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Fiscal sustainability vs tax gap – Evidence from Poland

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ABSTRACT

The main goals of the article are to investigate the level of fiscal unsustainability in Poland and estimate the tax gap necessary to stabilize the size of the public debt and to follow a path to fiscal sustainability. It hypothesizes that by closing the tax gaps for value-added tax (VAT) and personal income tax (PIT), Poland can cover most of its current fiscal needs and stabilize the country's fiscal situation. We estimated a modified version of the equation describing Ponzi games, calculated the primary gap indicator, and conducted cointegration tests for ex-post data on public expenditures and revenues to investigate the actual level of fiscal unsustainability. The research period covers yearly observations between 2003 and 2017. Empirical evidence confirmed our research hypothesis. We found out that closing the tax gap could change the situation dramatically. If the public authorities were able to collect the VAT and PIT that currently go uncollected, Poland could easily embark on the path towards fiscal sustainability.

KEYWORDS

public finance, primary deficit, tax gap, fiscal sustainability

JEL CLASSIFICATION INDICES

H62, H26

1. INTRODUCTION

Nowadays, many market economies struggle with excessive fiscal deficits and large volumes of public debt. The latest international literature provides evidences on the unsustainability of the

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European economies (Neaime 2015). The average public debt-to-gross domestic product (GDP) ratio for the European Union (EU) Member States has been rising for years, and is far from the Maastricht Treaty criterion (max. 60%). The same can be said about public sector deficits in the EU. In this case, the average deficit for the EU economies in the period of 2003–2014 amounted to 3.5% of GDP (max. 3% of GDP). Obviously, performance was worse during the financial crisis. In terms of using the Maastricht fiscal convergence criteria under the fiscal governance framework of the EU (relevant to the fiscal deficit and public debt), we should remember that their concept is criticized in the literature (e.g. Buiter et al. 1993) on the one hand, but on the other hand, they are sometimes "…considered major devices to prevent excessive debt increases" (Neck – Sturm 2008: 8). All the convergence criteria (relevant to deficit, debt, long-term interest rates, exchange rates and prices) "…are intended to ensure economic convergence (…) and were agreed by the EU Member States in 1991 as part of the preparations for the introduction of the euro" (EC 2016).

Poland, as an EU member, is formally required to adopt the euro currency (although *when* remains a question) and join the European Monetary Union. To do this, a Member State is obliged to meet the convergence criteria. We should mention that Poland had fulfilled the debt-to-GDP Maastricht criterion since the very beginning of the transition period, however, debt volume rose significantly in the investigated period. The average value of the deficit-to-GDP ratio in the analysed period was 4.6%. The results of previous research show that Poland failed the test for long-term fiscal sustainability at both the central government and local government levels (Uryszek 2015a, 2015b). Moreover, there is a tax gap, which represents the taxes that are due but are not collected (Klonowska 2017).

Considering these circumstances, this paper aims to answer some pertinent research questions: how far is Poland from achieving fiscal sustainability, what are the reasons for its current unsustainability and is it possible to close the existing tax gap with tax revenue assessed as unlikely to be collected? We investigate the level of fiscal unsustainability in Poland and estimate the reduction in the tax gap necessary to stabilize the size of public debt and embark on the fiscal sustainability path. As the value-added tax (VAT) and personal income tax (PIT) are the two main sources of tax revenue in Poland, we hypothesize that the tax gap created by uncollected VAT and PIT can cover most of the country's existing fiscal needs and stabilize its fiscal situation.

Following this introduction, the article consists of five Sections. In the second Section, we outlines the concept and theoretical background of fiscal sustainability and the tax gap. In the third one, we present the research method for the fiscal sustainability assessment, describe the data and outline the concept of the tax gap measures for VAT and PIT. The fourth Section reveals the actual level of fiscal unsustainability and the tax gap in Poland. In the fifth Section, we assess the level of fiscal sustainability after the tax gap inclusion. The last Section consists of a summary of the findings, conclusions and policy implications for Poland.

