

The stability of bank tax revenues in selected European Union countries – does it depend on the bank tax model?

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Abstract

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Bank taxes meet almost all requirements of optimal taxation (efficiency, fairness and low administration costs) apart from the stability of revenues they provide to the state. For these reasons, different models of bank taxes need to be examined in order to identify the model characterised by the minimum volatility of revenues and maximum certainty in the achievement of planned budget revenues. Additionally, foreseeable burdens incurred by economic agents allow them to run businesses with greater predictability, which should support economic growth. This study compares the stability of bank tax revenues to other taxes. The analysis is performed on a sample of 13 European Union countries where such a tax existed throughout the analysed period from 2012 to 2020. All calculations done with the use of descriptive statistics combined with the HP filter, ANOVA and the correlation of empirical data with the HP filter trend bring convergent results and confirm the higher volatility of bank taxes in comparison to other taxes. Based on the further analysis of the five countries with the highest (France, Germany, Hungary, Slovenia and Greece) and lowest (Portugal, Slovakia, Netherlands, Cyprus and Belgium) volatility of bank tax revenues, it was found that all countries in the group with the highest volatility of bank tax revenues (except for Germany) have implemented a solution based on a direct or indirect tax base of assets (possibly assets minus interbank transactions). This study is the first to analyse the variability of bank tax revenues, making it possible to identify the bank tax models with the lowest volatility, and the results obtained are a valuable source of information from the perspective of fiscal policy and bank stakeholders (owners, managers and clients).

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Introduction

The bank tax delivers considerable revenues in comparison to other niche (sectoral) taxes. It accounts for between 0.1% and 0.8% of total tax revenues, i.e. between 0.04% and 0.32% of GDP taking into consideration the average ratio of *Total tax revenues/GDP* in the European Union in 2020, i.e. approximately 40% (Eurostat, 2022). These are not small amounts, in either absolute or relative terms. For instance, assuming that all NATO states spend 2% of GDP on defence and the bank tax accounts for 0.8% of total tax revenues, bank tax revenues represent approximately 16% of defence spending. The compounded inflows from the bank tax over several years turn out to be significant and should either correspond to the actual state support provided to banks during the subprime crisis or possibly the bailout of the banking sector during subsequent crises. Therefore, the provision of such support (de facto self-financed by banks) offers the possibility of avoiding or significantly alleviating the consequences of an economic downturn. This is vital due to the fact that the overall impact of crises usually amounts to several dozen percent of GDP. In addition, the bank tax, being passed on to bank customers as it is to a certain extent, has a similar function to interest rate increases and has indirect effects on GDP and inflation (Weder di Mauro, 2010), which is why it has an indirect impact on the performance of companies and welfare of households. The introduction of taxes needs to be coordinated by states, as otherwise mobile capital may have an incentive to shift to a jurisdiction that does not impose a certain tax. The bank tax has been adopted by approximately half of all EU states, which makes it one of the most widespread sectoral levies active in the Community. This could be perceived as a reason for lower revenues raised by countries from other niche taxes,

the introduction of which is not coordinated. Concurrently, an argument emerges for a further rise in the importance of the bank tax in the foreseeable future. All the aforementioned reasons confirm the importance of the bank tax from both a theoretical and practical (regulatory) point of view.

The stability of payable amounts is a desirable feature of the tax. This is particularly important from the point of view of the state, which, thanks to predictable tax revenues, will be able to neutralise the negative effects of changing the phase of the business cycle (Karpowicz et al., 2020). The stability of tax revenues has an impact on the balance of public finances and the state's ability to meet public obligations (Wierzbicka et al., 2021; Garszka and Cieślukowski, 2014). Concepts for maximising the stability, and therefore predictability, of tax revenues have been the subject of numerous studies (e.g. Dye and Merriman, 2004; Giammarioli et al., 2007).

Compared to e.g. PIT, CIT or VAT, the bank tax meets all the requirements (efficiency, fairness and low cost of the fiscal process due to the relatively small number of taxable persons) laid down in A. Smith's Theory of Optimal Taxation (1776, 2017), updated and modified by Mirrlees (1971), with one exception – namely the stability of revenues. For these reasons, different models of the bank tax need to be examined in order to identify the model characterised by the minimum volatility of revenues and maximum certainty in terms of the achievement of planned budget revenues. Additionally, assuming that the cost of the bank tax is partially transferred to several stakeholders active in the economy, the foreseeable burden incurred by economic agents allows them to run businesses with greater predictability, which should support economic growth.

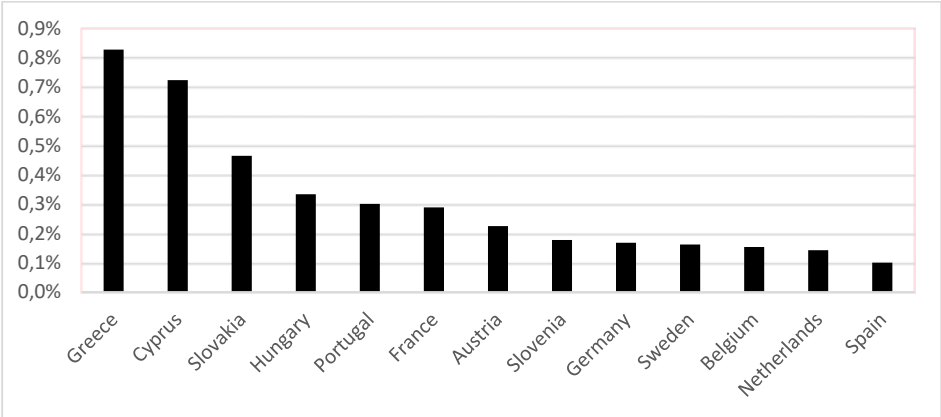
Therefore, the purpose of this paper is to fill the research gap by means of the examination of the volatility of bank tax payments against other fiscal burdens, as well as identifying concepts of this tax that ensure relatively higher stability which, as has been mentioned, is desirable from the fiscal policy point of view. The few studies in this area, most often limited to single countries, result in a lack of systematisation of knowledge and the impossibility of generalising conclusions on the impact of the construction of the bank tax and the rate thereof on the variability of revenues from this tax. The main addressee of the results of the study in question is the state treasury, as the issue of stabilisation of sectoral tax revenues assumes particular importance from the point of view of achieving the objectives of the state's financial policy: stabilisation of the economy (state budget balance), efficient allocation of production factors and income redistribution. Budget revenues are particularly important in the context of the need to mitigate the effects of the COVID-19 pandemic and to increase defence spending in connection with the war in Ukraine. The provision of systematic revenues is not only vital from the point of view of the state's need for tax revenues, but also for mitigating economic and social problems in the context of anticipated stagflation: support for low-income households, assistance measures for maintaining liquidity and servicing of liabilities by businesses, preservation of existing employment levels, etc. Finally, it is important to highlight the growing role of sectoral taxes and the tendency in Europe to broaden the spectrum of such taxes instead of raising PIT, CIT and VAT, as well

as the additional functions of sectoral taxes in the form of indirectly enforcing actions or behaviour with positive social or economic effects. In the case of the bank tax, this value is financial stability, as the bank tax serves to aggregate bank rescue funds on the one hand and implies decisions by bank managers to reduce their risk profile on the other hand.

