

Exploring the Drivers Behind Tax Base Erosion: Evidence from Poland's Banking Sector

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Abstract

This study aims to enhance our understanding of the banking sector's profit-shifting scale and identify its determinants. We apply dynamic and static panel data modelling to bank-level data from the Orbis database and administrative tax data of withholding taxed payments to non-residents from 2012 to 2019. We note that international tax differences cause a geographical distribution of profits, with low-tax jurisdictions attracting disproportionately high profits. Banks with varying sizes of assets and credit risks take different tax responses. Furthermore, we identify significant tax, regulatory, and macroeconomic drivers in banks' reported profit shifting. We provide insights into how enhanced tax regulation measures can influence risk management, particularly in regions with developing financial markets. This research highlights the critical role of international cooperation in creating a more equitable tax landscape. Overall, our analysis underscores the need for continuous improvement in tax policies to address the dynamic nature of global tax planning strategies.

Keywords: Profit shifting, Banking, Tax regulatory, Tax havens, Tax avoidance.

JEL: G21 G28 H26 H87

1. Introduction

The ongoing public debate on “Base Erosion and Profit Shifting” (BEPS), triggered by aggressive tax planning, has focused mainly on very well-known ICT and retail companies (IMF, 2020; OECD, 2010). According to Garcia-Bernardo & Janský (2024), multinational corporations shifted profits over \$850 billion in 2017, primarily to countries with low tax rates, causing a significant loss of tax revenue for lower-income countries. Moreover, Tørsløv et al. (2023) estimate that 36% of multinational profits are shifted to tax havens globally, with US multinationals shifting twice as much profit as other multinationals. Reallocating these profits to source countries would increase domestic earnings by about 20% in high-tax European Union countries, 10% in the US, and 5% in developing countries. As a result, researchers are

increasingly using this evidence to generate theoretical and empirical research on the role of tax havens and tax avoidance systems (Alfandia, 2024; Chardonnes & Wallmeier, 2024; Dharmapala, 2014; Dyreng et al., 2017; Heckemeyer & Overesch, 2017; Laudage Teles et al., 2024; Lu & Wang, 2024; Rachidi & El Moudden, 2023; Sitkiewicz & Białek-Jaworska, 2024).

It should be noted that the financial sector has largely remained on the periphery of discussions regarding tax avoidance and evasion. However, this is beginning to change. In 2016, the OECD acknowledged this shortcoming and published a discussion draft titled “Approaches to Address Base Erosion and Profit Shifting (BEPS) Involving Interest in the Banking and Insurance Sectors” as part of Action 4 on the limitation of interest deductions (OECD, 2016). The discussion underscored the importance of including banks in global efforts to modernise international corporate tax regulations. Given the banking sector’s significant role in facilitating financial flows, examining its practices and contributions to tax avoidance is essential to ensure comprehensive and effective tax reform. This shift in focus reflects the accelerated momentum in policy fields to address these issues holistically. The need to deal with tax evasion and tax avoidance and its distribution effects becomes even more critical given the current budgetary needs driven by geopolitical risks, sustainability efforts, and climate change. Combating tax evasion, implementing anti-profit-shifting policies, and introducing new fiscal instruments can contribute to achieving these goals.

Therefore, this study aims to broaden understanding of the scale of profit shifting in the banking sector and identify its determinants. In particular, the study analyses the impact of multinational banks taxed with different corporate tax rates in host countries, primarily due to their differing business models, on escalating this phenomenon.

The motivation for launching the study was the results obtained by Aliprandi et al. (2021), who discovered that major European banks book €20 billion (or 14% of total profits) in tax havens every year. Although mandatory disclosures have been introduced since 2014, the percentage has remained unchanged. Furthermore, bank profitability in tax-free zones is surprising: the per-employee costs are 238,000 euros, compared to about 65,000 euros in non-tax-free zones. This suggests that the profits paid in tax havens are mainly transferred from other countries where the service is provided. In addition, studies have shown that nearly 25% of profits earned by European banks are booked in countries with an effective tax rate of less than 15%.

Most of the empirical analysis highlights aggressive tax planning by nonfinancial firms. Only recently, in times of increasingly predominant global banks, few studies have considered verifying how European banks benefit from profit shifting. More recent empirical taxation

studies documented banks' use of tax havens (Bouvatier et al., 2017; Dutt et al., 2019; Janský, 2020b; Karamanou et al., 2017). This use takes the form of its advantage, namely banks shifting profits to low-tax jurisdictions and thereby reducing their tax liability (Fatica & Gregori, 2020a; Huizinga et al., 2014; Merz & Overesch, 2016), or it takes the form of customer intermediation (Gallemore et al., 2019).

The issue of profit shifting in Central and Eastern European countries, where the banking sector relies heavily on foreign capital, remains largely unexplored. Despite the absence of systemically essential banks in this region, the presence of subsidiaries of large, globally active banks raises concerns. The sole study we discovered on profit shifting and multinational banks' tax response in Eastern Europe was conducted by Anarfi & Nerudová (2018). To our knowledge, the issue of profit shifting in the banking sector in Poland has yet to be thoroughly investigated, underscoring the urgency and importance of this research gap.

One of the factors that may constitute an incentive to transfer bank profits or, in another way, determines the observed effects of profit shifting by banks in 2016-2019 is a newly adopted sectoral tax ('bank levy') concerning banks, cooperative savings and loan associations, as well as insurance companies and lending institutions¹. Although the tax is based on taxpayers' balance sheets, not income or cash flow, this might have reflected taxpayers' (including banks') attitude towards tax planning. Unlike other bank levies (financial stability contributions) imposed in other countries, mainly in the EU, Polish tax is calculated based on taxpayers' assets, not liabilities. Most jurisdictions determined the tax base as liabilities (often considering the weight of their risks), leaving equity and insured deposits as tax-irrelevant (Devereux et al., 2019). Hence, as a result, profitable high-value assets (e.g. loan receivables) may be transferred to headquarters or another subsidiary in a different jurisdiction that does not impose such a levy or where such assets will not be subject to the tax. The credit portfolio of financial institutions has a considerable influence on asset volume (Gajewski, 2016). Bearing in mind that within the EU, all banks (credit institutions) legally established and licensed in one member state are allowed to offer all banking services in a single European financial market, such as a transfer of assets or even concluding the mentioned loan agreement directly between headquarter and Polish subsidiary's client is neither restricted by law nor sophisticated, especially in B2B relations and may result in profit shifting.

We use the Arellano-Bond estimator for dynamic panel data analysis by the General Method of Moments, fixed and random-effects panel model estimators on data at 1,000 bank-

¹ Act of 15 January 2016 on tax on certain financial institutions (consolidated text Journal of Laws of 2023 item 623; hereinafter referred to as: Bank Levy Act).

country levels in 2012-2019, with 3,778 observations in total. The estimated specification is derived from the knowledge-capital model that includes two types of capital: human and physical. Additionally, we consider bank characteristics, control institutional factors, and governance quality measured by Kaufmann's Worldwide Governance Indicators. This study makes a significant contribution to the banking sector's taxation field. It offers one of the first investigations into tax base erosion and profit shifting in the Central and Eastern European banking sector due to the use of administrative tax data on withholding tax returns, which are not publicly available. This allows us to cover all banks engaged in passive income shifts to non-residents subject to withholding tax in Poland.

Furthermore, the study determines which factors increase the transfer of bank profits to other countries. The knowledge-capital model verifies what type of multinational enterprises (MNEs) engage in profit shifting by combining ownership and location advantages with technology and country characteristics, which are horizontal and vertical. Horizontal-integrated MNEs are established to overcome distance and use lower access costs to foreign markets, while MNEs integrated vertically are set to decrease production costs. In theory, horizontally integrated MNEs dominate between countries of similar economic size, with proportional humane and physical capital factor differentials and high trade costs (Faeth, 2009). Comparative advantages (Gudowski & Piasecki, 2020) and withholding tax (Arena & Roper, 2010; Białek-Jaworska, 2021; Białek-Jaworska & Klapkiv, 2021; Sitkiewicz & Białek-Jaworska, 2024) determine the capital inflow into the host country and – subsequently – returns on FDI investments transferred to origin countries. MNEs established in regions with better institutional environments, measured by Kaufmann's governance quality indices, provide more intracompany loans to Poland (Białek-Jaworska & Klapkiv, 2021).

Moreover, the research period considers the new reforms introduced by the European Commission in October 2016 regarding BEPS-related activities. The regulations cover three areas: (1) the two-stage proposal for a Common Consolidated Corporate Tax Base; (2) the Directive on Double Taxation Dispute Settlement Mechanisms in the EU; and (3) the Anti-Tax Avoidance Directives (ATADs) relating to the disparity of hybrid connections with third countries. Finally, we consider implementing the 2013/36/EU - Capital Requirements Directive IV about mandatory public disclosure of EU systemic banking activities, requiring annual reporting of essential information across countries and other government tax regulations.

Our findings illustrate different tax responses in banks with varying asset sizes and credit risks taken. Additionally, we find significant effects of tax regulatory and macroeconomic

drivers on the reported profit shifting of banks. The study results confirm that bank earnings are significantly responsive to tax incentives in the host country.