2. FISCAL SUSTAINABILITY AND THE TAX GAP – DEFINITIONS AND CONCEPTUAL ISSUES

2.1. Fiscal sustainability

Fiscal sustainability, its definitions and measures have been thoroughly discussed in the international and the Polish literature (John – Kurian 2009; Potrafke – Reischmann 2015). The

concept dates back to the time of the classical economists (Rowley et al. 2002) and is mostly relevant to fiscal capacity, tax gaps and primary deficits in the context of intertemporal budget constraints (e.g., Blanchard 1990; Bohn 1991; Bianconi 2000; Gabriel – Sangduan 2010; Molendowski – Stanek 2012; Collard et al. 2015; Konopinski 2021). The size of public debt and its consequences (as well as interactions) for the entire economy (financial and real spheres) have been profoundly investigated (Furceri – Zdzienicka 2012; Wiley 2013, 2014; Nishimura et al. 2015; Tanzi 2016). We should remember, however, that the effects of public spendings (affecting the increase of public debt) described in the literature are not always negative. Not only does the Keynesian approach (Gali 2013) provide justification for the use of public borrowing as a solution, but so does the mainstream economics too. It is connected to the Ricardian equivalence (Neck – Strum 2008: 2), debt neutrality theorem (Barro 1974, 1989) and intergenerational distribution of public debt (Lindbeck – Weibull 1986).

Fiscal sustainability can be defined as the absence of default risk (Neck – Sturm 2008). A sustainable fiscal policy is one that, if continued without modification, would keep the government solvent (Tanner 2013). A fundamental characteristic of sustainable fiscal policy consists of the government's rejection of situations in which the fiscal agents systematically service the cost of existing debt exclusively by the new borrowing processes (Fan – Arghyrou 2013). We can say that – in the long-run – the discounted value of all future primary fiscal surpluses should cover the initial level of public debt (Leonte 2011). For fiscal policy to be sustainable, this condition must be met (Neck – Sturm 2008: 6). In other words, public authorities should avoid Ponzi games (Minea – Villieu 2010; Martins-da-Rocha – Vailakis 2012). The sustainability of public finance is then based on fiscal surpluses and on controlling public borrowing (Gevorkyan 2010: 169). The size of the primary surplus is critical (Tanner 2013: 5). According to Shaw (2017), for fiscal policy to be sustainable, a government that currently has a higher ratio of debt-to-GDP than desired must run the primary fiscal surpluses until the debt-to-GDP ratio hits the target over a given period, which is usually between 25 and 75 years. To achieve fiscal sustainability, public authorities should tighten fiscal policy immediately or in the near future. In a short-term perspective, the fiscal authorities should stabilize the public debt-to-GDP ratio. To do that, they need to produce sufficient levels of primary surplus and pubic revenues (expenditures are supposed to be an exogenous variable – see Rowley et al. 2002).

It is worth mentioning that the problem of fiscal sustainability in the Central and Eastern European (CEE) countries – including Poland – has been already examined in the literature (eg., Uryszek 2015a, 2019; Mackiewicz-Łyziak 2015; Grover – Walacik 2019). The results of the research allow us to conclude that Poland, like other EU countries of CEE, has serious sustainability problems in the public finance sector (including stabilization of public debt). These economies mostly meet the Maastricht criterion of maximum public debt, but this is not enough. Poland is capable of generating primary surpluses in the public finance sector, both on a real and structural level. At the same time, the level of primary surpluses generated in Poland is too low and does not allow to cover the existing debt. As a result, the authorities effectively pursue something like a Ponzi scheme: they repay the debt from fresh borrowing.

2.2. The concept of the tax gap

While looking for ways to increase public revenue, the fiscal authorities have implemented different concepts towards increasing tax compliance e.g., the Australian Taxation Office (ATO),

Her Majesty's Revenue and Customs (HMRC) in the UK, and the Internal Revenue Service of the USA (IRS). Monitoring the tax gap has become a part of the compliance risk management strategies (Australian Taxation Office 2016; Reckon 2009; OECD 2015). Fiscal authorities assume that reducing the tax gap would help to improve fiscal sustainability (Walker 2005). Although estimating the tax gap is a standard activity of the fiscal authorities in the market economies all over the world and a part of their fiscal policies, it has not been considered particularly important in Poland. The Polish authorities published the first official document on this very issue entitled "Activities that Increase the Level of Tax Compliance and Improve the Efficiency of Tax Administration in the Years 2014–2017" as late as 2014 (Ministry of Finance 2014). The document stressed the necessity to report on the tax gap. However, such estimates have yet to be either published or even prepared by the Polish government. The tests carried out so far prove that the main reason for this is the lack of data necessary to make reliable estimates and the related selection of an appropriate method for estimating the tax gap (Klonowska 2017: 233). The fact that in the domestic literature, the number of items devoted to the tax gap category is negligible, is detrimental to preparing such estimates. Additionally, the tests verifying the legitimacy of using a particular method in domestic conditions are minimal.