The considerations in this paper are limited to the FSC (Financial Stability Contribution) and thus do not deal with the analysis of other taxes which are specific only to financial and credit institutions. This is primarily due to the inability to isolate most other burdens. Additionally, FSC is a relatively widely used solution introduced for a precisely defined reason and purpose (Karpowicz et al., 2022). There is also no bank-specific form of taxation other than the FSC that has operated in a relatively unchanged form for a sufficiently long period in a relatively large number of European countries. As mentioned earlier, FSC can take the form of payments into a separate fund or a tax paid directly to the state budget. The first variant can be described as a bank levy, and the second as a bank tax *sensu stricto* (Mielczarek, 2020).. Knowing the differences between a bank levy and a bank tax in the strict sense and using a certain simplification, in the course of further considerations the terms 'FSC' and 'bank tax' will be used interchangeably.

The study presented in this paper focuses on the stability of bank tax revenues in 13 EU countries over the period from 2012 to 2020. This period is determined by the year of introduction of the bank tax in the analysed countries (see Figure 1 below):

Figure 1. Revenues from the bank tax as a percentage of total tax revenues and social security contributions (2020)



Source: National tax lists prepared by Eurostat

The comparative analysis contrasts bank tax performance with the main taxes/contributions existing in the jurisdictions considered – i.e. Corporate Income Tax (CIT), Personal Income Tax (PIT), Value Added Tax (VAT), Social Security Contributions

(SC) as well as a combination of wage tax calculated as PIT+SC. To show the differences in tax mixes in the analysed countries, the raw data (time series) of analysed tax groups (bank tax, VAT, CIT, PIT and SC) are presented in Table 1:

Table 1. Revenues from bank tax, VAT, CIT, PIT and SC in the countries studied (in million EUR)

Bank tax	2012	2013	2014	2015	2016	2017	2018	2019	2020	Min	Max	Range	Average	σ *
Austria	583	588	586	554	572	343	341	348	357	341	588	247	475	114
Belgium	238	167	135	380	278	250	285	270	301	135	380	245	256	68
Cyprus	65	76	69	69	68	63	44	46	54	44	76	32	61	11
France	1026	899	979	1507	2104	2358	2576	2448	3016	899	3016	2117	1879	747
Germany	690	520	520	1578	1774	1720	1997	2011	2251	520	2251	1731	1451	646
Greece	80	280	480	350	776	735	615	353	529	80	776	696	466	212
Hungary	631	471	481	474	226	199	158	165	165	158	631	474	330	172
Netherlands	536	507	448	478	473	478	447	449	447	447	536	89	474	29
Portugal	156	132	160	182	205	172	186	179	211	132	211	79	176	23
Slovakia	170	204	153	110	120	127	134	143	149	110	204	94	146	27
Slovenia	7	18	26	18	29	26	29	30	31	7	31	24	24	7
Spain	183	227	296	421	447	414	377	381	410	183	447	264	351	88
Sweden	342	354	345	377	676	652	881	556	328	328	881	553	501	188
VAT	2012	2013	2014	2015	2016	2017	2018	2019	2020	Min	Max	Range	Average	σ *
Austria	24 507	24 895	25 386	26 247	27 301	28 304	29 323	30 405	28 384	24 507	30 405	5 899	27 195	1949
Belgium	27 420	27 738	27 804	27 952	29 179	30 255	31 545	32 181	29 761	27 420	32 181	4 761	29 315	1650
Cyprus	1 578	1 403	1 512	1 506	1 654	1 720	1 955	2 066	1 786	1 403	2 066	663	1 687	206
France	142 527	144 490	148 454	151 680	154 490	162 011	167 720	173 953	161 122	142 527	173 953	31 426	156 272	10 073
Germany	194 034	197 005	203 081	211 616	218 779	226 582	235 130	244 111	221 562	194 034	244 111	50 077	216 878	16 088

Greece	13 713	12 593	12 676	12 885	14 333	14 642	15 288	15 390	12 925	12 593	15 390	2 797	13 827	1 057
Hungary	9 084	9 073	9 754	10 676	10 595	11 729	12 950	13 916	13 429	9 073	13 916	4 842	11 245	1 745
Netherlands	41 777	42 408	42 951	44 746	47 849	49 833	52 712	58 115	58 211	41 777	58 211	16 434	48 734	6 086
Portugal	13 995	13 710	14 682	15 368	15 767	16 810	17 868	18 786	16 803	13 710	18 786	5 076	15 976	1 633
Slovakia	4 328	4 696	5 021	5 423	5 424	5 919	6 319	6 830	6 820	4 328	6 830	2 503	5 642	846
Slovenia	2 888	3 046	3 155	3 220	3 318	3 481	3 765	3 889	3 542	2 888	3 889	1 001	3 367	312
Spain	55 021	60 314	64 091	69 294	71 752	75 599	79 239	80 889	70 616	55 021	80 889	25 868	69 646	8 105
Sweden	37 834	39 048	38 846	40 532	42 789	44 098	43 403	43 413	43 938	37 834	44 098	6 264	41 544	2 334
CIT	2012	2013	2014	2015	2016	2017	2018	2019	2020	Min	Max	Range	Average	σ*
Austria	6 679	7 240	7 273	7 941	8 633	9 363	10 696	10 982	8 035	6 679	10 982	4 302	8 538	1 440
Belgium	11 624	12 192	12 585	13 644	14 640	18 098	19 788	17 736	14 943	11 624	19 788	8 165	15 028	2 730
Cyprus	1 114	1 171	1 112	1 046	1 047	1 180	1 254	1 304	1 263	1 046	1 304	259	1 166	89
France	55 913	58 736	57 081	58 068	57 880	66 935	63 652	68 760	63 391	55 913	68 760	12 847	61 157	4 380
Germany	69 284	67 188	68 858	71 466	83 439	86 961	94 148	91 298	74 365	67 188	94 148	26 960	78 556	9 872
Greece	2 088	2 071	3 349	3 800	4 388	3 510	3 998	4 071	1 999	1 999	4 388	2 389	3 253	895
Hungary	1 252	1 180	1 578	1 805	2 476	2 331	1 606	1 669	1 591	1 180	2 476	1 297	1 721	410
Netherlands	13 697	14 076	17 090	18 895	23 701	24 190	27 109	30 035	24 694	13 697	30 035	16 338	21 499	5 465
Portugal	4 629	5 545	4 931	5 614	5 674	6 271	6 802	6 682	5 540	4 629	6 802	2 173	5 743	690
Slovakia	1 715	2 118	2 504	2 917	2 818	2 926	2 943	2 848	2 787	1 715	2 943	1 228	2 619	407
Slovenia	446	433	529	568	645	764	886	954	914	433	954	520	682	192
Spain	22 127	20 434	20 573	23 761	24 683	26 004	29 700	25 721	22 062	20 434	29 700	9 266	23 896	2 821
Sweden	10 530	11 652	11 364	13 233	13 322	14 103	14 166	14 973	14 235	10 530	14 973	4 443	13 064	1 442
PIT	2012	2013	2014	2015	2016	2017	2018	2019	2020	Min	Max	Range	Average	σ*
Austria	31 651	32 820	34 673	37 079	33 300	34 523	37 196	39 028	35 850	31 651	39 028	7 377	35 124	2 240
Belgium	48 164	50 768	51 753	51 494	51 064	52 860	54 131	53 738	53 579	48 164	54 131	5 967	51 950	1 770
Cyprus	632	479	431	441	455	509	576	621	651	431	651	220	533	83
France	177 480	187 217	189 219	192 371	194 147	198 685	226 301	229 726	224 508	177 480	229 726	52 246	202 184	18 300
Greece	13 242	10 698	10 536	10 047	10 320	11 149	11 427	10 855	10 359	10 047	13 242	3 195	10 959	902
Netherlands	44 624	44 521	46 174	51 267	50 162	61 442	61 514	68 811	72 255	44 521	72 255	27 734	55 641	10 008
Portugal	9 790	13 119	13 322	13 149	12 613	12 603	13 312	13 580	14 009	9 790	14 009	4 219	12 833	1 152
Slovakia	2 123	2 175	2 275	2 464	2 680	2 855	3 218	3 535	3 492	2 123	3 535	1 412	2 757	520
Slovenia	2 041	1 847	1 896	1 974	2 116	2 188	2 457	2 545	2 517	1 847	2 545	699	2 176	254
Sweden	61 146	64 058	63 467	67 083	72 076	74 524	70 965	68 867	69 967	61 146	74 524	13 377	68 017	4 170
SC	2012	2013	2014	2015	2016	2017	2018	2019	2020	Min	Max	Range	Average	σ*
Austria	47 252	49 116	50 533	52 112	54 013	56 042	58 749	61 116	61 064	47 252	61 116	13 864	54 444	4 836
Belgium	64 509	66 164	66 913	68 140	67 746	69 794	71 376	73 683	73 119	64 509	73 683	9 174	69 049	2 982
Cyprus	1 510	1 362	1 445	1 483	1 543	1 710	1 847	2 378	2 412	1 362	2 412	1 049	1 743	374
France	387 117	398 881	408 802	413 030	418 371	430 212	424 889	407 782	392 813	387 117	430 212	43 095	409 100	13 545
Germany	454 584	465 367	482 343	501 165	524 290	549 481	572 589	598 221	607 948	454 584	607 948	153 364	528 443	53 647
Greece	26 621	24 455	24 088	24 422	24 908	25 998	26 272	26 654	25 438	24 088	26 654	2 566	25 428	942
Hungary	13 696	13 682	14 058	14 935	15 970	16 230	16 468	17 165	15 358	13 682	17 165	3 483	15 285	1 203
Netherlands	98 313	100 932	102 015	99 833	107 486	105 535	111 734	113 150	112 809	98 313	113 150	14 837	105 756	5 487
Portugal	19 143	20 450	20 458	20 784	21 610	22 693	23 860	25 360	25 606	19 143	25 606	6 463	22 218	2 170
Slovakia	9 112	10 011	10 394	11 079	11 657	12 500	13 347	14 315	14 500	9 112	14 500	5 388	11 879	1 807
Slovenia	5 874	5 765	5 863	6 101	6 338	6 747	7 207	7 723	8 061	5 765	8 061	2 296	6 631	807
Spain	129 823	126 856	128 966	131 508	135 573	142 430	149 450	160 656	162 215	126 856	162 215	35 359	140 831	12 906
Sweden	14 311	14 804	14 521	14 881	15 388	15 899	16 070	16 251	16 161	14 311	16 251	1 940	15 365	713