The remainder of the paper is organised as follows: Section 2 outlines the theoretical framework and elaborates on previous studies' findings. Section 3 shows the data. Next, Section 4 contains the methodology. Our main results and robustness checks are described in Section 5. Section 6 concludes.

2. Literature review

Although multinationals often successfully negotiate preferential tax treatment with national jurisdictions (Egger et al., 2020), they tend to bias the location of highly profitable assets favouring the headquarters location (Dischinger et al., 2014), which affects their profit-shifting strategies (Dischinger et al., 2013; Gauß et al., 2024). As previous literature (Arena & Roper, 2010; Białek-Jaworska, 2021; Białek-Jaworska & Klapkiv, 2021; Sitkiewicz & Białek-Jaworska, 2024) shows, withholding taxation determines the viability of returns from the capital flows (FDI) into the host country in the form of passive income transferred to origin countries. We first verify the following hypothesis:

H1: *Withholding tax limits profit-shifting from the banking sector in Poland.*

Splitting the composite tax differential into two separate components capturing the parent-to-foreign versus the foreign-to-foreign channels of profit shifting (Fatica & Gregori, 2020a) and earlier Dharmapala (2014) prove that the bulk of tax-induced profit shifting occurs among foreign subsidiaries rather than between the home country and foreign jurisdictions. Profit shifting between domestic and foreign operations is significantly more extensive if the parent has a lower tax rate than the foreign country. Thus, the profit is transferred to the parent company's country. However, profit shifting in the financial sector, particularly towards tax and regulatory havens, has important implications given the pivotal role of banks in the economy. Bank operations related to profit shifting toward tax havens raise concerns from a fiscal point of view because the literature suggests that financial institutions contribute to the erosion of domestic tax bases. Next, it poses a stability point of view as a potential source of hidden risks in bank balance sheets. Finally, the crisis shows the downside risks of the interlinkages between the financial sector and public finances (Fatica & Gregori, 2020a).

Reiter et al. (2021) argue that tax deductibility of interest payments can lead to base erosion and profit shifting. When a bank borrows from a third party, interest payments lower its taxable profit, but higher risks for shareholders and regulatory requirements limit this.

Internally, when a bank borrows from a different subsidiary, profit is shifted to that subsidiary, with interest payments tax-deductible in the borrowing subsidiary and income taxed in the lending subsidiary. Moreover, Møen et al. (2019) model a multinational firm's optimal choice of internal and external debt, focusing on the financial sector. They found that the choice of internal and external debt is independent if each has different costs for the firm. External debt has costs like disciplining overspending managers and balancing indebtedness against bankruptcy risk. Internal debt costs arise from compliance with tax rules, such as thin capitalisation and controlled foreign company rules.

Financial firms are less likely to invest in a distant location and more likely to invest in a prominent area (Davies & Killeen, 2018). Therefore, factors that affect location decisions may also drive the size of activity and, thus, the income in a particular location. For example, international tax differences trigger the geographical distribution of profits within multinational banks. As a result, tax havens attract more than 50% more profits. In general, 21% of the profits are shifted. This causes a significant reduction of tax bases in high-tax countries (Fatica & Gregori, 2020b). The literature has focused particular attention on verifying the relationship between the decline in income between financial subsidiaries and the increase in the consolidated effective tax rate of multinational banks. For example, Merz & Overesch (2016a) consider the effective tax rate, i.e., a tax measure computed as the ratio between tax expenses and pretax income. Their results show that the overall tax response regarding reported profitability appears more pronounced than for multinational corporations in other industries. Joshi et al. (2020) used the effective tax rate to verify the effect of system transparency on tax-motivated income shifting by European banks. They concluded that banks did not change their overall tax avoidance, showing the inefficiency of this regulation.

Additional analyses have shown that tax incentives respond differently depending on the type of bank business model. For example, many financial institutions' business models allow financial operations to be carried out regardless of the distance between the bank and the customer. In addition, selected bank business models are more flexible in reorganising structures, as operations do not require a specific infrastructure. Devereux et al. (2019) examine the behavioural responses to bank levies post-2007-2008 financial crisis, finding that banks increased equity funding reliance but also increased asset risk. The reduction in total risk was concentrated among banks with minimal financial stability threats.

Therefore, we can expect different tax responses in traditional lending, trading activities, and net fees and commissions charged. Operating in more than one country allows multinational banks to shift their trading activities to countries with favourable tax conditions. Campbell &

Froot (1993) and Umlauf (1993) demonstrate that introducing a securities transaction tax resulted in a significant migration of securities trading from Sweden to the UK. Similar evidence of a shift in securities trading volume from Singapore to Taiwan was found by Chou & Wang (2006). In additional analyses, Merz & Overesch (2016b) noted that revenues from interest-earning activities are less susceptible to tax changes than other activities. In particular, they demonstrated that loan loss provisioning could be a potential channel for profit-shifting. Their results suggest that tax incentives drive the discretionary accrual of loan loss provisions.

Furthermore, Merz & Overesch (2016b) showed that trading profits are highly sensitive to tax changes. Some accounting studies have analysed the provisions on loan losses as a management tool for the banking industry. Loan loss provisions are used to smooth earnings over time. Different managerial strategies for earnings smoothing are identified in the literature, *i.e.*, strategies that show less volatility for investors and managers' self-interest, such as earnings-based compensation (Balboa et al., 2013; Fonseca & González, 2008; Peterson & Arun, 2018). Other researchers point out that loan loss provisioning results from managing equity to meet capital requirements (Gunther & Moore, 2003; Laeven & Majnoni, 2003). Consequently, we will examine whether higher taxes in the home country are correlated with lower reported income of bank subsidiaries and try to identify the profit-shifting reactions related to loan loss provisioning.

In addition, the taxable income of the subsidiaries can be used to reallocate taxable profits, which can form the basis for the choice of debt or equity financing strategies. Interest costs should be considered to reduce the subsidiary's taxable income, while equity financing does not involve a comparable deduction. Therefore, it can be assumed that an international bank will be more willing to allocate debt financing to high-tax countries. Additionally, bank subsidiaries in high-tax jurisdictions may use internal capital markets to substitute equity for intra-firm debt financing (De Mooij & Keen, 2016; Hemmelgarn & Teichmann, 2014; Keen & Mooij, 2012). The legal frameworks in this area have slightly changed since 2019 (effective as of 2020) when notional interest deduction was introduced to the Polish Corporate Income Tax Law (art. 15cb)². This institution assumes that the amount equivalent to the reference rate of the National Bank of Poland applicable on the last business day of the year preceding the tax year increased by one percentage point multiplied by the following amounts shall also be deemed to be a tax-deductible cost:

- (i) the amounts of additional payment made to the company,

² Act of 15 February 1992 on Legal Persons' Income Tax (consolidated text Journal of Laws 2023 item 2805 as amended; hereinafter referred to as Corporate Income Tax Law).

(ii) the amounts of the profit transferred to the company's reserve or supplementary capital. The abovementioned deemed revenue earning cost shall be enjoyed in the year of making the additional payment or increasing the reserve or supplementary capital in two consecutive tax years and cannot exceed a capital of PLN 250,000 (ca. EUR 60,000) each tax year.

To verify the above relationships, we will use several control variables characterising the bank's activities in this study. We will perform model estimations for the differentiated dependent variables that define non-residents' passive income in total (excluding dividends) and separate from interests, licensing activities, immaterial services provided, and capital profits (Arts. 21-22 of the Corporate Income Tax Law) to verify the following hypotheses:

H2: *Limiting financial institutions' tax-deductible costs of acquiring intangible services and rights performed directly or indirectly to benefit related parties reduces profit-shifting from Poland.*

H3: *Banks offset the negative impact of revenue shortfalls by exploiting the bank's business model and generating passive income flows accompanied by insolvency risk.*

Irrespective of income tax, a bank levy imposed as of 2016 in Poland might have altered the tax policy of chosen banks (both domestic banks as well as branches of foreign banks and credit institutions) by a shift in the business activity undertaken towards transactions that do not influence the balance sheet or even aim to asset reduction, primarily resulting on the end of the calendar month as the last day of each month is crucial in determining monthly tax base.

It must be, however, noted that the Polish bank levy covers only several banks having the largest assets – the tax base in these institutions is the sum of the asset surplus exceeding PLN 4 billion (ca. EUR 1 billion) and is determined based on the tax entity's turnover and the balance statement (trial balance) for the last day of the month, based on the entries from its general ledger accounts. The tax-free allowance of PLN 4 bln corresponds to the Austrian solution where EUR 1 bln of such allowance was granted (reduced to EUR 300 mln afterwards). Countries with more developed financial sectors granted even higher tax allowance – e.g., the UK – GBP 20 bln, the Netherlands – EUR 20 bln, on the other hand, France EUR 0.5 bln and Germany – EUR 0.2 bln (Bronżewska & Majdowski, 2016). The general tax interpretation of the Ministry of Finance confirms that adjunct and contra accounts shall be considered regarding trial balance and all reserves and write-offs. In 2016-2019, the total number of banking sector entities being obliged to pay a levy was not constant and ranged from 18 to 22 institutions in total, whilst the nine largest banks operating in Poland, in relation to the entire banking sector, paid the levy and the share of their contributions achieved a relatively stable level nearly 90%

(Giżyński, 2021). As a result, only one cooperative savings and loan association is subject to the tax, and no cooperative bank is being effectively taxed. State-owned banks (currently: Bank Gospodarstwa Krajowego) are exempted from tax, raising questions about allowed public aid.