According to Malamud – Parry (2018), it is difficult to point to when exactly the term "tax gap" started to be used, but it was probably in the early 1980s. Other sources report that the first tax gap estimates were prepared by the Internal Revenue Service in the US in 1973 (U.S. General Accounting Office 1995: 2). According to the literature of subject, a tax gap means the difference between the total amounts of tax theoretically collectable based on the applicable tax law and the total amounts of tax actually collected in a given period (Andreoni et al. 1998; Gencheva 2011; Gemmel – Hasseldine 2012; EC 2018b). In a broader sense the tax gap consists of three categories of noncompliance: underreporting, underpayment and nonfiling. The first consists the amount of lost revenue from filed tax returns that underreport the amount of taxes owed. The second one means the difference between the amounts that were reported to be owed, and the amounts actually paid for the correctly filed tax returns. The last one is the amount of tax revenue lost from the returns that were never filed (Dubin 2012). From a tax collection perspective, the tax gap can be divided into a net tax gap and a gross tax gap. The latter focuses more on voluntary compliance, while the concept of a net tax gap involves the shortcomings of the tax administration's activities (tax collection) (EC 2016b: 14–15).

3. RESEARCH METHOD AND DATA

The research method used to assess the level of Poland's (un)sustainability is a modified version of the equation described by O'Connell – Zeldes (1988: 434) and Chalk – Hemming's (2000: 4) formal description of the no-Ponzi game condition. The Ponzi game, or scheme, is named after Charles Ponzi, an Italian white-collar criminal of 1920s in the United States. Generally, Ponzi schemes defraud investors by offering them lucrative investments with a very low level of risk. A Ponzi scheme in the area of fiscal policy means that the government systematically services the cost of the existing debt exclusively through new borrowing. This leads to insolvency and a country's bankruptcy. To avoid Ponzi schemes, governments should be able to cover the initial level of public debt with future primary surpluses.

As the results of empirical studies demonstrating a rather poor predictive power of fiscal sustainability indicators (Tóth 2014), we started with the ex-post assessment of the level of fiscal

sustainability in Poland. We took the beginning of 2003 as the starting point. Being aware that Poland has been characterized by fiscal deficits (including at the primary level in some years), we expected that the sum of the discounted primary fiscal surpluses was too low to cover the already existing debt. Instead, we checked whether the sum of the discounted primary surpluses was at least positive. The formula used is shown below:

$$\sum_{j=0}^{n} R(t,\ t+j)^{-1} D_{t+j} \geq 0 \tag{1}$$

where D_{t+j} is the primary balance (net lending less interest on public debt) in the period $t+j$; $R(t, t+j)$ is the discount factor applied between periods t and $t+j$, $R(t,\ t+j) = \prod_{k=0}^{j} R_{t+k}$ and $R_{t+k} = 1 + r_{t+k}$; and r_{t+k} is the real interest rate paid at the end of the period $t+k$.

We used nominal values for the ex post estimations of this formula. The calculations were conducted for the actual data as well as for several estimated vectors of the primary balance.

First, we applied the formula to the actual data from Eurostat. Then we added on the estimated amounts of uncollected tax revenue:

- the VAT gap,
- the net PIT gap,
- the gross PIT gap,
- the sum of VAT and net PIT gaps,
- the sum of VAT and gross PIT gaps.

In research, the tax gaps were used for VAT and PIT. This decision stems from the fact of a small group of countries produces and publishes the corporate income tax (CIT) gap, and excise tax gap as well. To our best knowledge Poland is *not* among them. In accordance with the last accessible information of the EC estimates on in-house CIT gap is not planned, initiated or not ongoing in our country (EC 2018b: 61). Data from OECD confirms it as well (OECD 2017, Table A. 139). However, we observed the development of estimation methodologies in this field (Ueda 2018). Although the problem of the CIT gap is broadly commented in the international arena, we would like to note that the results of a survey on the practices of CIT gap estimations show that only 9 EU countries are performing the national estimations. This reflects the last accessible information as of June 2017 (EC 2018b). In Poland, the Ministry of Finance (2020) has assumed developing a methodology for estimating the gap in excise duty and CIT in 2020. So far we possessed only brief information about the amount of tax gap in CIT and excise tax gap published occasionally. The results vary widely, e.g., the study provided by the researchers at the Warsaw School of Economics shows that the CIT gap is amounted to PLN 43–46 billion (Arak et al. 2019). Polish Economic Institute shows that the CIT gap is amounted to PLN 29 billion on average in 2014–2018 (Sawulski et al. 2020). Other researchers assess that the CIT gap oscillates between PLN 1–14 billion before 2015 (Frizis et al. 2017). Taking into consideration the fact of uncompleted and varied estimations on the CIT gap and the lack of data on the excise tax gap, we decided about reducing our research to the VAT and PIT gap.