Source: National tax lists prepared by Eurostat

Tax revenue variability was analysed using statistical tools including descriptive statistics, the Hodrick-Prescott (HP) filter, Pearson correlation and ANOVA. Based on a review of the literature on the subject and commonly expressed opinions, a hypothesis was formulated on the higher variability of bank tax revenues in relation to other forms of taxation. An additional hypothesis states that taxation legislation options adopted by different countries differ in terms of the level of volatility of budget revenues, whereas liabilities-based models are superior to asset-based ones with respect to stability.

The remainder of this article is structured as follows. Section 1 reviews the most relevant literature. The subsequent section describes the methods employed in the empirical research. Section 3 presents the

results, while Section 4 is dedicated to the discussion thereof. The last part of the manuscript contains the main conclusions.

1. Literature review

1.1. The nature, rationale and forms of taxation of banks

A bank tax is defined as a financial burden imposed on banks in order to promote financial stability, ensure the availability of resources for the future resolution of banks, limit banks’ risks or compensate for budget funds spent on bailouts of banks in recent financial crises (Capelle-Blancard and Havrylchyk, 2014). Bank tax arrangements vary from country to country in terms of the taxable institutions, the tax base, the tax rate and the derogations to be applied (Table 2).

Table 2. Bank tax frameworks in analysed countries

No. Specification		Year of implementation	Tax base	Tax rate
1	Austria	2011	Total liabilities after the deduction of insured deposits, capital and trust transactions.	The levy is structured progressively, with a rate of 0% for the bracket up to a tax base of 300 million EUR, 0.024% for the bracket up to 20 billion EUR, and 0.029% for an amount exceeding this threshold
2	Belgium	2012	Total liabilities excluding core capital and deposits ¹ .	0.035%
3	Cyprus	2011	Deposits	0.0375%
4	France	2011	Minimum capital requirement	0.0642%
5	Germany	2011	“Contribution-relevant liabilities”, which are total liabilities minus capital, client deposits, profit participation rights, and reserve funds for general banking risk.	Progressive tax as a function of the tax base: 0% - up to 300 million EUR 0.02% - from 300 million EUR up to 10 billion EUR 0.03% - from 10 billion EUR up to 100 billion EUR 0.04% - from 100 billion EUR up to 200 billion EUR 0.05% - from 200 billion EUR up to 300 billion EUR 0.06% - over 300 billion EUR
6	Greece	1975	Balance of the credit portfolio	0.12%-0.6%
7	Hungary	2010	Total assets deducted by interbank loans	Progressive tax as a function of the tax base: 0.15% - up to 50 billion HUF 0.20% - over 50 billion HUF

8	Netherlands	2012	Total liabilities reduced by Tier 1 capital, deposits insured by deposit insurance scheme and liabilities related to the assurance activity of the bank.	0.066% - short-term (uninsured) deposits 0.033% - long-term (uninsured) deposits
9	Portugal	2011	Total liabilities reduced by Tier 1 and Tier 2 as well as deposits insured through a deposit insurance scheme plus the notional amount of off-balance-sheet derivative financial instruments	0.01% – 0.11% plus a COVID solidarity surcharge accounting for 0.02% (for the years 2020 – 2022)
10	Slovakia ²	2012	Total liabilities reduced by capital, long term financing provided to branches of foreign banks and subordinated debt.	0.40%
11	Slovenia	2011	Total assets	0.10%
12	Spain ²	2014	Deposits	0.03%
13	Sweden	2009	Total liabilities net of capital and insured deposits	0.05%

¹ Banks additionally pay a so-called subscription tax calculated on all savings deposits that might be eligible for the deposit guarantee (DGS) up to EUR 100,000 per saver and per bank. The rate of this tax is 0.08%. In 2012 a loan-to-deposit tax was introduced in Belgium, the rate of which fluctuates between 0.03% and 0.12% according to the proportion of loans to deposits.

² In Spain, a state-wide tax paid by banks replaced similar charges previously levied by some Spanish regions in 2014.

Source: own elaboration based on: European Commission (2022)

A number of typical bank tax structures can be distinguished, the advantages and disadvantages of which are shown in Table 3.

