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Empirical Evidence on Selective Sovereign Defaults

Selektywne bankructwa na długu publicznym – analiza empiryczna

Abstract

This paper introduces a new empirical measure of fiscal fragility, specifically defined by fluctuations in the government's tax base, to analyze selective sovereign defaults on domestic and foreign debts. Utilizing data from multiple economies, the study tests theoretical predictions linking output and tax base shocks to selective default probabilities. The results confirm that output contractions predominantly drive foreign defaults, whereas fluctuations in the tax base primarily induce domestic defaults. The findings enhance the understanding of sovereign default risks, emphasizing the distinct roles of domestic and foreign debts.

Keywords: Sovereign Debt, Selective Default, Debt Composition.

JEL: F34, G15, H63

Streszczenie

W niniejszym artykule przedstawiono nową empiryczną miarę wrażliwości fiskalnej, definiowaną poprzez wahania bazy podatkowej państwa, w celu analizy selektywnych niewypłacalności na długu krajowym i zagranicznym. Wykorzystując dane z wielu gospodarek, badanie testuje przewidywania teoretyczne łączące wahania w PKB i w bazie podatkowej z prawdopodobieństwem selektywnej niewypłacalności. Wyniki potwierdzają, że spadki PKB w głównej mierze powodują niewypłacalności zagraniczne, natomiast spadki bazy podatkowej są głównym czynnikiem wywołującym niewypłacalności krajowe. Otrzymane rezultaty poszerzają wiedzę na temat ryzyka niewypłacalności państwowej, podkreślając odmienną rolę długu krajowego i zagranicznego.

Słowa kluczowe: dług publiczny, bankructwo selektywne, kompozycja długu.

JEL: F34, G15, H63



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1. Introduction

The literature on sovereign debt has traditionally concentrated on the causes and consequences of defaults, primarily in the context of external borrowing. Recently, however, attention has shifted toward understanding the selective nature of sovereign defaults, where governments strategically choose to default on either domestic or foreign debt obligations, but rarely simultaneously on both.

In a series of research papers published with co-authors (Barros Torres et al., 2024; Paczos & Shakhnov, 2022, 2024) we develop a theory of selective sovereign defaults. The theory proposes that governments issue foreign debt to smooth consumption from fluctuations in output, and issue domestic debt to avoid tax distortions (deadweight loss from taxation). Sudden contractions in output increase the risk of foreign default, while sudden contractions in the deadweight loss from taxation trigger selective domestic defaults. Unfortunately, tax distortions are hard to measure empirically. This paper describes a novel way to calculate approximate values empirically: by measuring fluctuations in the tax base. Importantly, since the tax base may be influenced by output, we control for output fluctuations in the regression analysis to separately identify the impact of tax base volatility on default probabilities.

The central contribution of this paper lies in introducing a new empirical measure of fiscal fragility, specifically defined by fluctuations in the government's tax base. Traditional empirical approaches to assessing debt sustainability have predominantly relied on aggregate output or expenditure shocks, neglecting the critical role of the volatility of tax revenues in shaping sovereign default decisions. By capturing movements in the tax base, this paper directly measures the constraints on fiscal capacity that governments face and that significantly influence their decisions regarding debt servicing.

Using a comprehensive dataset covering sovereign default episodes, government debt levels, tax bases, and macroeconomic indicators across multiple emerging and advanced economies, we rigorously test the key predictions of the theoretical model of selective sovereign defaults. Specifically, we examine how shocks to output and tax base correlate with the probabilities of selective defaults, distinguishing between foreign and domestic obligations. The findings in this paper confirm that output contractions drive defaults on foreign debt, while contractions in the tax base significantly elevate the risk of domestic default.

2. Literature Review

The literature on sovereign default has traditionally concentrated on external debt, highlighting the mechanisms through which defaults occur. Paczos and Shakhnov (2022) explore the implications of domestic versus foreign debt sustainability, particularly in the context of the COVID-19 pandemic. Their model demonstrates how governments face trade-offs in regulating domestic versus foreign obligations when subject to productivity and expenditure shocks. The model studies an optimal

government decision to repay or default, where debt levels are pre-determined exogenously. Selective defaults are predicted based on the nature of shocks, suggesting that foreign defaults are triggered primarily by productivity shocks while domestic defaults arise from expenditure shocks.