According to the International Revenue Service methodology (2011), the tax gap for PIT was estimated by Tax Gap Map 2006. The first step in the research was to establish the total tax liability (TTL) and its components for a given tax year. The total theoretical tax liability was calculated as a sum of the tax gap, and the amount of tax actually received. The formula is:

$$\mathrm{TTL} = \mathrm{GTG} + \mathrm{TVT} \tag{2}$$

where:

- TVT is the tax paid voluntarily and timely,
- GTG is the gross tax gap.

The gross tax gap, which includes enforced taxes, tax arrears and net tax gap, is one of the components of TTL. The formula used is shown below:

$$\mathrm{GTG} = \mathrm{ELP} + \mathrm{NTG} \tag{3}$$

where:

- NTG is the net tax gap
- ELP is enforced and other late payments of tax.

The net tax gap is calculated as:

$$\mathrm{NTG} = \mathrm{GTG} - \mathrm{ELP} \tag{4}$$

The amounts of the total tax liability include revenues from taxes paid voluntarily and timely, tax arrears, the number of tax enforcements and the amounts of unpaid (including hidden) tax. In turn, the gross tax gap is obtained when we subtracted voluntarily paid liabilities from obligations due to be paid. As a result, we arrived at the following formula:

$$\mathrm{GTG} = \mathrm{TTL} - \mathrm{TVT} \tag{5}$$

For the VAT gap, we used official estimations carried out for EC and prepared by Poniatowski – Bonch-Osmolovskiy (2016). In both cases, the tax gap estimates were obtained using a top-down approach. Our study's research period covers the observations between 2003 and 2017. Research period depends on the availability of National Accounts data necessary for assessing of tax gap in PIT. Moreover, the length of the research period seems to be adequate as it is much longer than the average period to maturity of public borrowing instruments (e.g., Uryszek 2015a). It also covers the years before, during, and after the financial crisis, providing us with a more general picture of the problem of fiscal sustainability. The results of the empirical estimations of the gaps in VAT and PIT are presented in Section 4. Data on the gaps are presented in Table 4.

We used the method described by equation 1 as it reflects the critical condition of fiscal sustainability. It checks whether the economy was able to produce the primary surpluses needed in a given period.

Then we used the primary gap indicators, developed by Blanchard (1990), calculated for nominal data and for the GDP ratios, i.e.,:

$$D^* = (r_t - n_t)B_t \text{ and } d^* = (r_t - n_t)b_t \tag{6}$$

where:

- d^* is the primary balance to GDP ratio necessary to stabilize the public debt ratio to GDP;
- D^* is the volume of the primary balance necessary to stabilize the public debt volume;
- r_t is the real interest rate on public borrowing in period t;

- n_t is the economy's real growth rate in period t;
- b_t is the public debt volume to output in period t.

If the outcomes of formula (6) were lower than the actual primary balance values, it would suggest that the primary surpluses were sufficient (or primary deficits were low enough) to stabilize the public debt-to-GDP ratio. We did ex-post estimations for the data before and after closing the tax gaps.

We also used the ADF and the Engle-Granger methods for cointegration testing, as it performs well in small samples. We wanted to check whether the public revenues and expenditures have moved closely together. We are aware of the fact that our sample is very limited and that the statistical tests of fiscal sustainability often provide different results depending on the data samples and the initial assumptions adopted (Corsetti – Roubini 1991; Gabriel – Sangduan 2010; Fincke – Greiner 2012; Mahdavi 2014; Tsuchiya 2016). Additionally, according to Bohn (2007), fiscal policy can be sustainable even if the revenues and expenditures are not cointegrated. However, we used this test as a supplementary method for our investigation process. We tested the following cointegration regression:

$$REV_t = a + b \cdot EXP_t + u_t \tag{7}$$

where REV_t and EXP_t are total revenues and total expenditures, respectively, expressed in nominal values in the Polish currency. We assumed that revenues are the dependent variable, and expenditures are exogenous here. We tested cointegration for the actual data and for our estimations, assuming that the particular tax gaps were closed.