Table 3. Pros and cons of different bank tax schemes

Bank tax base	Advantages	Disadvantages
Total liabilities less capital and insured deposits	- no capital taxation (incentive to increase capital); - no taxation of deposits insured through a deposit insurance scheme which makes such deposits more attractive to the bank, and thus means that the deposit base is more stable.	- does not make the tax dependent on the financial situation of the bank; - the tax is levied on items arising from accepted accounting standards (provisions and accruals); - the risk associated with the banking and trading book is not taken into account
Deposits	- based on the main item of liabilities	- does not make the tax dependent on the financial situation of the bank; - the risk associated with the banking and trading book is not taken into account; - may contribute to lowering the interest rate of deposits.
Total assets	- reflects the size of the bank	- does not take the risk of assets into account; - does not make the tax dependent on the financial situation of the bank; - taxation of low-risk items, i.e. central bank operations, treasury bonds; - the tax is levied on items arising from accepted accounting standards (provisions and accruals).
Risk Weighted Assets (RWA)	- the risk associated with the banking and trading book is taken into account	- makes the tax dependent on method of RWA calculation (standard method or the Internal Based Ratings (IRB) approach)
Minimum capital requirement	- reflects risk level and profile	- the item reflected in capital is subject to taxation; - does not make the tax dependent on the financial situation of the bank.

Source: own elaboration based on Szołno-Koguc and Twarowska-Ratajczak (2021).

The subprime crisis undermined the stability of the global banking sector. Significant state aid was necessary to prevent systemically important institutions from becoming illiquid and insolvent. Such support and bailouts resulted in a significant increase in sovereign indebtedness and a series of reductions in sovereign credit ratings. Therefore, in order for private commercial banks to repay their debt to the state and the burden of possible further support of

the banking sector to be lifted from the state in many countries, the decision was made to introduce additional tributes (Mara, 2012; Pesuth, 2015). According to the European Commission (2010), the bank tax shall increase state budget revenues, enhance the efficiency and stability of financial markets and reduce their volatility which can create negative externalities for the real economy. In particular, the financial sector might be too large and be subject to too much risk due

to actual or expected state support (resulting in moral hazard), information asymmetries and remuneration structures, which, together with macroeconomic developments, contributed to the recent crisis. Apart from this, the financial sector has been profitable in the last two decades and there is a desire to ensure that it makes a substantial contribution to public finances. The financial sector is seen to bear a major responsibility in the context of the occurrence and depth of the crisis. In the aftermath of the crisis, this branch of the economy should therefore contribute to fiscal consolidation via increased levies or brand new taxes. Other objectives of bank tax implementation include limiting the risks taken by banks, counteracting the excessive remuneration of bank managers and changing business models to more sustainable ones (Mielczarek, 2020). At the same time, it is important to note that the aim of risk limitation is emphasised (however not treated as the main goal) mainly in the banking systems, which represent the Anglo-Saxon model with investment banks predominant, while the banking sectors studied in this paper represent a continental model with the dominant role played by deposit and credit institutions, which are less risky than investment banks. The initiative to introduce additional burdens that would be imposed on banks shortly after the subprime crisis came from representatives of the G-20 countries, but the spectrum of potential solutions was defined by the International Monetary Fund (IMF). At that time, two variants of the levy were considered. The first would involve payments to a separate stability fund to finance resolution projects, and the second would involve payments made directly to the state budget. A bank tax can be calculated on the basis of a bank's impact on systemic risk, i.e. the abovementioned FSC. The alternative consists in linking the tax (Financial Activity Tax, FAT) to the financial results and salaries and payments made

directly to the state budget. This option distinguishes between a tax levied on the profit earned by financial institutions in cash-flow terms increased by remuneration (FAT1), a tax on economic rents, or the sum of profit and excessive remuneration (FAT2), and a tax on cash-flow profit above a defined return on capital and excessive remuneration (FAT3) (Cannas et al., 2014). Apart from the IMF proposals described above, additional (i.e. specific to financial or credit institutions) levies include: Financial Transactions Tax (FTT), which is a form of turnover tax (an example of which is the Tobin tax on foreign exchange transactions), additional CIT rate (a solution applied, for instance, in the UK, where it is known as Corporation Tax Surcharge) or a tax on additional remuneration (Government of the United Kingdom, 2021; Claessens et al., 2010). An extensive description of the various forms of bank taxation introduced in the wake of the subprime crisis is provided by Chaudhry et al. (2015). The impact of significant regulatory changes on bank tax inflows remains an important issue. Puławska (2021) concludes that after the implementation of Basel III these revenues decreased in Hungary, while in Germany this event and the introduction of the Single Resolution Fund led to an increase in the amount of bank tax paid.

1.2. Allocation of bank tax revenues

The problem of bank tax payments in some countries being sent directly to the state budget, instead of to a separate stabilisation fund, is pointed out by Borowski et al. (2016). Balutel and Voia (2021) analyse the bank tax in Central and Eastern Europe, where the tax revenues in the vast majority of countries contribute to state budgets, concluding that not only does this solution not improve the stability of the banking sector, but it also has a negative impact on lending and does not stimulate the inflow of foreign direct investment. At this point, however, it should be added that a bank tax is no different from

other forms of taxation in the sense that it reduces the scale of economic activity and contributes to price increases. The issue of optimising the bank tax model in the context of the adequacy of contributions relative to the impact of individual banks on systemic risk is investigated by Cannas et al. (2014), who simultaneously simulate the model for different regulatory scenarios.

1.3. Bank tax and bank business models

The introduction of a bank tax also affects banks' business models, including in particular the structure of capital sources, as noted by Devereux et al. (2015). In the bank tax model in which the amount of tax depends on the level and structure of liabilities, banks – exposed to a significant increase in tax costs – usually decide to increase the share of equity while augmenting their exposure to credit risk. The abovementioned reaction can be explained by the intention to stop the erosion of return on equity (ROE). A rather worrying finding of this study is that while the implementation of the bank tax has contributed to a decrease in total risk in the banking sector, this has been the result of a significant reduction in risk in banks of relatively low systemic importance while stabilising or even boosting risk in banks with a significant impact on systemic risk. A similar finding was made by Bremus et al. (2020), who find that basing a bank tax on liabilities may provide an incentive to reduce bank leverage. On the other hand, Borowski et al. (2016) came to the opposite conclusion, showing that the effect of introducing a bank tax is a fall in the capital base and a slowdown in lending. However, it should be noted that the study by Borowski et al. refers to a bank tax formula based on assets and not liabilities, as in the case of the study by Devereux et al. In addition to a building up a fund that can be used to stabilise the banking sector, the bank tax is also intended to serve as an instrument to reduce the vulnerability of the banking

sector to crises. After the credit crunch that followed the collapse of Lehman Brothers, it became clear that the banking business model based on raising short-term revolving funding on the interbank market could lead to serious liquidity problems. In the context of changes in the business models of banks affected by the introduction of the bank tax, it is reasonable to inquire about a possible change in the results achieved by banks in relation to the period when the bank tax was not in force. Kogler (2019) argues that there was an increase in the net interest margin (NIM) as banks adjusted to the new levy. In turn, Puławska (2021), based on a study of the German and Hungarian markets characterised by different principles of bank tax construction, proves the negative impact of the implementation of the bank tax on return on assets (ROA) of the largest Hungarian and smaller German banks.