The Bank Levy Act does not impose the definition of assets, hence one reference to art. 3 p. 12) of the Accounting Act³ is necessary – it means the property controlled by an undertaking, with a reliably assessed value that arose due to past events and which will bring economic benefits to the undertaking in the future. This implies that the tax base calculation is wholly grounded on accountancy, and the entries from ledger accounts determine tax liabilities in the Polish bank levy. One of the most valuable assets in banking activity is receivables from granted loans and credits. Hence, the greater the loan amount given, the higher the tax base in the bank levy. Some assets may be subject to double taxation – e.g. real estate will be taxed in property tax and bank levy.

The Bank Levy Act provides for a deduction of the tax base – a taxpayer may reduce it, e.g. by the equivalent of own funds, purchased treasury securities (including bonds which artificially may understate bond yields), and value of assets purchased by the taxpayer from the National Bank of Poland and constituting security for a refinancing loan granted by the National Bank of Poland. Since 2022, the scope of the deduction has been extended to bonds issued by the Bank Guarantee Fund purchased by the taxpayer and loans granted to the Bank Guarantee Fund. However, this remains beyond the scope of this paper.

It shall be underlined – to characterise the Polish bank levy in a broader view and international context – that the motives for its adoption differ significantly from other countries' experiences. Due to the global financial crisis of 2007-2008, 14 EU member states unilaterally adopted the concept of bank levy due to the setback of implementing a worldwide financial transaction tax. The main goal of newly imposed bank levies (financial stability contributions) was a contribution by the banking sector to compensate taxpayers for the costs of guarantees and bailouts and create new special-purpose funds to anticipate future crises. However, in Poland, bailouts of banks during the crisis did not occur, subject to one small cooperative bank and a few cooperative savings and loan associations of no significant importance from a financial sector perspective. The levy was imposed with a substantial delay, 4-5 years after such public burdens occurred in other EU countries, within a rapid legislative procedure and short-term *vacation legis* and solely with one aim to gather public incomes. This also plays an important role in the behavioural aspect of tax compliance.

³ Act of 29 September 1994 on accounting (consolidated text Journal of Laws of 2023 item 120 as amended; hereinafter referred to as: Accounting Act).

In terms of profits gained and taxes paid, transparency of institutions' activities is essential to maintain confidence in the financial sector. It becomes equally important in light of current budgetary needs. Obligatory reporting is a crucial element of corporate responsibility towards stakeholders and society. Since 2014, an EU directive has obliged multinational banks to publish key financial and tax data in Country-by-Country Reporting (CbCR). These requirements were an extension of the EU directive implementing Basel III recommendations. There are arguments on both sides of the debate regarding the efficacy of CbCR in reducing tax-inspired profit shifting. On the one hand, proponents of CbCR argue that these regulations can reduce profit shifting by providing more precise information on the transfer of tax liabilities of international banks. On the other hand, it can be pointed out that CbCR will not change tax avoidance by banks since, in most European countries, there was already an obligation to provide tax information, including payments and transfer pricing documentation. However, CbCR has not been implemented in Poland until 2023.

Furthermore, some studies confirm that international banks' tax strategies are not illegal and can be based on tax gaps (Evers et al., 2018). A review of the literature suggests that there are many ways in which domestic tax bases are eroded; however, a significant source of base erosion is profit shifting. To prevent this problem, regulators are creating more and more ways to prevent the buildup of tax avoidance by transferring profits to tax havens. Hoopes et al. (2018) studied the impact of public disclosure of information from tax returns filed in Australia and found only a small increase in taxes for private firms and the opposite effect for public firms. Hasegawa et al. (2013) proved that Japanese firms' taxable income decreased after the end of the system of public notification of tax returns. In contrast, Hope et al. (2013) found that the cessation of disclosure of the geographic location of earnings led to increased tax avoidance by US firms. Overesch & Wolff (2021) examine multinational banks being required to disclose their tax activities in tax havens, which were not disclosed before the country-by-country reporting mandate, i.e., before 2016. The study predicts that these banks will increase their tax expenses compared to those without such activities and domestic banks unaffected by the new mandate. The findings suggest that country-by-country reporting can help curb corporate tax avoidance. However, on the other hand, disclosure might increase companies' profit-shifting activities among less transparent affiliates (Joshi et al., 2020), i.e., Poland. Fatica & Gregori (2020a) verified to what extent the largest European multinational banks shift profit to reduce their tax burden. They demonstrated that international tax differences cause a geographical distribution of earnings in multinational banks, with low-tax jurisdictions, especially tax havens, attracting disproportionately high profits. Their results suggest that, overall, 21% of

profits are shifted. Using country-by-country reported (CbCR) data, Aubry & Dauphin (2017) argue for profit shifting to countries with low or zero corporate tax rates in 2014, while (Janský, 2020a) identifies major European tax havens as the prominent locations of European banks' profits.

Given the above arguments, whether the introduction of taxation of commercial banks, cooperative savings and loan associations, insurance companies, and lending institutions in Poland in 2016 (since when CbCR was in force in more transparent countries contrary to Poland) contributed to increased profit shifting to avoid taxation remains an open question. Our study seeks to answer this question. Thus, we state the following hypotheses:

H4: *Following the implementation of special financial institution taxation, commercial banks and cooperative savings in Poland modified their profit-shifting strategies.*

3. Data and Methodology

We start estimations with the specification derived from the knowledge-capital (KC) model, which includes two types of capital: human and physical. However, as Fatica and Gregori (2020b) stated, measuring capital input is less straightforward in the case of banks. Although a standard proxy used in profit-shifting studies for nonfinancial firms is the amount of fixed capital, in the case of banks as financial intermediaries, labour mainly constitutes an input. We follow Białek-Jaworska & Klapkiv (2021), but we use the total passive incomes shifted to non-residents, excluding dividends, as a proxy for total profit-shifting, our dependent variable. In the KC model, the explanatory variables are the similarity in economic size and relative endowments of the physical and human capital factors between Poland and the countries-recipients of passive income. We measure the similarity in relative economic size (sdi_{ij}) using a bilateral style of the Helpman size dispersion index. This Helpman's index is calculated using data on output-side real GDP at chained purchasing power parity (PPP) rates and expressed in constant 2011 US dollars for Poland and a particular country that receives passive flows:

$$sdi_{ij} = 1 - \frac{gdp_{i_sum}}{gdp_{j_sum}}^2 - \frac{gdp_{j_sum}}{gdp_{i_sum}}^2$$

where the gdp_{i_sum} variable is i country's share of countries: recipient's and payer's GDPs calculated as described above.

The relative physical capital factor endowment between Poland and the country-recipient of passive income (ln_kdiff) is proxied by the logarithm of fixed assets per worker difference between the country-recipient and country-payer. Physical capital is calculated using the

national capital stocks expressed in PPPs in constant 2011 USD and the number of employed workers. At the same time, we used the differences in human capital endowments calculated using the human capital indexes for the recipient and payer countries to calculate relative human capital factor endowments between Poland and each country recipient (*hdiff*). Human capital indexes are based on the average years of schooling and return to education.

These variables allow us to distinguish between horizontal and vertical theoretical models. By assessing the statistical significance and signs of the estimated coefficients in these variables, we identify which investment motive better explains the cross-country pattern of profit-shifting. A positive similarity coefficient in the economic size supports horizontal integration and KC models (importance of market access motive). In comparison, its insignificance confirms the vertical integration model. Negative coefficients at differences in relative human capital factor endowments favour the horizontal integration model. In contrast, the pure vertical and KC models assume a significant positive relationship (when the efficiency-seeking motive is of higher importance than the market access motive). We use Penn World Table 10.0 to measure the differences in relative factor endowments between Poland and recipients (countries) using human and physical capital per worker. For the summation of Poland's GDP and the recipient country (*sum*), we expect that the coefficient at the combined market size of the profit-shifting parties is positive, similar to the theoretical predictions for total FDI. This approach assumes that profit-shifting (passive income) is a cost of foreign capital. The literature highlights the fiscal incentives to record profits in one country versus all the other locales where the multinational operates. So far, researchers have shown that the difference in taxation triggers the geographical distribution of earnings within international banks, and income appears to be shifted mainly among subsidiaries, as foreign-to-foreign tax differences matter significantly more than home-to-foreign differentials (Fatica & Gregori, 2020a). Therefore, we control withholding taxation on passive flows between payers (Poland) and recipient countries, set at the bilateral tax differences level and the tax burden in recipient countries.

Next, we control for additional factors that drive profitability, such as macroeconomic variables and the quality of institutions in the payer (shifting out) country. For example, government spending, labour freedom, investment freedom, financial freedom, and market capitalisation indicators of recipient countries are control variables that catch differences in macroeconomic development. Next, we include several bank-specific variables, such as the book value of a bank's assets and its square, to allow control of the size effect. Our data confirm the well-known regularity that larger banks have higher leverage ratios. The bank capital ratio

and loan loss provision measure the solvency risk. Long-term funds to total assets and liquid assets to bank deposits ratios are used to measure the bank's liquidity risk. We control the return on equity (ROE) and cost-to-income ratio as the bank's efficiency indices. The goodwill value allows one to identify Mergers and Acquisitions. The derivative assets to the total assets ratio measures risk management and changes in a bank's business model.