Paczos and Shakhnov (2024) further illustrate how governments strategically choose between domestic and foreign defaults depending on economic conditions. They build a quantitative general equilibrium model to study, in a unified framework, a government's decision of debt issuance and debt default, on domestic and foreign markets. They show that domestic debt primarily smooths volatile tax distortions, whereas foreign debt is employed to mitigate output fluctuations. The differentiation of debt types underscores varying default incentives, with domestic debt offering stability against tax volatility, and foreign debt addressing consumption smoothing across output cycles.

Measuring tax inefficiencies is empirically challenging. Chari, Kehoe and McGrattan (2007) propose a business cycle accounting framework in which economic inefficiencies are represented by time-varying wedges, including distortions to labor and capital markets. Their approach enables the decomposition of macroeconomic fluctuations into sources that are isomorphic to tax distortions, even without specifying the underlying frictions in detail. This methodology underpins the theoretical model developed in Paczos and Shakhnov (2024), where labor tax wedges are used to capture the effects of changing tax distortions on sovereign default decisions. The current paper extends this line of inquiry using tax base fluctuations to measure fiscal inefficiencies in a reduced-form way.

Barros Torres, Paczos and Shakhnov (2024) analyze the stability of domestic and foreign sovereign debt in the presence of output fluctuations, fiscal expenditure shocks, and distortionary taxes. They identify a novel mechanism whereby tax distortions create incentives for governments to selectively default. Their results suggest that domestic debt is inherently more stable, but less valuable in mitigating business cycle fluctuations, whereas foreign debt, which can smooth output and fiscal expenditure fluctuations, entails higher stability risks. This underscores the importance of tax distortion volatility in understanding sovereign debt stability.

Keyser and Paczos (2023) empirically examine how public debt size and composition affect sovereign risk across different exchange rate regimes. Their study finds that the size of public debt and the share of foreign debt increase sovereign risk significantly in economies with floating exchange rates, while the size effect is predominant in monetary unions and ambiguous in managed regimes. These insights emphasize the critical role of exchange rate regimes and debt composition in shaping sovereign default risks.

Froemel and Paczos (2024) contribute by exploring the cyclical policy and its interaction with sovereign risk. They find that economies with higher sovereign risk exhibit a procyclical fiscal policy, mainly driven by social transfers. Their model demonstrates how default risk constrains the government's ability to borrow during recessions, forcing it to adopt procyclical fiscal adjustments. Empirical validations support these theoretical predictions, demonstrating significant

differences in the cyclicality of social transfers in high-risk compared to low-risk economies.

A complementary strand of the literature explores how sovereign defaults impact domestic financial stability. Erce and Mallucci (2018) explicitly model selective default, showing that governments may choose to default on foreign debt while continuing to service domestic obligations in order to shield the domestic banking sector, which is heavily exposed to sovereign bonds. In contrast, Thaler (2020) and Rojas and Thaler (2024) analyze models in which defaults are indiscriminate. Thaler (2020) explains post-default exclusion from capital markets via sovereign-bank linkages, while Rojas and Thaler (2024) show how exposure of banks to sovereign debt can propagate sovereign risk into credit markets, amplifying the domestic economic cost of default. While these studies offer insight into the consequences of default, our work is distinct in empirically analyzing the determinants of selective defaults, where governments strategically choose between domestic and foreign obligations, a behavior well-documented in empirical studies, such as Reinhart and Rogoff (2011) and Borensztein and Panizza (2008).