1.4. Passing on the bank tax to clients

Despite the explicit prohibition in many countries of passing on the bank tax to clients, in practice this is the case, although obviously not in a direct manner. Chiorazzo and Milani (2011) argue that European banks have shifted the bank tax burden to their customers. Also, Weder di Mauro (2010) confirms the existence of a process of passing on the tax. Kogler (2019), on the other hand, using the Monti-Klein model and data from 23 EU countries, finds that banks pass on bank fees to customers mainly by raising lending rates, which is mainly the case for banks with high loans/deposits ratios and banks with low capital adequacy ratios, for which the erosion of net income would be a threat to their ability to maintain capital ratios at the level required by regulators. That author also shows a higher level of efficiency of the process of transferring the bank tax burden in countries with a high concentration of the banking sector and a low level of competition. Capelle-Blancard and Havrylchuk (2017) identify households

as the client segment for which tax shifting is easiest, because they have the lowest elasticity of demand for credit. Merz and Overesch (2016) show that, in terms of the impact of the introduction of a bank tax, interest income increases less than commission revenues, which can probably be combined with regulations that limit the possibility of directly transferring the bank tax to customers by raising interest rates (especially in models where the tax is charged on assets).

1.5. Criticism of the bank tax

The bank tax is also the subject of criticism. The following drawbacks have been pointed out, among others: the limited impact on the state of public finances (Osvát and Osvát, 2010); a potential slowdown in lending (Puławska, 2021); an increase in the prices of bank products; and a further decline in the profitability of banks. In connection with the COVID-19 crisis, a number of studies dedicated to the analysis of the impact of the pandemic on the banking sector were conducted (e.g. Kulińska-Sadłocha et al., 2020; Korzeb and Niedziółka, 2020; Kozak, 2021; Korzeb et al., 2021; Dash Wu and Olson, 2020; Bernardelli et al., 2021; Zaleska, 2021). The banking sector has been identified as one of the pillars of the pandemic mitigation system (Demirguc-Kunt et al., 2020). Due to the fact that banks incurred significant costs during the pandemic and effectively supported both individual and corporate clients, there has been a call to reduce or suspend the bank tax for a certain period or to change the formula for its calculation (Mórawski, 2020; Chiorazzo and Milani, 2011).

1.6. Fiscal policy and economic growth

The studies presented above refer mainly to the bank tax analysed from the point of view of supervisory institutions (the extent to which the tax revenues constitute a source of potential support for the banking sector, and the tax structure itself affects the systemic risk) or to the impact of the bank tax

on the results of individual banks. The importance of the bank tax to the state budget is also the subject of consideration in this article. In this context, the research question arises about the variability over time of bank tax revenues, their predictability and the impact of said tax on economic growth. Reducing CIT rates not only serves to restrict the shadow economy but also to improve competitiveness (Karpowicz, 2018). Generalising the above conclusion, one can refer to the results of studies showing that expansionary fiscal policy stimulates economic growth (Engen and Skinner, 1992; Daveri and Tabellini, 2000; Karras and Furceri, 2009; Padovano and Galli, 2001; Lee and Gordon, 2005); nevertheless, some empirical studies do not support the significance of the relationship between GDP and tax rates (Easterly and Rebelo, 1993; Mendoza et al., 1997). In the long run, however, low taxes can be expected to be accompanied by high public deficits, which are ultimately detrimental to economic growth. Therefore, it is necessary to stabilise tax revenues at a level that ensures balanced public finances. At the same time, the low volatility of tax revenues should be an important feature of an optimal (just and efficient) tax system (Felix, 2008). Maintaining an appropriate balance between taxation and government spending should promote economic growth as long as the amount of government expenditure is not excessive (Fölster and Henrekson, 2001; Bassanini et al., 2001). In this context, the sustainability of fiscal revenues remains an important issue, both from the point of view of preserving current balances and laying the foundations for growth. These incomes tend to be correlated with the business cycle.

1.7. Stability of tax revenues

It is essential to identify revenues that are less susceptible to cyclical conditions, which is a *sine qua non* for a long-term, stable and predictable fiscal policy, which in turn

favours investment. Typically, states have difficulty estimating future fiscal revenues. This is due to, among other things, the use of a progressive tax model, frequent changes in tax law or the tendency of businesses and individuals to avoid paying taxes (Creedy and Gemmell, 2008). Few studies have emerged so far on the stability of revenues from different types of taxes, and most of them refer to the United States, which clearly indicates a research gap to be filled. Among the pioneering studies was an article by Williams et al. (1973) in which the authors noted that personal income tax revenues and taxes on alcohol and tobacco were more volatile than expected. Fox and Campbell (1984) concluded that the sales tax is procyclical in nature and therefore characterised by a high level of volatility. Dye and McGuire (1991) confirmed Fox and Campbell's conclusions to a certain degree, arguing that sales taxes are less stable than income taxes. 15 years later, the opposite conclusion was reached by Bruce et al. (2006), who showed that the volatility of income tax revenues is higher than that of sales taxes. Yan (2012), based on data covering tax inflows in the United States from 1986 to 2004, proved that diversification of tax revenue sources usually reduces revenue volatility. Among studies based on data from the European market, an article by Afonso and Furceri (2010), who argue that the high volatility of government revenues and expenditures has a negative impact on economic growth, stands out. The analysis of data from 10 EU countries from 1997 to 2007 shows a significant negative correlation between the volatility of tax revenue and increased gross domestic product (GDP) (Riscado et al., 2010; Karpowicz and Majewska, 2018). Based on data from 37 Sub-Saharan African countries from 1980 to 2005, Ebeke and Ehrhart (2011) show that unstable fiscal revenues result in increased volatility and lower levels of public investment, as well as inducing variation in government spending. Bleaney et al. (1995)

observe that tax revenue volatility occurs primarily in developing open economies with higher inflation. White (1983) builds a model that optimises the structure of revenues from various taxes so that these revenues are as minimally dependent as possible on the phase of the business cycle. Creating a model with similar properties is the goal of research by Kwak (2013), which proposes to use different income elasticities of wealth to maximise the stability of sales tax revenue. Focusing on data from the German market, Buch et al. (2016) show that bank tax receipts turned out to be lower than expected, with the dominant part coming from large commercial banks. This also implies the suitability of the approach used in Germany, i.e. linking the levy to the systemic risk, which is mainly created by large banks.

2. Methods

To check the volatility of bank tax revenues, we analysed empirical data from 13 EU member states over nine years. Among all countries that were scrutinised, the bank tax was introduced in the period 2010–2012 (the only exception is Greece where this tax has existed since 1975). Therefore, for each jurisdiction, the period from 2012 to 2020 was considered (to arrive at a balanced panel across states for the sake of better comparability).

To assess the stability of inflows from bank tax, the decision was made to compare the performance of this tax with consumption taxes, income taxes and social security contributions. The authors selected these taxes as the benchmark as those levies are commonly used by EU countries. Therefore, the comparison for the entire sample of 13 states was feasible. In addition, it was decided that such a background could provide for interesting findings.