4. THE LEVEL OF FISCAL UNSUSTAINABILITY AND THE TAX GAP – EMPIRICAL INVESTIGATION FOR HISTORICAL DATA

To assess the initial level of fiscal unsustainability in Poland, we used the actual "official" data, as mentioned earlier. The values of primary net lending (according to Eurostat) are shown in Table 1.

Each observation (excluding 2007) was negative. That is why the sum of the discounted primary net lending values was, obviously, negative. The outcomes for the sum of the nominal and as well as discounted (i.e., the left side of Eq. 1) values for the "official" data were PLN –363.7 bn and PLN –293.8 bn respectively, meaning that Poland seriously failed to achieve fiscal sustainability in that period. These outcomes were verified by the cointegration test. The outcomes for this test presented in Table 2 confirm the above-mentioned verdict.

We also calculated the values of primary gap indicator and compared them with the actual data. The outcomes are presented in Table 3.

The outcomes clearly show that Poland strongly failed the Blanchard's test on primary balance. The historical values of primary balance were (in most cases) insufficient to stabilize the debt volume.

As the next part of our research, we estimated the levels of the VAT and PIT gaps to reveal whether they were sufficient to stabilize the fiscal situation in Poland. Detailed data are presented in Table 4.

Table 1. Values of primary net lending (million PLN)

Year	Nominal	Discounted, according to formula (1), using the real interest rate
2003	–26 345	–25 096
2004	–21 793	–20 374
2005	–14 849	–13 533
2006	–12 727	–11 212
2007	3 855	3 339
2008	–19 110	–16 211
2009	–65 881	–54 651
2010	–70 927	–56 545
2011	–36 800	–28 582
2012	–17 663	–13 372
2013	–27 781	–20 276
2014	–29 099	–20 618
2015	–15 428	–10 724
2016	–12 385	–8 381
2017	1 941	1 294
Total	–364 992	–294 943

Source: Eurostat data.

Table 2. Results of DF-GLS unit root test and the Engle – Granger cointegration test

DF-GLS unit root test			
Variables	**Lags**	**Test statistic**	***P*-value**
REV_t	2	–0.533366	0.8824
EXP_t	0	0.0946256	0.9528
Engle–Granger cointegration test			
Variables	Lags	Test statistic	*P*-value
REV_t and EXP_t	1	–2.79678	0.1667

Note: REV_t and EXP_t are public (general government) revenues and expenditures, respectively, expressed in PLN, as stated in equation 7. To select lags (max = 2), modified AIC was used. Calculations were made in the GRETL computer program.
Source: Eurostat data.

Table 3. Results for Blanchard's primary gap indicator (million PLN)

Year	D^*	$D_t - D^*$	Passed/Failed
2003	5 568.08	–31 913.08	Failed
2004	–13 621.67	–8 171.33	Failed
2005	–4 181.75	–10 667.35	Failed
2006	–13 736.78	1 009.78	Passed
2007	–27 957.90	31 812.90	Passed
2008	–12 730.17	–6 379.83	Failed
2009	–3 777.13	–62 103.87	Failed
2010	3 425.49	–74 352.49	Failed
2011	–20 100.35	–16 699.65	Failed
2012	8 602.40	–26 265.40	Failed
2013	21 579.02	–49 360.02	Failed
2014	–2 365.78	–26 732.92	Failed
2015	–17 683.91	2 256.11	Passed
2016	490.74	–12 875.74	Failed
2017	–34 241.40	36 182.40	Passed

Note: d^* is the value of primary gap indicator and d_t is the actual primary net lending, according to equation 4.
Source: Authors' own elaboration based on Eurostat data.