The Kaufmann indices (including regulatory quality, voice and accountability, political stability and absence of violence, government effectiveness, the rule of law, and corruption control) control the institutional environment and governance. Table 1 describes all test and control variables in detail, while Table 2 reports their descriptive statistics. Due to possible multicollinearity, we consider highly correlated control variables in separate models.

Using estimators for panel data, we estimate the relationships between the total profit-shifting or its components (*profit_shifting*) and the explanatory variables described in Table 1.

$$\begin{aligned}
 & \textit{profit_shifting}_{ijt} \\
 & = \beta_0 + \beta_1 \ln_wht_{ijt} + \beta_2 \textit{limit_licence}_{ijt} + \beta_3 \textit{bank_tax}_{ijt} \\
 & + \beta_4 \textit{tax_burden}_{ijt} + \beta_5 \textit{sdi}_{ijt} + \beta_6 \ln \textit{kdiff}_{ijt} + \beta_7 \textit{hdiff}_{ijt} + \beta_8 \textit{sum}_{ijt} \\
 & + \beta_9 \textit{controls} + v_{ij} + \varepsilon_{ijt}
 \end{aligned}$$

where i – a bank shifting profits, j – a recipient's country, t – time, v_{ij} , ε_{ijt} – errors.

<Table 1 Definitions of variables>

<Table 2 Descriptive statistics>

In Table 5 and Table 6c, we use the generalised method of moments (GMM) Arellano-Bond dynamic panel-data estimator to focus on the impact of limit licence on profit-shifting in total and its components, separate from taxing havens and non-tax haven countries. First, this approach uses instruments for the differenced equation, unifies the estimators, and eliminates the disadvantages of reduced sample size (Arellano & Bond, 1991). Second, the dynamic panel-data approach allows a better understanding of the adjustment dynamics, primarily when current behaviour depends on past behaviour.

4. Results

Based on the knowledge capital model estimates (Table 3), we conclude that horizontally integrated banking groups based on physical capital investments are more involved

in the passive income transfer from Poland. The motive for market access plays an important role. The search for a labour efficiency motive is more important than market access in profit-shifting. However, vertically integrated banking service groups are more likely to transfer profits through privilege-based services in the human capital production function. The larger the market in which banks operate, the greater the transfer of profits. Withholding tax does not counteract profit transfer, which is against the H1 hypothesis. The higher the public spending, the lower the profit transfer. Investment freedom promotes profit-shifting. More passive flows are directed to countries with more control of corruption, higher quality rules of law, higher regulatory quality, higher political stability, and higher government effectiveness. This means more profits are shifted to developed destinations with better institutions and governance, supporting the assumption of cost of capital.

Next, we analyse the effects of bank-specific characteristics on profit-shifting activity in Polish banks (Tables 4, 4a and 4b). In particular models/columns, three groups of control variables are added. In Model 1, a reaction for total profit-shifting is presented. The subsequent regressions take into account interest transfer (Model 2), royalties (*ln_licence*) paid to non-residents (Model 3), immaterial services (*ln_consulting*) (Model 4) and capital profits (Model 5) reported in the IFT tax statements. Based on Table 4, limiting tax-deductible costs of acquiring intangible services and rights performed directly or indirectly to benefit related parties reduces profit-shifting from Poland, except for royalties and capital gains (where coefficient estimates are insignificant). These results are according to the H2 hypothesis. However, introducing special financial institution taxation does not change profit-shifting size. This allows rejecting the H4 hypothesis. Banks pay higher royalties to entities in countries with lower tax burdens and higher stock market capitalisation. Recipients established in countries with higher labour freedom receive higher royalties but lower interest payments. Higher capital gains from foreign banks operating in Poland in foreign branches are transferred to countries with lower financial freedom. The search for infrastructure efficiency is more important than the market access motive in profit-shifting. Vertically integrated capital-intensive banking groups (with high fixed-assets investment) and labour-intensive banking groups earn higher capital gains from foreign banks operating in foreign branches in Poland, while the latter gain more total profit transfers and obtain higher interests.

Based on Table 4a, findings confirm the efficacy of withholding taxation in the case of reducing fees for foreign immaterial services, aligned with the H1 hypothesis. Next, the study highlights that introducing special financial institution taxation had a specific effect on decreasing profit-shifting of the consulting services in banking sector and unintended influence

on an increase in capital gains shifted to foreign shareholders. This gives no basis for rejecting the H4 hypothesis.

<Table 3 Total profit-shifting (PS) explained by KC model and regulatory quality – regression results>

In other channels, the model did not demonstrate a statistically significant impact of this new taxation of banks. This could indicate that special financial institution taxation did not significantly address the mechanisms or loopholes used for profit-shifting in sectors other than immaterial services. According to Sobiech et al. (2021), taxing banks' gross profits leads to higher leverage and lower risk exposure. This can result in a contraction in credit supply, impacting corporate debt financing and investment activity. On the other hand, the regulation implemented by the Ministry of Finance in Poland (*limit_licence*), which likely imposed stricter controls on the licensing via intangible-based channels of passive income flows abroad, appears to have been more effective on a broader scale.

<Table 4 Regression results for profit-shifting in the KC model with bank risk-specific>

This regulation significantly curtailed the volume of passive income flows out of the country, indicating its effectiveness in addressing wider issues of income shifting and tax base erosion. The relationship is statistically significant for licence and interest payments. Results point to no basis to reject the H2 hypothesis, except for immaterial services and capital gains. Moreover, our study found that the specific characteristics of banks determine – stimulate, or limit – profit-shifting. In particular, we note that larger banks engage more in profit-shifting by transferring higher passive income to non-residents, especially for licence and capital profits, contrary to immaterial services fees. More profitable banks (with higher ROE) transfer more profits in interest but less in fees for immaterial consulting services. Loan loss provisions stimulate profit-shifting, primarily via interests contrary to royalties and immaterial services fees (see Table 4b) and capital gains (see Table 4a).

<Table 4a GMM results for profit-shifting in the KC model with bank risk-specific>

<Table 4b Regression results for profit-shifting vs bank risk-specific business model>

The literature suggests that loan loss provisioning is an item with a discretionary element that depends on the strategy of bank managers. The results show a positive correlation between

profit-shifting and loan loss provisions. Selected studies indicate that loan loss provisions are increasing in the tax rate for countries that permit general provision tax deductibility (Amedzro St-Hilaire, 2018). This suggests that tax policies can influence the level of loan loss provisions. In turn, the more capital-stable the bank, the smaller the passive income flows are. Liquidity risk limits the royalties and the capital profits paid. Thus, it can be concluded that passive income flows are generated in larger banks accompanied by the risk of insolvency through the channel of debt interests. These findings support the H3 hypothesis. It can be assumed that large banks have shifted risk management services to other countries with more convenient tax regulations since double tax treaties. Considering macroeconomic variables, the incentive to transfer profits is lower tax burdens, higher investment freedom and market capitalisation. Higher royalties and immaterial services fees are transferred to recipients in countries with more labour freedom. In contrast, fewer profits go to recipients from countries with higher government spending and financial freedom.

Elaborating on the results in Table 5, we confirm a negative relationship between tax regulations (*limit_licence* variable) and the profit-shifting phenomenon for interest, royalties and immaterial services fees, which aligns with the H2 hypothesis. Profit shifting in the banking sector occurs through the channel of intangible assets, significantly the goodwill created on acquisitions. A spectacular increase in passive flows also accompanies banks that make derivative transactions (this transfer relates, in particular, to royalties paid) and finance themselves with long-term debt capital (in particular, in terms of interest transfers). Higher profits are paid to shareholders from countries with higher rules of law and lower quality law regulations. Banks pay higher interest to countries with lower regulatory quality and higher charges for consulting services provided by entities from countries with a lower political stability but higher voting rights, voice and accountability. Less efficient banks are more engaged in profit shifting, primarily via capital gains paid to foreign owners.

4.1 Robustness tests

We provide several robustness checks in Tables 6a, 6b, and 6c. The first set of additional tests in columns (1, 3, 5, 7, 9) of each table approximates the shift profits to tax havens countries.

<Table 5 Profit-shifting vs bank size and activity with Kaufmann regulatory variables – GMM regression results>

Correspondingly, tests in columns (2, 4, 6, 8, 10) refer to flows to countries not classified as tax havens. Table 6a shows that profit transfers to tax havens are made by service multinational corporations, which have greater flexibility and adaptability to new legal regulations by changing the geographical location of the headquarters of group members. In contrast, business groups with higher infrastructure investments (fixed assets) do not transfer profits to tax havens. An exception is the profit-shifting channel based on debt, including intra-group loans.

<Table 6a Profit-shifting vs model KC in tax_haven country and no-tax haven countries - regression results>

<Table 6b Profit-shifting vs bank risk in tax_haven countries and no-tax-haven countries -regression results>

<Table 6c Profit-shifting vs bank activity with Kaufmann in tax_haven and no-tax haven countries - regression results>

Vertically integrated banking multinationals make profit transfers through debt-based interest payments. The efficiency-seeking motive is more important than market access.

In contrast, banks making passive flows to countries other than tax havens shift profits to economies with higher purchasing power (higher GDP), driven by an enlarging market size motive. Withholding tax does not limit profit shifting except in the immaterial services (consulting) channel, where the relationship is insignificant. These findings reject the H1 hypothesis.