3. Selective default in practice

Definitions

Before conducting the empirical analysis, we set the scene with some definitions. There are three ways to draw the distinction between domestic and foreign debt. According to the *legal* definition, domestic debt is any debt issued according to domestic law, regardless of its currency, and regardless of who holds it. According to the *economic* definition, domestic debt is held by residents, regardless of the currency and the law. According to the *currency* definition, domestic debt is denominated in domestic currency, regardless of law and residency. Theoretical models in Barros Torres, Paczos and Shakhnov (2024) and Paczos and Shakhnov (2022, 2024) use the *economic* definition, as it creates clear differential incentives for the sovereign to default. However, the data on selective defaults and debt compositions are available in the *legal* definition. Therefore this paper relies on a working assumption, that the *economic* and *legal* definitions yield bond allocations that are not far from each other. As Reinhart and Rogoff (2011) pointed out, *Domestic public debt is issued under home legal jurisdiction. In most countries, over most of their history, it has been denominated in the local currency and held mainly by residents.*

Examples of selective defaults

The data on defaults come from the updated database accompanying Reinhart and Rogoff (2011) and cover up to 130 countries for the years 1800-2014. The dataset provides dates for the five types of crises: domestic debt, external debt, inflation, currency, and banking crises. As the dates of the domestic and foreign debt crises sometimes overlap, there are many ways to calculate the final number of events. We concentrate on the postwar period. When a government, in a given year, defaulted *de jure* on both domestic and foreign debt we label this event as *total default*. There

are 13 such instances. When a government, in a given year, defaulted *only* on its foreign debt, we label this event as *foreign default* (even if the default on domestic debt followed before the end of the foreign default). There are 163 such instances. Similarly, when a government, in a given year, defaulted *only* on its domestic debt, we label this event as *domestic default*. There are 35 such instances. We also recognize that hyperinflation is a *de facto* way to default on domestic debt. Inflation crises help to reduce the burden of nominal debt in local currency. This debt was often issued domestically and sold to domestic residents. There are 193 instances of domestic default.¹

How can a government default on foreign investors while repaying domestic investors or *vice versa*? Among the tools that governments use to discriminate against particular types of bondholders, the most popular are capital controls, exchange controls and freezes on deposits. In 1990, Brazil defaulted on its domestic debt but kept servicing its foreign debt. All foreign exchange transactions were directed through the central bank. In 1998, Russia defaulted on both foreign and local currency debt issued domestically, imposing capital and exchange rate controls. Russia kept servicing debts towards foreign investors and bonds held by domestic households were repaid, so Russia effectively defaulted only on domestic public debt held by firms. Default was accompanied by deposit freezes.

Argentina's 2001 default is often considered as a model case of foreign default, although in fact it was a total default. First, all resident-held bonds, both domestic and foreign currency denominated, were converted into government-guaranteed loans, which were all later converted into pesos at a much lower rate than the market exchange rate. Also, 60% of the debt defaulted on in December 2001 was held by Argentinians.²

4. Methodology and Results

4.1. Introducing tax base volatility

In this paper, we adopt a broad notion of the fiscal inefficiency associated with taxation: the idea that raising one dollar of government revenue imposes a cost greater than one dollar on the private sector. This wedge may arise not only from standard deadweight loss (behavioral responses to taxation), but also from administrative costs, tax compliance burdens, enforcement inefficiencies, or evasion.

¹ Outright domestic defaults are rare, which is consistent with a view long held by some investors that after all, governments can service these obligations by printing money, which in turn can reduce the real burden of debt through inflation, and dramatically so in cases like Germany in 1923 and Yugoslavia in 1993-94. We find it reasonable to identify hyperinflation as domestic default.

² Recent examples of what could be considered pure foreign default include: Bolivia in 1989 (most of the domestic debt was repurchased a year before default), Pakistan in 1999 (which stopped payments on outstanding obligations to creditors in the UK, Europe and the US and put a freeze on foreign currency deposits mostly owned by non-residents), and Cyprus in 2013 (a freeze and a partial expropriation of deposits exceeding €100,000, which were mostly owned by non-residents).

We refer to this generalized loss as a *deadweight loss* for consistency with public finance terminology, while recognizing that it includes a range of fiscal frictions.