Table 4. Tax gap, 2003–2017 (million PLN)

Year	Net PIT Gap*	Gross PIT Gap*	VAT Gap**
2003	5 962	9 412	12 454
2004	2 858	6 068	12 749
2005	3 885	7 285	8 205
2006	2 840	6 514	5 186
2007	6 843	10 136	2 188
2008	9 541	13 214	11 747
2009	8 018	12 243	17 066
2010	8 008	12 694	30 556
2011	13 133	18 354	33 575
2012	5 582	11 643	41 926

(continued)

Table 4. Continued

Year	Net PIT Gap*	Gross PIT Gap*	VAT Gap**
2013	4 901	11 684	40 457
2014	10 971	18 099	39 832
2015	6 679	14 149	39 573
2016	5 426	13 126	32 860
2017	6 905	14 902	24 538

Notes: * Authors' own calculations. **The data converted at the average exchange rate on 10/12/2016.
Sources: Reckon LLP (2009); European Commission 2013, 2016a, 2016b, 2017, 2018a, 2018b, 2019; Statistical Office of Poland.

The huge scale of tax fraud significantly affects the fiscal unsustainability of Poland. The data presented suggest that the impact of the tax gap for both taxes could be important for public revenue collection and fiscal policy improvement.

5. THE LEVEL OF FISCAL (UN)SUSTAINABILITY AFTER CLOSING THE TAX GAPS

The tax gap dramatically changed the fiscal situation in Poland. If it had been collected by the public authorities, the primary net lending would have been positive in most of the investigated years. These hypothetical data are presented in Table 5.

After the VAT and PIT tax gaps "inclusion", the values of the primary net lending improved significantly. They were strongly negative, particularly in the years of 2009–2010 i.e., during the apogee of the financial crisis. In 2007 and staring form 2012, closing the VAT gap would be enough to produce primary surpluses. In 2016, closing the gross PIT gap only would be sufficient to achieve this goal. Closing the tax gaps should then direct Poland to the sustainable fiscal path.

As the full closing of the VAT gap seems to be extremely hard to achieve, we also assumed that this gap in Poland could be reduced to the EU median level (EC 2019). Results of such an assumption are presented in Table 6.

The results are very similar to those, presented in Table 5. In 2007 and between 2012 and 2017, reducing the VAT gap to the EU median would be sufficient to produce the primary surpluses in Poland.

As the next part of our study, we estimated the outcomes for the formula described in Eq. 1. We did it under the assumption that the particular tax gaps were closed. The results are presented in Table 7.

The sum of the discounted primary net lending values, assuming that the VAT and PIT gaps were closed, was positive (both: for VAT and net PIT as well as for VAT and gross PIT gaps). We obtained similar results for the assumption that the VAT gap was reduced to the EU median level, and the net or gross PIT gaps were closed. This means that Poland could enter the path to

Table 5. The values of primary net lending (after the particular tax gaps would have been closed, million PLN)

Year	Primary net lending				
	Including VAT gap	Including net PIT gap	Including gross PIT gap	Including VAT and net PIT tax gaps	Including VAT and gross PIT tax gaps
2003	–13 891	–20 383	–16 933	–7 929	–4 479
2004	–9 044	–18 935	–15 725	–6 186	–2 976
2005	–6 644	–10 964	–7 564	–2 759	641
2006	–7 541	–9 887	–6 213	–4 701	–1 027
2007	6 043	10 698	13 991	12 886	16 179
2008	–7 363	–9 569	–5 896	2 178	5 851
2009	–48 815	–57 863	–53 638	–40 797	–36 572
2010	–40 371	–62 919	–58 233	–32 363	–27 677
2011	–3 225	–23 667	–18 446	9 908	15 129
2012	24 263	–12 081	–6 020	29 845	35 906
2013	12 676	–22 880	–16 097	17 577	24 360
2014	10 733	–18 128	–11 000	21 704	28 832
2015	24 145	–8 749	–1 279	30 824	38 294
2016	20 475	–6 959	741	25 901	33 601
2017	26 479	8 846	16 843	33 384	41 381

Source: Authors' own estimations based on Eurostat data.

fiscal sustainability if the tax gap for VAT and PIT were closed (or the PIT gap was closed and the VAT gap was reduced to the EU median level) by collecting the uncollected taxes.

However, these outcomes were not confirmed by the cointegration tests. The outcomes for the Engle – Granger tests are presented in Table 8.

We may observe that there was no cointegration between revenues and expenditures, even after closing the tax gaps (or reducing the VAT gap to the EU median level). We may find different explanations for that. First, reducing (or even closing) the gap for more than a dozen of years does not mean reaching fiscal sustainability. Second, the research sample is very short, even for the Engle – Granger method. Third, we must keep in mind Bohn's research on cointegration. On the other hand, we may observe that closing the tax gaps would strongly improve the outcomes for Blanchard's primary gap indicator. They are presented in Table 9.