An in-depth comparative analysis shows that the results obtained in the previous section are confirmed and that the relationship between factors encouraging/restricting profit shifting is much more significant for the sample involving transfers to countries designated as tax havens.

Table 6b does not identify significant differences between the characteristics of banks in transferring passive income to tax havens and non-tax haven countries, except for the notice that larger banks transfer less interest to tax havens and that more liquid banks shift less interest to non-tax havens. Table 6c provides evidence to confirm the H2 hypothesis for profits shifted to tax haven countries, primarily via interest and royalty payments. Concerning non-tax haven

countries, this limit of intangible services works only in the case of interest payments. Table 6b confirms the H3 hypothesis that banks offset the negative impact of revenue shortfalls by exploiting the bank's business model and generating passive income flows accompanied by insolvency risk.

Based on the results shown in Table 6c, policymakers should control passive income transfers to countries that control less corruption with lower regulatory quality to prevent tax base erosion in the banking sector. In addition, it is recommended that flows to countries with higher-quality rules of law and transfers for consulting and other immaterial services made by larger banks but less efficient be watched to act against profit-shifting to tax havens. Notably, more indebted smaller banks will likely pay interest to tax havens.

Conclusions

We analysed the reaction of banks' engagement in profit shifting in Poland to tax regulations. Our study aligns with the ongoing debate on „Base Erosion and Profit Shifting” triggered by aggressive tax planning in the nonfinancial and financial sectors. We used a bank data set from the Orbis database for the empirical analysis from 2012 to 2019. It offers one of the first investigations into tax base erosion and profit shifting in the Central and Eastern European banking sector. Furthermore, the study determines which factors increase the transfer of bank profits to other countries. The study results found that bank earnings are significantly responsive to tax incentives in the host country. Using administrative tax data on the transfer of bank profits by category of non-residents' passive income: interest, royalties, immaterial services fees, or capital gains, we find evidence of a decline in the income shifted by financial subsidiaries following regulatory adoption. Finally, our study confirms the hypothesis that limiting financial institutions' costs of acquiring intangible services and rights performed directly or indirectly to benefit related parties reduces profit-shifting from Poland. However, our results indicate that withholding taxation is ineffective in limiting profit-shifting from the banking sector.

Our research has highlighted the importance of the type of bank business model in response to tax incentives. Many financial institutions' business models allow financial operations to be carried out regardless of the distance between the bank and the customer. In addition, selected bank business models are more flexible in reorganising structures, as operations do not require a specific infrastructure. Our findings confirm that banks offset the negative impact of revenue shortfalls by exploiting the bank's business model. In particular,

larger banks engage more in profit shifting by transferring higher passive income to non-residents. More profitable banks transfer more profits and interest in aggregate. Loan loss provisions stimulate profit shifting through debt interests. In addition, the taxable income of the subsidiaries can be used to reallocate taxable profits, which can form the basis for the choice of debt or equity financing strategies. Passive income flows are generated in larger banks accompanied by insolvency risk. Therefore, it can be assumed that large banks move risk management services to other countries with more convenient tax regulations.

The present findings might help solve the problem of base erosion and profit shifting and provide empirical evidence on the impact of public disclosure of tax information on reducing tax avoidance by financial institutions. By limiting passive income flows abroad, countries can protect their tax base and ensure that more income generated within the country remains taxable within its jurisdiction, potentially leading to increased public revenues. Policymakers might consider these findings to design more effective tax and regulatory measures. For instance, combining targeted measures with broad regulations could address both sector-specific and general tax avoidance practices more effectively.

The challenge for future research appears to be to verify whether taxation affects only the location of reported profits or the site of certain banking activities. Additionally, it would be interesting to determine the impact of the ownership structure on the profit shifting in banks.

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Declaration of interest statement

The authors report there are no competing interests to declare.

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Table 1 Definitions of variables

Variable	Definition
Dependent variables:	
PS	total profit-shifting measured by passive income, excluding dividends, to non-residents reported in the IFT tax statements; it is used as a proxy for profit-shifting
interest	interests paid to non-residents reported in the IFT tax statements
licence	royalties (licence) paid to non-residents reported in the IFT tax statements
consulting	immaterial services fees paid to non-residents reported in the IFT tax statements
art_21_22	capital profits reported in the IFT tax statements
_tax haven	passive income to non-residents set in tax havens
_no haven	passive income to non-residents set in countries other than tax havens
Test variables:	
ln_wht	the logarithm of withholding tax paid
bank_tax	time dummy variable equals 1 for the years since 2016 (introducing specific financial institution taxation in the banking industry in Poland)
limit_licence	the binary variable means 1 for the years after 2017 (introducing the regulation of the Ministry of Finance in Poland on limits of financial institutions' costs of acquiring intangible services and rights performed directly or indirectly to the benefit of related parties)
tax_burden	a measure of the tax burden imposed by the government; It includes direct taxes, in terms of the top marginal tax rates on individual and corporate incomes, and overall taxes, including all forms of direct and indirect taxation at all levels of government, as a percentage of GDP
Control variables:	
costtoincomeratio	cost-to-income ratio for individual bank
capitalisation	derivatives assets to total assets
liquidassets_deposits	liquid assets to bank deposits ratio
ln_goodwill	the logarithm of goodwill value
totalcapital	bank capital ratio
ln_TA	the logarithm of the bank's assets
ln_TA_sq	square of the bank's assets
loanlossprov_revenue	loan loss provision to revenue
longtermfund_ta	long term funds to total assets
ROE	return on equity ratio
sdi	Helpman's size dispersion index is calculated using data on output-side real GDP at chained purchasing power parity (PPP) rates and expressed in constant 2011 US dollars for country-payer (shifting out) and particular country-recipient (shifting in)
	$sdi_{ij} = 1 - \frac{gdp_{i_{sum}}^2}{gdp_{j_{sum}}^2}$
	where $gdp_{i_{sum}}$ is a country i 's GDP share in a group of country recipient's and payer's GDPs calculated using data on output-side real GDP at chained purchasing power parity (PPP) rates and expressed in constant 2011 US dollars
ln_kdiff	the logarithm of capital per worker difference is calculated using the national capital stocks expressed in PPPs in constant 2011 USD and the number of workers employed
hdiff	the differences in human capital endowments are calculated using the human capital indexes for the recipient (shifting in) and payer (shifting out) countries that are based on the average years of schooling and return to education
sum	logarithm of a sum of recipient country's (shifting in) and payer's (shifting out) GDPs
government_spending	the size of government across countries. The large variation in this indicator highlights the variety of countries' approaches to delivering public goods and services and providing social protection, not necessarily differences in resources spent. This indicator is measured in terms of thousands of USD per capita as a share (%) of GDP.
Financial_freedom	is a measure of banking efficiency and independence from government control and interference in the financial sector. Data are measured on a 0–100 scale.
Labor_freedom	is a quantitative measure that considers various aspects of the legal and regulatory framework of a country's labour market, including regulations concerning minimum wages, laws inhibiting layoffs, severance requirements, and measurable regulatory restraints on hiring and hours worked
investment_freedom	the index evaluates a variety of restrictions that are typically imposed on investment. As indicated below, points are deducted from the ideal score of 100 for each of the restrictions in a country's investment regime.

Market_capitalisation	logarithm of the market capitalisation of listed domestic companies, in current USD
Kaufmann's Worldwide Governance Indicators	
voice_and_accountability	voice and accountability capture perceptions of the extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and a free media
regulatory_quality	regulatory quality captures perceptions of the government's ability to formulate and implement sound policies and regulations that permit and promote private sector development,
rule_of_law	the rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular, the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence,
political_stability	political stability and absence of violence/terrorism measure perceptions of the likelihood of political instability and /or politically motivated violence, including terrorism
government_effectiveness	government effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies
control_of_corruption	control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests

Table 2 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
All profit-shifting less dividends	3,778	11.2073	4.5086	0	23.0510
interest	3,778	6.7796	6.7164	0	22.1236
licence	3,778	1.1695	3.6034	0	17.3373
art_21_22	3,778	5.9335	5.6525	0	23.0510
tax_burden	3,778	67.7831	15.5507	0	99.9
ln_wht	3,778	7.1033	4.7277	0	19.2099
costtoincomeratio	2,808	54.3978	11.5733	36	126
derivativ_ta	2,667	0.0155	0.0132	0.0001	0.1128
liquidassets_deposits	2,833	11.1617	8.8354	0	98
ln_goodwill	2,055	17.4829	2.3412	11.8092	20.2323
totalcapital	2,758	15.5109	2.5114	10	36
ln_TA	2,840	23.6315	1.0879	17.5407	25.1244
ln_TA_sq	2,840	559.6309	49.4106	307.676	631.2363
loanlossprov_reveue	2,783	22.5271	13.8773	-17	125
longtermfund_ta	2,675	0.0405	0.0427	0.0002	0.4431
ROE	2,819	9.9833	5.4008	-25	25
sdi	3,778	0.3125	0.1513	0.0037	0.4999
ln_kdiff	3,778	11.1113	5.6745	-2.0443	13.5986
hdiff	3,778	1.6852	3.6897	-0.2151	26.2945
sum	3,778	14.5071	0.7361	13.7949	16.8978
government_spending	3,778	41.7678	22.2067	0	94.8
financial_freedom	3,778	46.0138	24.8243	0	90
labor_freedom	3,778	65.1976	15.9166	0	98.5
investment_freedom	3,778	75.7358	17.5283	0	95
market_capitalisation	3,778	55.3925	57.4987	0	259.2718
voice_and_accountability	3,637	0.9850	0.7344	-1.88	1.74
regulatory_quality	3,637	1.2158	0.6379	-1.49	2.26
rule_of_law	3,637	1.2264	0.7311	-1.26	2.13
political_stability	3,637	0.6630	0.6036	-2.34	1.62
government_effectiveness	3,637	1.2374	0.6461	-1.52	2.24
control_of_corruption	3,637	1.1895	0.8599	-1.53	2.41
Dummy variables: _tax_haven	3,778	0.2043	0.4033	0	1
bank_tax	3,778	0.3147	0.4645	0	1
limit_licence	3,778	0.0143	0.1187	0	1