Taxes serving as a comparison platform were defined according to European System of Accounts (ESA):

- D211 – “Value added type taxes” – VAT. This category is unambiguous as in each analysed jurisdiction there is only one tax classified under this code. This results from the harmonisation of VAT across EU member states.
- D510 – “Taxes on the income or profits of corporations including holding gains” - CIT. Under this category there are often several types of taxes recorded (from one up to six – depending on the country). However, all of them relate to taxation of income of corporations and therefore the Authors decided to use for the research such comprehensive data rather than pure corporate income tax. Firstly, traditional corporate income taxes are responsible for the vast majority of revenues classified under the D510 code. Secondly, in several jurisdictions there is no separate legislation for interest, dividends, capital gains or corporate income. This means that most states report tax revenues from these sources collectively. As a consequence, for a number of countries there is no such detailed data available. Finally, every additional constraint limits the sample and means the results are less conclusive.
- D51A – “Taxes on individual or household income” - PIT. Classified under this category are primarily wage taxes, taxes imposed on the self-employed or taxes on the income of owners of unincorporated enterprises. There are also reported taxes imposed on the passive income of individuals (e.g. from property or interest). Other components in terms of the value of revenues are of lesser importance.
- D61 – “Net social contributions” – SC. They are defined for ESA purposes as “the actual or imputed contributions made by households to social insurance schemes to make provision for social benefits to be paid”.

In addition to the above taxes/contributions, the authors decided to analyse the

performance of a combined set of PIT and SC revenues. The reason for such an approach results from the fact that both levies are imposed on wages and to some extent are interchangeable. All data used were sourced from (i) the Eurostat database and (ii) national tax lists – a detailed database also delivered by Eurostat. Such an approach provided for the relative homogeneity of data across EU member states, which report to Eurostat according to consistent criteria. There were alternatives to conducting an analysis of figures expressed as (i) a share of revenues from a particular tax in total tax inflows, (ii) a share of inflows from a particular tax in national GDP or (iii) the values of tax revenues expressed in EUR. The first two options would provide for biased results to some extent, as the level of both total revenues and GDP fluctuate. Moreover, due to the rounding of such shares expressed in databases, the calculation would be less precise. Therefore, the decision was made to select the third option – i.e. nominal values. The sourced data was complete for all countries and periods. The only exception were revenues from taxes on individual or household income for Germany, Hungary and Spain, where figures were missing and not available in nominal values in databases other than Eurostat (thus, their implementation in this article would be incompatible). However, PIT is not a key tax from the perspective of the research, and despite that limitation the calculations remain informative.

The volatility of bank taxes has been analysed using different statistical tools, in particular:

- descriptive statistics – in the first stage, data on the value of bank tax revenues for each country for the analysed period were prepared. Secondly, a mean for each state was calculated separately. Next, standard deviations were computed for each jurisdiction. Afterwards, these values were compared, and as a result, the

coefficients of variation for revenues from the bank tax for particular member states were assessed. Lastly, the average coefficient of variation for that tax for all countries in the sample was computed. The same procedure was followed for all other taxes that were used as a benchmark. Finally, this exercise enabled the researchers to assess how volatile or stable inflows from the bank tax are in comparison to other taxes.

- The HP filter, as a commonly used tool in macroeconomics, was applied in order to extract a trend component from a time series (de Jong and Sakarya, 2016; Hodrick and Prescott, 1997; Kufel et al., 2014). A trend line estimated with use of HP filter and lambda 100 - unlike standard approach of trend estimation - is not linear but characterised by better fit to empirical data. The decision was made to use the HP filter to smooth the empirical data and to get rid of outliers that may significantly impact the results. Next, for such estimated figures, descriptive statistics were again used and all the above-mentioned procedures were repeated. As a result, a slightly different perspective on the scale of volatility of the considered taxes was achieved.
- ANOVA – an alternative calculation was made to analyse the volatility of inflows from particular taxes. A one-way ANOVA for the entire set of thirteen countries for the period 2012-2020 was performed. Each year for all countries was defined as a group, and consequently nine groups within each tax were created. With six taxes to be analysed (the bank tax, CIT, VAT, PIT, SC and PIT+SC), ANOVA was also run six times. The objective was to verify the null hypothesis which assumes that there is no difference between the means of the groups. This study provided for one more alternative measure of the stability of the bank tax and other levies.

- Pearson correlation – empirical data were compared with figures produced by the HP filter. In doing so, the extent to which actual fiscal results follow the trend line has been verified. This study – unlike the three approaches discussed above – was not concerned with the mean. The initial assumption was that it may be the case that revenues from the bank tax (or other taxes) in a particular jurisdiction in the long term are rising or falling but always follow a certain trend, whereas for constantly rising or falling inflows from a particular tax the coefficient of variation would be high (because of significant deviation from the mean), and thus the correlation of empirical figures with the trend line produced by the HP filter might also be very high. This happens especially when there are few outliers. As a result, the trend is then smooth, and despite the high coefficient of variation, revenues are most likely easier for the government to anticipate in the following years.

The advantages of these simple research methods consist mainly in their intuitive understandability and ease of interpretation. The calculations used provide for information on variability of inflows from particular taxes both from the mean and the long-term trend. Therefore, the approach is sufficiently complex. Yet, as the study was conducted on aggregated panel data, no one-off individual effects are tracked and consequently the statistical methods used do not account for such potential outliers triggered by fiscal policy changes, for instance.

3. Results

The average coefficient of variation for inflows from the bank tax for all analysed countries over the period 2012-2020 is 29.3%. With the implementation of the HP filter, the figure becomes considerably lower (21.8%). This decreased value for a trend curve is

a reasonable outcome as outliers are eliminated. The authors are aware of various economic developments or legislative changes that could contribute to such high variation, which can be perceived as a limitation of the study. Nevertheless, amendments are also made in respect of other tax acts. Yet, they provide for considerably more stable budget inflows. In particular, for the same panel of countries the coefficient of variation for CIT is 16.7% and with the HP filter it falls to 11.7%. All other taxes demonstrate

a similar level of volatility. More specifically, the amounts are as follows (in descending order): PIT 10.6%; VAT 9.7%; PIT+SC 9.1%; SC 8.9%. In absolute terms with the HP filter the figures are only slightly lower: VAT 8.7%; PIT 8.3%; SC 8.1%; PIT+SC 8%. Therefore the scale of volatility between the bank tax and other taxes is approximately two to three times lower. The detailed data regarding the volatility of verified types of tax revenues in 13 EU countries in the period 2012-2020 are presented in Tables 4-9 below:

Table 4. Volatility of bank tax revenues in 13 EU countries in the period 2012-2020

State (bank tax)	Coefficient of variation (empirical data)	Coefficient of variation (HP filter)	Correlation of empirical data and HP filter data
Hungary	52.2%	48.4%	0.93
Greece	45.5%	24.9%	0.63
Germany	44.5%	41.0%	0.92
France	39.7%	38.1%	0.96
Sweden	37.5%	16.4%	0.52
Slovenia	30.9%	25.9%	0.85
Belgium	26.6%	12.3%	0.47
Spain	25.1%	18.8%	0.79
Austria	24.1%	21.1%	0.88
Slovakia	18.4%	8.6%	0.56
Cyprus	17.2%	13.5%	0.80
Portugal	13.2%	9.9%	0.76
Netherlands	6.2%	4.8%	0.79
Average	29.3%	21.8%	0.76

ANOVA (bank tax)

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1216491	8	152061.5	0.418217	0.907887	2.025247
Within Groups	39268196	108	363594.4			
Total	40484688	116				