Closing the VAT and PIT tax gaps in Poland would affect mostly the positive results for the primary gap indicator. Poland would fail this test three times only in the years of 2003–2017. Similar results were obtained when we assumed that the PIT gap was closed, and the VAT gap was reduced to the EU median level. They are presented in Table 10.

Table 6. The values of primary net lending (after the VAT gap has been reduced to the EU median, million PLN)

Year	Primary net lending/borrowing		
	Including VAT gap	Including VAT and net PIT tax gaps	Including VAT and gross PIT tax gaps
2003	–15 567	–9 605	–6 155
2004	–10 823	–7 965	–4 755
2005	–8 740	–4 855	–1 455
2006	–9 898	–7 058	–3 384
2007	3 373	10 216	13 509
2008	–10 580	–1 039	2 634
2009	–51 546	–43 528	–39 303
2010	–43 532	–35 524	–30 838
2011	–6 786	6 347	11 568
2012	20 508	26 090	32 151
2013	8 847	13 748	20 531
2014	6 791	17 762	24 890
2015	20 121	26 800	34 270
2016	16 577	22 003	29 703
2017	22 228	29 133	37 130

Source: Authors' own estimations based on Eurostat data.

Table 7. The sum of discounted primary net lending values (after the tax gaps inclusions) – ex post estimations

Including VAT gap	The outcomes for the formula described in the Eq. 1 (million PLN)						
	Dimishing VAT gap to EU median level	Including net PIT gap	Including gross PIT gap	Including VAT and net PIT tax gaps	Dimishing VAT gap to EU median level and including net PIT tax gap	Including VAT and gross PIT tax gaps	Dimishing VAT gap to EU median level and including gross PIT tax gap
–27 065	–63 603.18	–214 798	–154 587	53 081	16 542.10	113 292	76 753.13

Source: Author's own estimations based on Eurostat data.

Table 8. Results of DF – GLS unit root test and the Engle – Granger cointegration test

DF – GLS unit root test			
Variables	**Lags**	**Test statistic**	***P*–value**
REV_{1t}	0	–0.364848	0.8908
REV_{2t}	2	–0.76178	0.8291
REV_{3t}	2	–0.718356	0.8404
REV_{4t}	0	–0.413602	0.8816
REV_{5t}	0	–0.376068	0.8887
REV_{6t}	0	–0.353905	0.8927
REV_{7t}	0	–0.40451	0.8834
REV_{8t}	0	–0.36656	0.8904
EXP_t	0	0.0946256	0.9528
Engle – Granger cointegration test			
Variables	Lags	Test statistic	*P*–value
REV_{1t} and EXP_t	1	–2.58457	0.2437
REV_{2t} and EXP_t	0	–2.42276	0.3558
REV_{3t} and EXP_t	0	–2.32678	0.3957
REV_{4t} and EXP_t	1	–2.40132	0.324
REV_{5t} and EXP_t	1	–2.37505	0.3364
REV_{6t} and EXP_t	1	–2.57364	0.2481
REV_{7t} and EXP_t	1	–2.39037	0.3291
REV_{8t} and EXP_t	1	–2.36361	0.3419

Notes: * REV_{1t} are public revenues after closing the VAT gap; REV_{2t} are public revenues after closing the net PIT gap; REV_{3t} are public revenues after closing the gross PIT gap; REV_{4t} are public revenues after closing the VAT and the net PIT gaps; REV_{5t} are public revenues after closing the VAT and the gross PIT gap; REV_{6t} are public revenues after reducing the VAT gap to the EU median; REV_{7t} are public revenues after closing the net PIT gap and reducing the VAT gap to the EU median; REV_{8t} are public revenues after closing the gross PIT gap and reducing the VAT gap to the EU median; EXP_t are public expenditures. To select lags (max = 2), modified AIC was used. Calculations were made in the GRETL computer program.
Source: Authors' elaboration based on Eurostat data.

We may observe that Poland would fail the test for Blanchard's indicator five times out of 15. It means that reducing the VAT gap to the EU median level and closing the PIT gap in Poland would be sufficient to stabilize the public debt volume in most of the analysed years in Poland.