A deadweight loss from taxation is a cornerstone of the research in public economics. The Harberger (1964) classic estimate puts a marginal deadweight loss at around 2.5 cents per dollar, while Browning (1976) calculates it to be between 9 cents and 16 cents in 1974. Stuart (1984) proposes a general equilibrium approach, which results in the estimates being 1.5 times those of Browning. The seminal contribution by Feldstein (1999) using micro-level data and accounting for multiple channels of adjustments to tax code changes puts this number at 32.2 cents per dollar and, more importantly, shows that marginal losses can be as high as USD 2 per additional USD 1 raised. The takeaway from this literature is that the deadweight loss from taxation is significant, positive and volatile.

The aim is to recover the changes in the deadweight loss from taxation from the data. As there is no readily available measure, we use standard tools in public economics and identify the movements in the deadweight loss via the movements in the tax base. Simple logic states that the two are inversely related. This logic rests on two points. First, it is broadly agreed that the deadweight loss moves in tandem with the corresponding tax rate. Then, when a tax rate moves, a tax base moves in the opposite direction.

Second, deadweight loss may move due to reasons other than a tax rate. All those other shocks that affect deadweight loss are again captured by the inverse movements in the tax base. A prominent example of this approach is the OECD (2010) report, which develops an argument that *tax base-broadening reforms [...] reduce distortions to economic decisions*. Thus, deadweight loss from taxation and tax base move in opposite directions, and hence we can use fluctuations in the latter to proxy for the former.

Tax base fluctuations can be recovered from the data using the fact that tax revenue R_i from a specific tax instrument is, by definition, equal to the product of the tax rate t_i and the tax base TB_i :

$$R_i = t_i \times TB_i \quad (1)$$

Given availability of time series on tax rates t_i and tax revenues R_i , we can recover the movements in the tax base. Our empirical proxy, the tax base volatility, is intended to capture a reduced-form analogue of the tax distortion wedges introduced by Chari, Kehoe and McGrattan (2007).

It is important to acknowledge that this empirical approach relies on aggregate measures of tax base fluctuations, which may not fully capture underlying tax inefficiencies in all institutional contexts. In particular, in economies with a high level of tax evasion and weak enforcement capacity, the observed tax base (e.g., from VAT or CIT) may not accurately reflect the true fiscal capacity. As such, while the methodology offers a useful cross-country approximation, it may obscure heterogeneity in institutional effectiveness and structural tax policy design.

4.2. Data and Estimation

We estimate the following regression separately for domestic and foreign debt and default:

$$Pr(Def_{i,t}^j = 1) = \alpha_0^j + \alpha_1^j GDP_{i,t-1} + \alpha_2^j TB_{i,t-1} + \alpha_3^j B_{i,t-1}^j + \epsilon_{i,t} \quad (2)$$

where Pr is the probability of default of type j (domestic, foreign) in country i in period t . The Reinhart and Rogoff (2011) database provides the dependent variables, and dummy indicators Def^f and Def^d . GDP stand for GDP growth calculated as log differences of the GDP in local currency in fixed prices from the Penn World Tables 8.1. TB is the Tax Base calculated from the equation (1). We use the implied tax base for corporate taxes using the ICTD Government Revenue Dataset (Prichard, Cobham and Goodall, 2014) for the data on tax revenues and by combining three different sources for the data on tax rates. Finally, B^j are the respective debts from Panizza (2008) and Reinhart and Rogoff (2011). We use debt series in the first differences, as the theory focuses on debt issuance, rather than debt stock. All variables are annual. Debt and tax base are given as fractions of GDP. The independent variables are lagged one period to mitigate the possible endogeneity problem. The estimation sample with the full data coverage is 89 countries for the years 1981-2011, yielding a total of 1255 country-year observations with 18 foreign and 30 domestic default episodes. Table 1 presents a detailed breakdown of data sources used in this study.

The theory implies that foreign default is mostly driven by fluctuations in output, therefore we expect α_1^f to be significant and negative and α_2^f to be zero. Domestic default is driven mostly by the deadweight loss, which is inversely related to the tax base TB , therefore we expect α_2^d to be significant and positive and we remain agnostic about α_1^d . Trivially, defaults are more probable with higher debt levels, therefore we expect both α_3^j to be positive. We run three regressions for each default: a pooled logit, a random effects logit and a probit.