Source: own elaboration

Table 5. Volatility of VAT revenues in 13 EU countries in the period 2012-2020

State (VAT)	Coefficient of variation (empirical data)	Coefficient of variation (HP filter)	Correlation of empirical data and HP filter data
Hungary	15.5%	15.1%	0.97
Slovakia	15.0%	14.8%	0.99
Netherlands	12.5%	12.1%	0.98
Cyprus	12.2%	10.0%	0.82
Spain	11.6%	9.9%	0.88
Portugal	10.2%	9.2%	0.91
Slovenia	9.3%	8.5%	0.92
Greece	7.6%	3.8%	0.53
Germany	7.4%	6.6%	0.89
Austria	7.2%	6.6%	0.93
France	6.4%	5.8%	0.91
Belgium	5.6%	4.8%	0.85
Sweden	5.6%	5.2%	0.93
Average	9.7%	8.7%	0.88

ANOVA (VAT)

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.76E+09	8	2.2E+08	0.05156	0.99993	2.025247
Within Groups	4.61E+11	108	4.27E+09			
Total	4.63E+11	116				

Source: own elaboration

Table 6. Volatility of PIT revenues in 13 EU countries in the period 2012-2020

State (PIT)	Coefficient of variation (empirical data)	Coefficient of variation (HP filter)	Correlation of empirical data and HP filter data
Slovakia	18.9%	18.5%	0.98
Netherlands	18.0%	17.3%	0.97
Cyprus	15.6%	7.1%	0.60
Slovenia	11.7%	10.6%	0.91
France	9.1%	8.4%	0.93
Portugal	9.0%	5.9%	0.68
Greece	8.2%	3.2%	0.48
Austria	6.4%	4.6%	0.73
Sweden	6.1%	4.6%	0.78
Belgium	3.4%	3.0%	0.90
Average	10.6%	8.3%	0.80

ANOVA (PIT)

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.11E+09	8	1.38E+08	0.03701	0.99998	2.054882
Within Groups	3.03E+11	81	3.74E+09			
Total	3.04E+11	89				

Source: own elaboration

Table 7. Volatility of CIT revenues in 13 EU countries in the period 2012-2020

State (CIT)	Coefficient of variation (empirical data)	Coefficient of variation (HP filter)	Correlation of empirical data and HP filter data
Slovenia	28.1%	27.4%	0.97
Greece	27.5%	9.2%	0.53
Netherlands	25.4%	23.5%	0.93
Hungary	23.8%	8.8%	0.52
Belgium	18.2%	14.0%	0.79
Austria	16.9%	12.6%	0.76
Slovakia	15.5%	12.1%	0.83
Germany	12.6%	8.7%	0.72
Portugal	12.0%	8.6%	0.74
Spain	11.8%	6.5%	0.60
Sweden	11.0%	10.3%	0.94
Cyprus	7.6%	5.2%	0.72
France	7.2%	5.8%	0.81
Average	16.7%	11.7%	0.76

ANOVA (CIT)

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	5.58E+08	8	69744387	0.115327	0.998578	2.025247
Within Groups	6.53E+10	108	6.05E+08			
Total	6.59E+10	116				

Source: own elaboration

Table 8. Volatility of SC revenues in 13 EU countries in the period 2012-2020

State (SC)	Coefficient of variation (empirical data)	Coefficient of variation (HP filter)	Correlation of empirical data and HP filter data
Cyprus	21.4%	19.0%	0.91
Slovakia	15.2%	15.1%	1.00
Slovenia	12.2%	11.7%	0.97
Germany	10.2%	10.1%	1.00
Portugal	9.8%	9.5%	0.98
Spain	9.2%	8.6%	0.95
Austria	8.9%	8.8%	0.99
Hungary	7.9%	6.5%	0.85
Netherlands	5.2%	4.9%	0.94
Sweden	4.6%	4.4%	0.96
Belgium	4.3%	4.2%	0.98
Greece	3.7%	1.3%	0.43
France	3.3%	1.1%	0.57
Average	8.9%	8.1%	0.89

ANOVA (SC)

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	5.71E+09	8	7.13E+08	0.025344	0.999996	2.025247
Within Groups	3.04E+12	108	2.81E+10			
Total	3.05E+12	116				

Source: own elaboration

Table 9. Volatility of (PIT+SC) revenues in 13 EU countries in the period 2012-2020

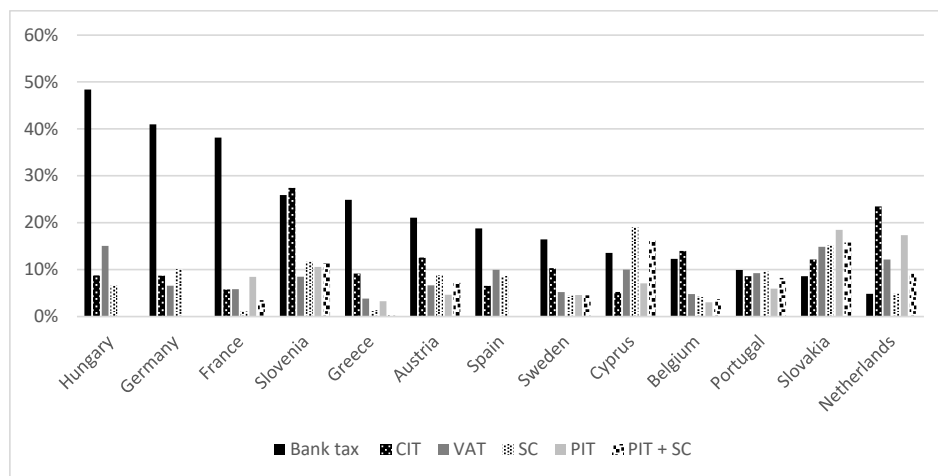
State (PIT+SC)	Coefficient of variation (empirical data)	Coefficient of variation (HP filter)	Correlation of empirical data and HP filter data
Cyprus	19.3%	16.2%	0.87
Slovakia	15.9%	15.8%	0.99
Slovenia	12.0%	11.4%	0.96
Netherlands	9.3%	9.2%	0.98
Portugal	8.7%	8.2%	0.95
Austria	7.5%	7.2%	0.96
Sweden	5.7%	4.6%	0.82
Greece	4.6%	0.3%	0.67
France	4.1%	3.5%	0.87
Belgium	3.8%	3.7%	0.97
Average	9.1%	8.0%	0.90

ANOVA (PIT+SC)						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	3.19E+09	8	3.99E+08	0.012076	1	2.054882
Within Groups	2.68E+12	81	3.3E+10			
Total	2.68E+12	89				

Source: own elaboration

The stability as a statistical variable (coefficient of variation adjusted by the use of the HP filter) is expressed graphically in Figure 2:

Figure 2. Coefficient of variation adjusted by the HP filter of different taxes in analysed countries



Source: National tax lists prepared by Eurostat

As the p-value for ANOVA for all taxes is higher than 0.05, there are no grounds to reject the null hypothesis. The null hypothesis states that there is no difference between the means of the groups (in this study, each group consists of revenues collected by certain countries from a particular tax). Such results are also confirmed by the F-statistic, where in the case of all taxes it is lower than the F critical value. Therefore, one may assume that the variation in value of revenues collected year-on-year by governments from all levies is not very high. However, the p-value for the bank tax of 0.91 is observed. At the same time, for all other taxes it is at least at the level of 0.99. Of course, any of these figures are some way higher than 0.05, which leads to the same conclusion – i.e. there is no difference between the means of the groups. Yet, such a difference in significance value suggests that indeed the variability of bank tax might well be higher.