Table 9. Results for Blanchard's primary gap indicator after closing the tax gaps (million PLN)

Year	D^*	$D_t^{'} - D^*$	passed/failed
2003	5 568.08	–10 047.08	Failed
2004	–13 621.67	10 645.67	Passed
2005	–4 181.75	4 822.65	Passed
2006	–13 736.78	12 709.78	Passed
2007	–27 957.90	44 136.90	Passed
2008	–12 730.17	18 581.17	Passed
2009	–3 777.13	–32 794.87	Failed
2010	3 425.49	–31 102.49	Failed
2011	–20 100.35	35 229.35	Passed
2012	8 602.40	27 303.60	Passed
2013	21 579.02	2 780.98	Passed
2014	–2 365.78	31 198.08	Passed
2015	–17 683.91	55 978.11	Passed
2016	490.74	33 110.26	Passed
2017	–34 241.40	75 622.40	Passed

Note: D^* is the value of primary gap indicator, according to equation 6, and $D_t^{'}$ is the estimated value of primary net lending after closing the tax gaps.
Source: Authors' elaboration based on Eurostat data.

Table 10. Results for Blanchard's primary gap indicator after closing the tax gaps (million PLN)

Year	$D^{''}{}_t - D^*$	passed/failed
2003	–21 134.97	failed
2004	2 799.06	passed
2005	–4 558.40	failed
2006	3 838.74	passed
2007	31 331.06	passed
2008	2 150.63	passed
2009	–47 769.02	failed
2010	–46 957.79	failed

(continued)

Table 10. Continued

Year	$D''_t - D^*$	passed/failed
2011	13 314.79	passed
2012	11 905.92	passed
2013	–12 732.03	failed
2014	9 156.85	passed
2015	37 805.27	passed
2016	16 085.76	passed
2017	56 468.91	passed

Note: D^* is the value of primary gap indicator, according to equation 6, and D''_t is the estimated value of primary net lending after closing the PIT gap and reducing the VAT gap to the EU median.
Source: Authors' elaboration based on Eurostat data.

6. CONCLUSIONS AND POLICY IMPLICATIONS

The levels of fiscal unsustainability and fiscal gaps in Poland are significant. Poland has fulfilled the criterion concerning the maximum volume of public debt, and now it finances the deficit criterion, but that is insufficient. Poland is unable to generate primary net surpluses, which prevents the country from achieving a sustainable fiscal situation and produces Ponzi scheme losses. As primary deficits have been recorded in the past years, the nominal volumes of the gross public debt have been rising continuously, making the real obstacle in the path to fiscal sustainability the issue of primary deficits.

However, we found that closing the tax gap on VAT and PIT could change the situation dramatically. If the public authorities were able to collect the uncollected amounts of VAT and PIT, Poland could easily embark on the path toward fiscal sustainability. Significant net primary surpluses could be generated. The sum of the discounted values of the primary net lending (for the ex-post estimations in the period of 2003–2017) would be positive (which means fulfilling the condition presented in Eq. 1).

Therefore, imposing new taxes or increasing the current tax burden is not the first best option to achieve sustainability in the Polish public finance sector. Instead, steps should be taken to close the tax gap (by sealing the tax system and through the enforcement of existing regulations or by seeking ways to increase voluntary tax compliance). Our study has shown that reducing the size of the tax gap for VAT and PIT alone could significantly affect the central government's budget balance in Poland and would help to avoid dangerous Ponzi games. Thus, the government should attempt to close this gap as the most efficient way to embark on the path to fiscal sustainability.

Considering the future revenues for this research, as well as the general policy implications of this study, we take into account the following issues. First, we are aware of the fact that our study investigates the gaps in VAT and PIT only. Consequently, future research should focus on investigating the gaps in corporate income and excise taxes. Future research should also seek out

the most efficient ways to close all the tax gaps and uncover these instruments. Then, we would like to apply other cointegration tests. Since several observations are required to apply them, this will become possible in the future.

Ultimately, we need to remember that the political changes that took place in Poland in 1989 and at the beginning of the 1990s were very similar to those experienced by other post-socialist Central and Eastern European economies, including several current EU Member States. They have all had to create modern market economies and adapt their political and economic systems to the new political reality. We need to focus on these countries and investigate the tax gaps there as well. In this way, we will be able to confirm whether the situation we found in Poland is unique or if it can be considered a reflection of the general state of affairs.

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