Table 3 Total profit-shifting (PS) explained by KC model and regulatory quality – regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
sdi	4.3906 *** (0.9645)	5.3204 *** (1.0274)	4.9569 *** (1.0270)	5.0907 *** (1.0221)	5.0601 *** (1.0260)	5.3574 *** (1.029)	5.0335 *** (1.0254)
ln_kdiff	-0.0242 (0.0194)	-0.0392 * (0.0212)	-0.0515 ** (0.0215)	-0.0695 *** (0.0222)	-0.0556 ** (0.0222)	-0.0405 * (0.0215)	-0.0564 ** (0.0220)
hdiff	0.0951 ** (0.0389)	0.1099 *** (0.0407)	0.1002 ** (0.0407)	0.1007 ** (0.0405)	0.1090 *** (0.0405)	0.1128 *** (0.0405)	0.1064 *** (0.0405)
sum	1.1682 *** (0.1796)	1.2189 *** (0.1866)	1.1833 *** (0.1866)	1.1364 *** (0.1867)	1.1996 *** (0.1865)	1.2921 *** (0.1906)	1.1728 *** (0.1868)
ln_wht	H1 0.4004 *** (0.0129)	0.3857 *** (0.0131)	0.3842 *** (0.0131)	0.3829 *** (0.0131)	0.3833 *** (0.0131)	0.3838 *** (0.0132)	0.3830 *** (0.0131)
tax_burden	-0.0134 (0.0092)	-0.0034 (0.0103)	0.0013 (0.0100)	0.0049 (0.0100)	-0.0018 (0.0099)	-0.0085 (0.0095)	-0.0092 (0.0099)
government_spending	-0.0164 *** (0.0057)	-0.0152 ** (0.0060)	-0.0167 *** (0.0060)	-0.0140 ** (0.0060)	-0.0186 *** (0.0060)	-0.0161 *** (0.0060)	-0.0162 *** (0.0060)
labor_freedom	0.0042 (0.0058)	-0.0056 (0.0060)	-0.0102 * (0.0062)	-0.0133 ** (0.0063)	-0.0078 (0.0061)	-0.0076 (0.0062)	-0.0112 * (0.0063)
investment_freedom	0.0294 *** (0.0059)	0.0251 *** (0.0077)	0.0235 *** (0.0070)	0.1604 ** (0.0075)	0.0204 *** (0.0077)	0.0306 *** (0.0067)	0.0224 *** (0.0072)
financial_freedom	-0.0016 (0.0041)	-0.0046 (0.0042)	-0.0037 (0.0042)	-0.0048 (0.0042)	-0.0045 (0.0042)	-0.0031 (0.0042)	-0.0035 (0.0042)
market_capitalization	-0.0003 (0.0015)	-0.0006 (0.0016)	-0.0014 * (0.0016)	-0.0023 (0.0016)	-0.0016 (0.0016)	-0.0007 (0.0016)	-0.0018 (0.0016)
voice_and_accountability		0.4401 * (0.2288)					
control_of_corruption			0.6388 *** (0.1745)				
rule_of_law				1.1274 *** (0.2379)			
regulatory_quality					0.7868 *** (0.2509)		
political_stability						0.3307 * (0.1815)	
government_effectiveness							0.8291 *** (0.2357)
_cons	-10.5515 *** (2.9574)	-11.9033 *** (3.0774)	-11.2644 *** (3.0746)	-10.5068 *** (3.0752)	-11.2681 *** (3.0765)	-12.7183 *** (3.1221)	-11.0497 *** (3.0770)
Number of observations	3,778	3,637	3,637	3,637	3,637	3,637	3,637
Number of groups	1,000	956	956	956	956	956	956
Wald test	1,105.65 ***	998.59 ***	1,011.06 ***	1,023.58 ***	1,006.68 ***	998.24 ***	1,010.15 ***
R ²	0.3401	0.3287	0.3307	0.3369	0.3320	0.3304	0.3354

Standard errors are in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4 Regression results for profit-shifting in the KC model with bank risk-specific

		(1)		(2)		(3)		(4)		(5)
		PS		ln_interest		ln_licence		ln_consulting		ln_art_21_22
limit_licence	H	-1.5218 **		-5.9574 **		-0.4891		-3.1044 **		-0.5399
		(0.5955)		(0.9020)		(0.5820)		(0.7216)		(0.8567)
bank_tax	H	-0.0886		-0.2256		-0.1177		0.0864		-0.1933
		(0.1429)		(0.2156)		(0.1382)		(0.1720)		(0.2038)
sdi		3.1412 **		2.3790		0.5488		2.3562 *		-0.4386
		(1.2928)		(1.7686)		(0.8499)		(1.3098)		(1.4240)
ln_kdiff		-0.0026		0.0098		0.0035		-0.0201		0.0544 *
		(0.0252)		(0.0348)		(0.0172)		(0.0260)		(0.0285)
hdiff		0.1494 **		0.1603 **		-0.0156		-0.0076		0.1648 **
		(0.0521)		(0.0712)		(0.0343)		(0.0527)		(0.0574)
sum		1.3079 **		1.5291 **		0.4678 **		1.8525 **		0.9136 **
		(0.2609)		(0.3565)		(0.1706)		(0.2638)		(0.2865)
ln_TA		0.1777		0.2709		0.1849 **		0.1410		0.7022 **
		(0.1215)		(0.1688)		(0.0846)		(0.1264)		(0.1392)
totalcapital		-0.1078 **		-0.1182 **		-0.0626 **		0.0200		-0.0339
		(0.0300)		(0.0450)		(0.0282)		(0.0358)		(0.0421)
loanlossprov_revenue	H	0.0160 **		0.0403 **		-0.0220 **		-0.0124		-0.0107
		(0.0074)		(0.0110)		(0.0066)		(0.0087)		(0.0101)
liquidassets_deposit		0.0014		0.0089		-0.0206 *		-0.0053		-0.0684 **
		(0.0135)		(0.0199)		(0.0115)		(0.0155)		(0.0179)
ROE		0.0195		0.1463 **		-0.0001		-0.1056 **		-0.0221
		(0.0174)		(0.0260)		(0.0158)		(0.0205)		(0.0240)
tax_burden		-0.0156		0.0192		-0.0198 **		-0.0173		-0.0101
		(0.0123)		(0.0177)		(0.0095)		(0.0135)		(0.0152)
government_spending		-0.0193 **		-0.0481 **		-0.0159 **		-0.0252 **		0.0066
		(0.0078)		(0.0113)		(0.0062)		(0.0087)		(0.0099)
labor_freedom		0.0019		-0.0218 *		0.0140 **		0.0074		0.0064
		(0.0083)		(0.0119)		(0.0062)		(0.0090)		(0.0101)
investment_freedom		0.0280 **		0.0518 **		0.0126 **		0.0395 **		0.0072
		(0.0080)		(0.0113)		(0.0059)		(0.0086)		(0.0095)
financial_freedom		-0.0039		0.0033		-0.0016		-0.0067		-0.0141 **
		(0.0058)		(0.0080)		(0.0040)		(0.0060)		(0.0066)
market_capitalization		0.0023		-0.0024		0.0033 *		0.0065 **		0.0030
		(0.0022)		(0.0032)		(0.0018)		(0.0025)		(0.0029)
_cons		- **		- **		-8.2652 **		- **		- **
		(5.2048)		(7.1994)		(3.5669)		(5.3760)		(5.8990)
Number of		2,751		2,751		2,751		2,751		2,751
Number of groups		724		724		724		724		724
Wald test		127.02 **		228.24 **		127.91 **		265.35 **		87.77 **
R ²		0.1185		0.0908		0.1383		0.2066		0.0844

Standard errors are in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4a GMM results for profit-shifting in the KC model with bank risk-specific