All the above calculations are preoccupied with variation from the mean. In some countries, inflows from bank tax follow a certain trend line. Therefore, the authors have decided to analyse the extent to which revenues from that tax deviate from that

trend. Yet, the aforementioned conclusions of exceptionally large instability of inflows from bank tax also hold from this perspective. The average correlation coefficient of data on actual inflows from bank taxes and the trend line estimated with the HP filter for all analysed EU states is 0.76. At the same time, the results for other taxes are as follows: PIT+SC 0.90, SC 0.89, VAT 0.88, PIT 0.80 and CIT 0.76. It means that bank taxes are less likely to follow a trend than other taxes (except for CIT, which performed even slightly worse than the bank tax).

To summarise, calculations made with the use of (i) descriptive statistics performed on empirical data, (ii) descriptive statistics combined with the HP filter, (iii) ANOVA and (iv) Pearson correlation give convergent results and confirm the higher volatility of bank taxes in comparison to other taxes.

4. Discussion

Although the stability of tax revenues has been the subject of academic research, this has mainly concerned sales tax or income tax. There are also relatively few studies devoted to sectoral taxes, despite their

ever-growing importance. The volatility of bank tax revenues has not yet been analysed in the literature. The results obtained can only be contrasted with two works. The bank tax is a sectoral tax and the elevated variability of revenues from this type of tribute confirms the conclusions made by Williams et al. (1973) pertaining to the relatively high variability of receipts from the aforementioned sectoral taxes. However, the breakdown of banking systems identified in the study according to the criterion of variability of bank tax revenues is different from that identified by Bleaney et al. (1995), who showed the higher variability of tax revenues in countries defined as developing open economies with higher inflation.

The results obtained are important and bring implications for different stakeholder groups. First and foremost, they provide guidance to fiscal policy on which bank tax model is optimal from the point of view of its objectives. However, it should be pointed out that the long-term goal of fiscal policy shall be the stability (and thus also the predictability) of tax revenues, and the results obtained from the study provide an answer to the question of a solution that achieves this goal. In the short term, the goal may be to increase tax revenues on an ad hoc basis, but in turn, frequent changes in tax law do not support business development and economic growth (Gale and Samwick, 2014; Engen and Skinner, 1992). In turn, this approach favours the use of various forms of tax optimisation and provides a premise for the escalation of the phenomenon of tax competition, about which Burandt (2021), among others, has written. In turn, knowing which bank tax model is optimal for the state is important for bank managers. They can take timely action in the area of balance sheet structure that maximises (in response to a change in the taxation option) income and shareholder value. In relation to this issue, the impact of taxation on the

aforementioned change in balance sheet structure is mentioned by Gambacorta et al. (2017), who show that banks endogenously respond to a reduction in tax rates by reducing non-deposit liabilities more than deposits in addition to lowering leverage. Finally, bank tax revenues and the stability thereof have important social implications, which are manifested in three dimensions. First, as evidenced by numerous studies (e.g. Capelle-Blancard and Havrylchyk, 2017; Twarowska-Ratajczak, 2018), the bank tax is passed on to bank customers. Secondly, the development of sectoral taxes (as long as they fulfil their role, i.e. generate stable revenues) is one of the few solutions that make it possible not to increase PIT, CIT and VAT. Thirdly, sectoral taxes also serve important objectives other than fiscal ones, including social goals - for example, financial stability and minimising the risk of financial crises (bank tax), reducing the consumption of sugar or plastics, or limiting gambling.

Conclusions

The analysis of the bank tax in 13 EU countries where the tax was continuously in force between 2012 and 2020 confirmed the relatively high volatility of bank tax revenues compared to other forms of business taxation. Using descriptive statistics and the ANOVA method, the authors positively verified the hypothesis formulated at the beginning of the article. Furthermore, the filtering of the time series to extract the trend and the component responsible for the volatility resulting from changes in the business cycle phase performed using the HP filter leads to the conclusion of a relatively high level of volatility of the bank tax. Similar conclusions are drawn from the correlation analysis of the empirical data and the values estimated using the HP filter.

Having analysed the five countries with the highest (France, Germany, Hungary,

Slovenia and Greece) and lowest (Portugal, Slovakia, Netherlands, Cyprus and Belgium) level of volatility of bank tax revenues (based on the HP filter), it has been found that all countries with the highest volatility of bank tax revenues, except for Germany, have implemented a solution based on a direct or indirect tax base of assets (possibly assets minus interbank transactions). The indirect relationship, which exists in France, means that the capital requirement, which is a function of risk-weighted assets, is considered the tax base. In contrast, countries with the lowest volatility of tax revenue use liabilities (or liabilities adjusted for own funds and deposits covered by the deposit guarantee scheme). As a result, the second hypothesis set in this article was confirmed.

Countries with the highest volatility of bank tax revenues show an upward trend. The relationship between trend and volatility cannot be identified among the states with the lowest volatility of receipts. The above observation seems to be very important from the point of view of the state fiscal policy and optimisation of the tax calculation rules so that the latter meets the stability requirement. The authors also point out that from the taxation theory perspective, it is better to introduce several low taxes than a few high ones. This is due to the fact that at low taxation rate levels the deadweight loss is correspondingly small, which shall be considered a favourable situation. Deadweight loss depends on the price elasticity of demand/supply for the good and the tax rate squared. Since the elasticity is not readily observable, then the focus should be on the tax rate that increases this idle loss to the power, not just linearly. Despite the high volatility of revenues, given the above arguments and the need to fill the fiscal gap with another tax, the authors do not recommend abandoning bank taxes.

It should also be noted that the introduction of a bank tax is never without an

impact on banks' business models. One of the natural reactions of the sector, oriented towards the creation of shareholder value, are attempts to transfer selected business segments to countries with higher profitability rates and to pass on some of the costs to clients. An additional element affecting the stability of taxes paid is the reorientation of the existing structure of assets and liabilities in terms of tax optimisation.

To the best of the authors' knowledge, this study is the first of its kind to analyse the variability of bank tax revenues based on such a broad spectrum of EU economies, and the results obtained are a valuable source of information from the perspective of fiscal policy. However, the study has some limitations. These include the assumption of the stability of the formula for determining and allocating bank tax revenues, as well as the stability of the tax base (which can change, for example, under the influence of mergers and acquisitions in the banking sector or individual exemptions, nationalisation or the worsening financial performance of some banks leading to their exclusion from the group obliged to pay the tax or as a result of changes in fiscal policy affecting the scope of entities subject to the tax, tax rate or tax exemptions and incentives). In addition, aggregate data from the 13 countries studied were taken into account. Therefore, a comparative analyses of the variability of bank tax revenues across countries, as well as of the burden determined by different bank tax models, will be the direction of further research. Future studies may seek to be more detailed (e.g. performed on the level of a particular country) and take developments in a single economy, its banking sector or fiscal policy and legislation in a particular jurisdiction into consideration. Also, since the common measure of stabilisation function level is the elasticity of the tax base to GDP, this approach is to be applied in planned analysis.

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