Table 2 presents the regression results for the foreign default. The GDP growth estimate is positive and significant in all three estimations. At the same time, the changes in the tax base do not affect the probability of the foreign default in either of the estimations. Thus, the data confirm our hypothesis from the theoretical models, that foreign default is driven by the output fluctuations and that the tax distortions do not play a significant role.

Table 1.
Data Sources

Variable	Series	Countries	Dates	Source
<i>Def</i>	Domestic default	128	1950–2014	Reinhart and Rogoff (2011)
	Foreign default	128	1950–2014	Reinhart and Rogoff (2011)

Variable	Series	Countries	Dates	Source
	Inflation	66	1950–2014	Reinhart and Rogoff (2011)
<i>GDP</i>	Real GDP in local currency	209	1950–2011	Feenstra, Inklaar and Timmer (2015)
<i>TB</i>	Corporate tax revenue	163	1980–2010	Prichard, Cobham and Goodall (2014)
	Sales tax revenue	180	1980–2010	Prichard, Cobham and Goodall (2014)
	Corporate tax rate	155	1960–2002	World Tax Database (2015)†
		135	1993–2015	KPMG (2015)
		45	1979–2014	CBT Tax Database (2015)†
	VAT rate	60	1967–2013	Vegh and Vuletin (2015)
		103	2006–2015	KPMG (2015)
		36	1992–2015	Keen and Lockwood (2010)
<i>B</i>	Domestic Debt to GDP	59	1950–2010	Reinhart and Rogoff (2011)
		61	1990–2007	Panizza (2008)§
	Foreign Debt to GDP	59	1950–2010	Reinhart and Rogoff (2011)
		103	1990–2007	Panizza (2008)§

Notes: † The first two sources are used as the main ones and are complementary regarding time coverage. The third source is used as a supplement for missing countries and data points. For overlapping country-years, the tax rate claimed by at least two sources is taken. If there is a missing data period and the tax rate before and after are the same, we interpolate this tax rate throughout the period.

§ Supplementary source; used to broaden cross-country coverage.

Source: Author's own compilation based on sources listed in the last column.

Table 3 presents the regression results for the domestic default. Although the results are not as clear-cut as foreign default, we can still observe a pattern in which the higher the tax base (which corresponds to lower tax distortions), the lower the probability of domestic default. The result is significant in all three estimations. The GDP growth however, affects probability of domestic default negatively, as in the case of foreign default. Importance is secondary, as coefficients are significant only at 10% confidence level. We find evidence to support our second hypothesis, that domestic default is more likely when the tax distortions are high. In both cases, the respective debt levels do not behave as predicted. On a foreign market, foreign debt increases the probability of foreign default, but statistically the results are only of borderline significance in one out of three cases. On the domestic market, the results for domestic debt are puzzling and may be due to the fact that in the studied timeframe domestic debt was in a fast upward trend in many emerging economies.

Table 2.
Foreign Default

	Logit Pooled	Logit RE	Probit RE
LD.ForDebt	0.0286* (0.0169)	0.0229 (0.0187)	0.0129 (0.00958)
L.GDPgrowth	-15.16*** (5.297)	-14.44*** (5.579)	-6.121** (2.568)
L.TaxBaseCorp	-0.110 (0.0741)	-0.118 (0.0798)	-0.0508 (0.0339)
N	1255	1255	1255

Note: Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$.

Source: Own calculations.

Table 3.
Domestic Default

	Logit Pooled	Logit RE	Probit RE
LD.DomDebt	-0.0522* (0.0311)	-0.0439 (0.0281)	-0.0238* (0.0145)
L.GDPgrowth	-9.618* (5.553)	-9.750* (5.557)	-4.981* (2.782)
L.TaxBaseCorp	-0.163** (0.0697)	-0.175** (0.0881)	-0.0879** (0.0428)
N	1242	1242	1242

Note: Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$.

Source: Own calculations.

