubin, 1983). Matching procedures

generally allow for replacement in the pool of firms. However, replacement was not feasible for the comparison of EU banks and US banks due to the restricted number of available multinational US banks.

In the main analysis, Table 3 Column 4, we match exposed multinational EU banks to unexposed multinational EU banks with regard to profitability and capital equipment. We apply a 1:1 nearest neighbor PSM approach over two financial figures: *ROE* and *Equity*. Differences in profitability and capital equipment before CRD IV might affect tax payments after the reform, which motivates this matching specification. Moreover, the sample of multinational banks does not allow for matching over absolute criteria (e.g. assets) because the largest exposed banks (mostly G-SIBs) do not have any match with respect to size in the pool of unexposed EU Banks. In total, there are 41 exposed EU banks and 24 unexposed EU banks after the matching.

In Table A-5 Column 3, we match exposed EU banks to U.S. multinational banks with regard to size (*Total Assets* in bn. €) and profitability (*ROE*). We apply a 1:1 nearest neighbor matching which results in the sample of 15 U.S. banks and 15 exposed EU banks. The number of U.S. multinational banks is limited. The FED (Federal Reserve System, 2017) lists 23 U.S.-headquartered banks with subsidiaries abroad. Finally, the financial data of 15 out of the 23 U.S. banks are available in *Compustat BANKS*.

In Table A-5 Column 6, we apply a 1:2 nearest neighbor matching over the criteria absolute profit in € (*Profit*), number of employees (*Employees*), and the total amount of equity in € (*Total Equity*) in order to compute the propensity score. Financial firms as insurers are more comparable to banks in terms of total equity and profits than assets, which motivates the design of this matching specification. There are 35 exposed EU banks and 32 EU financial firms after the matching.

Lastly, in Table A-5 Column 9, we apply a 1:3 nearest neighbor matching approach over the number of employees (*Employees*) and absolute profit in € (*Profit*). Banks and manufacturing companies show many differences in their corporate structure, however this PSM approach is designed to compare trends in *ETR* between exposed banks and large EU manufacturing firms (e.g. as car producers) over the reform. The matching procedure leads to 37 multinational banks and 81 industry firms. Each pair of nearest neighbors must be headquartered in the same EU country.

Table A-7 :
Response through different Tax Havens (Complete Results)

Sample	Multinational and Domestic EU Banks						
Dependent variable	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>	<i>ETR</i>
Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>MULTI x POST</i>	-0.346 (1.544)	-0.256 (1.522)	-0.196 (1.500)	-0.206 (1.500)	-0.265 (1.595)	-0.320 (1.493)	-0.352 (1.567)
<i>MALTA x POST</i>	-1.699 (2.842)						
<i>CYPRUS x POST</i>		1.288 (1.565)					
<i>IRELAND x POST</i>			1.613 (1.478)				
<i>ISLEOFMAN x POST</i>				2.715 (4.169)			
<i>LUX x POST</i>					2.719** (1.366)		
<i>JERSEY x POST</i>						3.524** (1.642)	
<i>GUERNSEY x POST</i>							4.232** (2.024)
Observations	846	922	952	895	845	987	840
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-squared	0.055	0.063	0.059	0.065	0.039	0.058	0.071

Notes. The Table shows the results of seven separate OLS regressions, which are illustrated in Figure 3. The baseline estimation model for the first tax haven, Malta, is: $ETR_{it} = \beta_0 + \beta_1 MALTA_i x POST_t + Year_t + Bank_i + \beta_j X_{it} + u_{it}$. All exposed banks that are not active in the tax haven of interest (in this case, Malta) are removed from the respective regression sample to avoid counter-effects between banks active in other tax havens. Thus, the DiD interaction term compares the change in *ETR* for banks active in Malta with the change in *ETR* for all other unexposed banks after controlling for the usual covariates in our model. We perform the same operation for the remaining tax havens (Cyprus, Ireland, Isle of Man, Luxembourg, Jersey and Guernsey). Table A-1 defines the dependent and all other control variables (*ETR*, *Size*, *Equity*, *ROE*, *LLP*, *NOL*, *Intangibles*). ** represents significance at the 5% level.

Table A-8
CRD IV Placebo Treatment Groups

Sample	Multinational and Domestic EU Banks		Multinational EU Banks	
	<i>ETR</i>	<i>CETR</i>	<i>ETR</i>	<i>CETR</i>
Dependent Variable				
Specification	(1)	(2)	(3)	(4)
(B1) <i>LARGE x POST</i>	1.770 (1.750)	1.878 (1.767)	1.589 (1.778)	1.732 (1.793)
(B2) <i>PROFITABLE x POST</i>	2.009 (1.722)	1.894 (1.743)	2.171 (1.789)	2.008 (1.807)
(B3) <i>STRONG_EQUITY x POST</i>	-0.544 (1.867)	-0.663 (1.886)	-0.525 (1.946)	-0.684 (1.961)
(B4) <i>MANY_COUNTRIES x POST</i>	-0.745 (1.265)	-0.729 (1.272)	0.116 (1.749)	-0.064 (1.795)
Observations	1051	1051	428	428
Controls	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes

Notes. The Table shows selected coefficients for separate OLS regressions on the sample of multinational and domestic EU banks (columns (1)-(2)) and the subsample of exclusively multinational banks (columns (3)-(4)). The baseline estimation equation in specification (B1) is: $ETR_{it} = \beta_0 + \beta_1 LARGE_i x POST_t + Year_t + Firm_i + \beta_j X_{it} + u_{it}$. The dependent variable in columns (1) and (3) is *ETR* and in columns (2) and (4) is *CETR*. *LARGE* is an indicator variable that equals one if the bank's average total assets are larger than the median average total assets in the sample of multinational banks in the pre-CRD IV period (2010-2013) and zero otherwise. The indicator variable *PROFITABLE* in specification (B2) equals one if a bank's *ROE* is above the median *ROE* in the pre-CRD IV period (2010-2013) and zero otherwise. The indicator variable *STRONG_EQUITY* in specification (B3) equals one if a bank's capital ratio is above the median equity ratio in the pre-CRD IV period (2010-2013) and zero otherwise. Table A-1 defines the dependent and all other control variables (*ETR*, *CETR*, *Size*, *Equity*, *ROE*, *LLP*, *NOL*, *Intangibles*). The constant and the coefficients of other control variables are omitted for brevity. Robust standard errors are clustered on the firm level and are shown in parentheses. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.

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