4.3. Robustness

Tables 4 and 5 present regression results using VAT rates and revenues to construct data series for the tax base. For foreign default, GDP growth coefficients are negative and significant in all estimations and are of the same magnitude as in table 2. Here however, also the tax base coefficient is significant. The lower the tax distortions (higher tax base), the lower the probability of foreign default, while the significance is of a lower order of magnitude compared to the GDP growth. Thus, the data confirm the hypothesis that foreign default is mostly driven by the output fluctuations. Table 5 presents the regression results for the domestic default.

Only the tax base is significant. The lower the tax wedge (which corresponds to the higher tax base), the lower the probability of domestic default. Thus, the data confirms our second hypothesis, that domestic default is more likely with the high tax wedge and is less dependent on output.

Table 4.*Foreign Default – with VAT-based Tax Base*

	Logit Pooled	Logit RE	Probit RE
LD.ForDebt	0.0247 (0.0220)	0.0189 (0.0230)	0.0137 (0.0118)
L.GDPgrowth	-19.64*** (5.635)	-20.43*** (5.889)	-8.419*** (2.738)
L.TaxBaseVat	-0.0370** (0.0169)	-0.0369** (0.0183)	-0.0158** (0.00782)
N	1071	1071	1071

Note: Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$

Source: Own calculations.

Table 5.*Domestic Default – with VAT-based Tax Base*

	Logit Pooled	Logit RE	Probit RE
LD.DomDebt	-0.0532 (0.0354)	-0.0598 (0.0385)	-0.0258 (0.0180)
L.GDPgrowth	-6.589 (5.335)	-6.891 (5.076)	-3.076 (2.344)
L.TaxBaseVat	-0.0293** (0.0132)	-0.0263* (0.0159)	-0.0114 (0.00693)
N	1065	1065	1065

Note: Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$.

Source: Own calculations.

Additionally, in table 6, we present the regression results based on the subsample of *only de jure* defaults. There are five such instances. The signs of the coefficients remain unchanged, but they cease to be statistically significant.

The data confirms the two main takeaways from the theory, that foreign default is mostly driven by fluctuations in output, while domestic default is statistically more strongly associated with fluctuations in the tax base than with output fluctuations.

While the estimated coefficient on output growth is numerically higher, it is less precisely estimated, suggesting that tax-related fiscal constraints are a more robust predictor of domestic default within our framework.

Table 6.

De jure Domestic Default

	Logit Pooled	Logit RE	Probit RE
LD.DomDebt	-0.000911 (0.0773)	-0.000909 (0.0773)	-0.000396 (0.0258)
L.GDPgrowth	-5.987 (17.83)	-5.987 (17.83)	-2.274 (5.939)
L.TaxBaseCorp	-0.230 (0.254)	-0.230 (0.254)	-0.0761 (0.0829)
N	1241	1241	1241

Note: Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$.

Source: Own calculations.

5. Conclusions

This study introduces and empirically validates a novel measure of fiscal fragility based on fluctuations in the government's tax base, enhancing the understanding of sovereign default dynamics. Empirical results confirm that selective sovereign defaults are systematically associated with distinct economic shocks: productivity shocks predominantly affect the likelihood of foreign defaults, while shocks to the tax base significantly impact domestic defaults.

The findings have important implications for fiscal policy design and sovereign debt management, highlighting the necessity for differentiated strategies to manage domestic and foreign debt. Policymakers should consider in particular that while helpful in smoothing macroeconomic fluctuations, foreign borrowing carries greater stability risks compared to domestic debt, which serves predominantly to absorb fiscal shocks. This insight is crucial for improving debt sustainability frameworks and mitigating risks associated with sovereign defaults.

However, the study has limitations that suggest areas for future research. First, the empirical analysis relies on aggregate measures of tax base volatility, potentially overlooking specific institutional and structural differences in tax systems across countries. A more detailed country-level analysis could further refine the understanding of how tax system characteristics influence fiscal fragility and sovereign default risk. While the analysis highlights clear distinctions between domestic and

foreign debt dynamics, an extended analysis could involve political economy factors, market segmentation issues, and debt market imperfections.

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