	(1)	(2)	(3)	(4)	(5)
	PS	ln_interest	ln_licence	ln_consulting	ln_art_21_22
L1.Y	0.2534 *** (0.0786)	0.7350 *** (0.0741)	0.2386 *** (0.0427)	0.3768 *** (0.0636)	0.3032 *** (0.0545)
ln_wht	H1 0.3346 *** (0.0406)	0.0606 (0.0586)	0.1098 *** (0.0417)	-0.1009 ** (0.0401)	0.8153 *** (0.0522)
limit_licence	H2 1.2385 (0.7813)	-9.4253 *** (1.7531)	-2.2434 ** (0.9610)	0.8188 (0.9958)	6.1929 *** (1.1918)
bank_tax	H4 -0.0648 (0.3172)	-0.6095 (0.5751)	0.0968 (0.3014)	-0.6643 * (0.3524)	0.9021 ** (0.4252)
bank_tax *ln_wht	-0.0102 (0.0282)	0.0776 (0.0579)	-0.0334 (0.0327)	0.0971 ** (0.0399)	-0.0755 * (0.0414)
limit_licence *ln_wht	-1.4166 *** (0.3346)	-0.0723 (0.8299)	0.5071 ** (0.2182)	-3.0685 *** (0.3525)	-2.2072 (1.6608)
sdi	2.7801 (6.9890)	17.0210 (14.8384)	7.6492 (6.2034)	13.5316 (10.8488)	20.3714 (14.9605)
ln_kdiff	-0.5723 ** (0.2601)	0.2981 (0.2679)	-0.0091 (0.1780)	-0.6038 (0.3855)	-0.0799 (0.2781)
hdiff	-0.5026 (0.3326)	0.2140 (0.8188)	0.2060 (0.2801)	0.1737 (0.4986)	0.0574 (0.6232)
sum	0.6542 (0.7761)	1.2974 (1.5007)	-2.0231 ** (0.8645)	2.8212 *** (0.8895)	-3.2522 ** (1.2967)
ln_TA	0.0810 (0.4307)	-1.1514 (0.8263)	1.0655 ** (0.5159)	-1.5153 *** (0.5542)	1.7890 ** (0.7724)
totalcapital	-0.0161 (0.0341)	-0.0053 (0.0751)	0.0358 (0.0382)	0.0140 (0.0650)	0.0228 (0.0479)
loanlossprov_revenue	H3 0.0060 ** (0.0100)	0.0034 (0.0217)	-0.0111 (0.0082)	0.0053 (0.0152)	-0.0536 *** (0.0159)
liquidassets_deposits	-0.0034 (0.0185)	-0.0590 (0.0378)	0.0309 (0.0224)	0.0011 (0.0231)	-0.0370 * (0.0217)
ROE	0.0317 (0.0239)	0.1083 ** (0.0537)	-0.0007 (0.0213)	-0.0926 ** (0.0426)	-0.0023 (0.0412)
tax_burden	-0.0192 (0.0245)	-0.0194 (0.0506)	0.0191 (0.0226)	-0.0145 (0.0393)	-0.0295 (0.0447)
government_spending	0.0193 (0.0150)	-0.0434 (0.0334)	0.0103 (0.0125)	-0.0014 (0.0213)	0.0238 (0.0318)
labor_freedom	0.0117 (0.0116)	-0.0015 (0.0256)	0.0140 (0.0129)	0.0113 (0.0230)	0.0129 (0.0266)
investment_freedom	0.0196 (0.0137)	0.0038 (0.0303)	-0.0132 (0.0135)	0.0451 (0.0279)	-0.0012 (0.0296)
financial_freedom	-0.0220 (0.0146)	0.0389 (0.0294)	-0.0325 (0.0199)	-0.0356 (0.0291)	-0.0314 (0.0246)
market_capitalization	-0.0008 (0.0026)	-0.0045 (0.0059)	-0.0006 (0.0054)	0.0136 *** (0.0050)	0.0008 (0.0063)
Observations	1,976	1,976	1,976	1,976	1,976
N of groups	571	571	571	571	571
Instruments	40	40	40	40	40
Sargan test	22.7990	23.8138	19.6122	21.0994	30.2072
p-value	0.2463	0.2034	0.2382	0.3313	0.0355
Arellano-Bond test					
	AR(1)				
p-value	-5.6217	-6.9503	-4.7299	-5.9802	-6.5354
	AR(2)				
p-value	0.4749	-0.8841	1.9949	0.5951	0.8948
p-value	0.6349	0.3766	0.0461	0.5518	0.3709

Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4b Regression results for profit-shifting vs bank risk-specific business model

		(1)	(2)	(3)	(4)	(5)
		PS	ln_interest	ln_licence	ln_consulting	art_21_22
bank_tax	H4	-0.003 (0.141)	-0.101 (0.213)	-0.079 (0.136)	0.2314 (0.1702)	-0.165 (0.201)
limit_licence	H2	-1.400** (0.595)	-5.765*** (0.901)	-0.389 (0.579)	-2.884*** (0.721)	-0.457 (0.855)
ln_TA		0.135 (0.121)	0.199 (0.168)	0.166** (0.084)	0.079 (0.128)	0.674*** (0.139)
totalcapital		-0.109*** (0.030)	-0.118*** (0.045)	-0.064** (0.028)	0.013 (0.036)	-0.034 (0.042)
loanlossprov_revenue	H3	0.015** (0.007)	0.039*** (0.011)	-0.023*** (0.007)	-0.015* (0.009)	-0.012 (0.01)
liquidassets_deposits		0.002 (0.013)	0.011 (0.02)	-0.02* (0.011)	-0.004 (0.016)	-0.068*** (0.018)
ROE		0.013 (0.017)	0.138*** (0.026)	-0.004 (0.016)	-0.119*** (0.020)	-0.028 (0.024)
tax_burden		-0.035*** (0.011)	0.009 (0.016)	-0.023*** (0.008)	-0.038*** (0.012)	-0.027** (0.014)
government_spending		-0.012* (0.007)	-0.046*** (0.011)	-0.016*** (0.006)	-0.018** (0.008)	0.009 (0.009)
labor_freedom		0.009 (0.008)	-0.009 (0.011)	0.018*** (0.006)	0.021** (0.008)	0.005 (0.01)
investment_freedom		0.018*** (0.007)	0.043*** (0.01)	0.008* (0.005)	0.022*** (0.212)	0.005 (0.008)
financial_freedom		-0.005 (0.006)	0.001 (0.008)	-0.002 (0.004)	-0.008 (0.006)	-0.016** (0.007)
market_capitalisation		0.005** (0.002)	0.002 (0.003)	0.005*** (0.002)	0.012*** (0.002)	0.004 (0.003)
Observations		2,780	2,780	2,780	2,780	2,780
N groups		735	735	735	735	735
Wald test Chi ²		95.56	205.756	114.276	187.74	66.121
p-value		0.000	0.000	0.000	0.000	0.000
Overall R ²		0.083	0.083	0.074	0.1307	0.05

Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5 Profit-shifting vs bank size and activity with Kaufmann regulatory variables – GMM regression results

	(1) PS	(2) ln_interest	(3) ln_licence	(4) ln_consulting	(5) ln_art_21_22
Y.(-1)	0.279* (0.144)	0.601*** (0.1)	0.363*** (0.051)	0.174 (0.149)	0.239*** (0.078)
Y.(-2)	0.052 (0.061)	-0.003 (0.041)	0.139*** (0.032)	-0.054 (0.086)	-0.053 (0.039)
limit_licence	H2 2.851 (1.908)	-12.872*** (1.839)	-2.803*** (1.078)	-4.0099** (2.035)	0.006 (1.511)
ln_TA_sq	-0.041** (0.020)	-0.051*** (0.019)	0.021* (0.011)	0.025* (0.013)	-0.022 (0.016)
ln_goodwill	0.258** (0.106)				
longtermfund_ta	-3.335 (5.856)	13.872*** (4.997)		6.978 (9.399)	
derivativ_ta	5.792 (14.904)		34*** (10.027)		
costtoincomeratio	-0.040** (0.019)			-0.002 (0.017)	-0.046** (0.019)
voice_and_accountability	-1.532 (1.926)	-2.684 (3.598)	-1.595 (2.065)	4.379* (2.441)	-2.377 (3.264)
control_of_corruptionn	-1.045 (1.229)	-2.962 (2.293)	-1.056 (1.301)		-3.199 (2.047)
rule_of_law	2.150* (1.221)	2.021 (1.976)	-0.289 (1.154)		2.269 (1.742)
regulatory_quality	-2.337** (1.159)	-3.998** (1.973)	-0.724 (1.153)		1.447 (1.77)
political_stability	-1.029 (0.786)	0.235 (1.356)	0.781 (0.771)	-1.689* (1.016)	1.099 (1.199)
government_effectiveness	1.096 (1.445)	2.111 (2.268)	-0.34 (1.313)		-2.389 (2.049)
Number of observations	762	916	912	904	955
Number of groups	297	357	355	357	381
N instruments	23	24	20	20	23
Wald test Chi ²	53.82	146.398	73.5	18.82	33.119
p-value	0.0000	0.0000	0.0000	0.0158	0.0000
Sargan test	37.717	31.16	34.934	12.747	29.49
p-value	0.0000	0.0032	0.0001	0.3877	0.0033
AR(1)	-2.724	-6.32	-6.705	-3.5876	-7.063
p-value	0.0064	0.0000	0.0000	0.0003	0.0000
AR(2)	0.724	-0.985	-0.401	0.81306	1.725
p-value	0.4689	0.3246	0.6887	0.4162	0.0846
AR(3)	-0.389	-0.848	-2.686	0.459	-0.367
p-value	0.6974	0.3961	0.0072	0.6461	0.7133

*Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1*

Table 6a Profit-shifting vs model KC in tax_haven country and no-tax haven countries - regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	PS_tax	PS_no	ln_interest	ln_interest	ln_licence	ln_licence	ln_consult	ln_consult	ln_art_21_22	ln_art_21_22
ln_TA	-0.158 (0.178)	-0.183* (0.111)	0.003 (0.277)	-0.095 (0.161)	0.030 (0.151)	0.002 (0.093)	0.119 (0.248)	0.045 (0.130)	0.565*** (0.199)	0.245** (0.107)
sdi	3.842 (2.396)	4.062*** (1.132)	10.698*** (3.854)	6.645*** (1.552)	4.620* (2.368)	1.600* (0.859)	3.043 (3.481)	2.916** (1.271)	-6.171** (3.083)	-0.554 (0.963)
ln_kdiff	0.005 (0.045)	0.038* (0.020)	0.138* (0.073)	0.057** (0.028)	0.013 (0.045)	0.038** (0.016)	0.036 (0.066)	0.068*** (0.023)	-0.023 (0.058)	0.018 (0.018)
hdiff	0.181*** (0.058)	0.001 (0.056)	0.445*** (0.088)	-0.060 (0.077)	0.009 (0.046)	-0.003 (0.044)	0.045 (0.078)	0.003 (0.063)	-0.106* (0.061)	0.073 (0.049)
sum	2.660 (1.752)	1.044*** (0.216)	-8.262*** (2.982)	0.522* (0.295)	-0.587 (2.059)	0.651*** (0.163)	6.829** (2.726)	2.191*** (0.242)	5.667** (2.663)	0.531*** (0.182)
ln_wht	H1 0.499*** (0.029)	0.394*** (0.017)	0.579*** (0.049)	0.371*** (0.028)	0.078** (0.032)	0.042** (0.017)	-0.028 (0.045)	0.007 (0.022)	0.713*** (0.041)	0.697*** (0.021)
Observations	643	2,342	643	2,342	643	2,342	643	2,342	643	2,342
N groups	156	627	156	627	156	627	156	627	156	627
Wald test Chi ²	314.96	594.79	221.68	229.95	19.83	40.16	37.01	111.71	345.00	1,217.15
p-value	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000
Between R ²	0.4704	0.292	0.434	0.217	0.073	0.033	0.113	0.133	0.591	0.494

*Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*

Table 6b Profit-shifting vs bank risk in tax_haven countries and no-tax-haven countries - regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	PS_tax	PS_no	ln_interest	ln_interest	ln_licence	ln_licence	ln_consult	ln_consult	art_21_22_tax	art_21_22_no
ln_TA	-0.253** (0.495)	-0.333 (0.290)	-0.603* (0.344)	-0.082 (0.18)	0.033 (0.145)	-0.021 (0.09)	-0.358 (0.633)	-0.430 (0.330)	1.126*** (0.282)	0.452*** (0.144)
totalcapital	-0.16*** (0.052)	-0.15*** (0.036)	-0.143** (0.072)	-0.142*** (0.05)	-0.053 (0.043)	-0.082*** (0.03)	-0.1063 (0.0668)	-0.048 (0.041)	0.007 (0.069)	-0.065 (0.045)
loanlossprov_H3	-0.010 (0.016)	0.020** (0.010)	-0.004 (0.02)	0.038*** (0.012)	-0.024** (0.011)	-0.024*** (0.007)	-0.034* (0.021)	0.0115 (0.011)	0.012 (0.019)	-0.022** (0.011)
liquidassets_	-0.012 (0.023)	-0.027* (0.016)	-0.043 (0.029)	-0.035* (0.02)	-0.012 (0.016)	-0.023** (0.011)	-0.097*** (0.029)	-0.056*** (0.019)	-0.048* (0.027)	-0.083*** (0.018)
ROE	-0.061* (0.032)	0.009 (0.023)	0.088** (0.042)	0.183*** (0.027)	-0.022 (0.025)	0.005 (0.016)	-0.255*** (0.041)	-0.112*** (0.027)	-0.033 (0.04)	-0.03 (0.024)
Observations	664	2,406	664	2,406	664	2,406	664	2,406	664	2,406
N groups	171	659	171	659	171	659	171	659	171	659
F test	2.97	6.83					10.57	6.72		
p-value	0.0119	0.0000					0.000	0.000		
Wald test Chi ²			17.955	81.037	6.383	20.889			20.807	38.228
p-value			0.000	0.000	0.000	0.000			0.000	0.000
R ²	0.0295	0.0192	0.0073	0.0116			0.098	0.019		

Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6c Profit-shifting vs bank activity with Kaufmann in tax_haven and no-tax haven countries - regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	PS_tax	PS_no	ln_interest	ln_interest	ln_licence	ln_licence	ln_consult	ln_consult	art_21_22	art_21_22_
Y.(-1)	-0.323 (0.20)	0.437** (0.170)	0.344** (0.138)	0.705*** (0.13)	0.22** (0.093)	0.375*** (0.056)	0.366*** (0.090)	0.204*** (0.078)	0.356*** (0.132)	0.208** (0.09)
Y.(-2)	-0.091 (0.132)	0.102 (0.065)	-0.111 (0.083)	0.02 (0.048)	0.14** (0.057)	0.13*** (0.036)			-0.191** (0.077)	-0.033 (0.044)
limit_licence H2	3.214*** (0.442)	0.477 (4.269)	-15.895*** (2.933)	-11.834*** (2.389)	-5.695*** (1.873)	-1.351 (1.312)	-0.303 (0.579)	4.165* (2.429)	1.486 (2.134)	-1.244 (2.07)
ln_TA_sq	-0.050* (0.026)	-0.0337 (0.018)	-0.102** (0.05)	-0.04* (0.022)	0.025 (0.027)	0.025** (0.013)	0.042** (0.018)	0.003 (0.007)	-0.049 (0.04)	-0.02 (0.017)
ln_goodwill	0.270** (0.136)	0.228* (0.122)					-0.178** (0.077)	0.064 (0.089)		
longtermfund_ta	-16.036* (9.771)	1.847 (6.333)	21.65** (9.091)	7.82 (6.502)			1.368 (2.532)	3.967 (5.658)		
derivativ_ta	1.511 (25.846)	21.408 (16.867)			16.687 (17.757)	40.164*** (11.891)	-4.807 (14.578)	-25.846* (14.046)		
costtoincomeratio	-0.021 (0.025)	-0.051** (0.023)					0.062** (0.029)	0.003 (0.020)	-0.037 (0.035)	-0.047** (0.022)
voice_and_accou	-3.891 (4.469)	-1.661 (2.120)	0.562 (9.498)	-3.228 (4.111)	-4.554 (5.463)	-1.262 (2.275)	-0.969 (2.575)	1.791 (1.607)	-5.8 (8.728)	-1.73 (3.601)
control_of_corr	-5.210* (2.784)	-0.091 (1.222)	-2.559 (4.609)	-2.216 (2.834)	0.183 (2.552)	-0.879 (1.566)		2.216* (1.327)	-5.357 (4.052)	-2.569 (2.423)
rule_of_law	2.564* (1.420)	2.912* (1.616)	3.568 (3.447)	2.363 (2.597)	-1.965 (2.053)	0.768 (1.447)		-1.477 (1.225)	-1.007 (3.195)	2.955 (2.242)
regulatory_qual	-5.636** (2.408)	-1.493 (1.246)	-4.099 (5.058)	-3.266 (2.255)	-1.328 (2.965)	-0.931 (1.252)		-1.040 (0.937)	3.792 (4.635)	1.469 (1.923)
political_stabi~y	1.803 (1.588)	-1.707* (0.898)	1.031 (2.843)	0.365 (1.618)	0.485 (1.608)	0.668 (0.889)		-0.928* (0.489)	3.445 (2.634)	0.295 (1.366)
government_eff	2.594 (3.823)	0.696 (1.394)	-1.563 (4.787)	2.47 (2.673)	2.232 (2.81)	-0.555 (1.49)		-0.376 (0.885)	5.157 (4.584)	-4.475* (2.354)
Observations	152	610	197	719	198	714	215	1,263	210	745
N groups	57	240	74	283	75	280	68	378	81	300
N instruments	21	22	20	22	18	20	17	28	20	22

Wald test Chi ²	938.64	45.50	70.814	87.18	15.987	63.927	80.21	65.01	24.861	23.409
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sargan test	10.1785	28.012	15.792	19.231	16.886	33.609	6.726	14.749	13.364	21.747
p-value	0.1787	0.0005	0.0714	0.0571	0.0181	0.000	0.6656	0.4696	0.1468	0.0264
AR(1)	-0.135	-2.5954	-3.404	-5.441	-3.101	-5.919	-1.857	-4.5798	-3.661	-6.19
p-value	0.8926	0.0094	0.000	0.000	0.000	0.000	0.0632	0.000	0.000	0.000
AR(2)	0.653	-0.355	2.071	-1.853	-1.675	0.565	-1.754	0.139	2.174	1.052
p-value	0.513	0.7222	0.0384	0.0639	0.094	0.5722	0.0794	0.8892	0.0297	0.2930
AR(3)	0.123		0.4913	0.68803	3.033	-3.753			0.242	-0.83027
p-value	0.9017		0.6232	0.4914	0.0024	0.0002			0.8088	0.4064

*Standard errors are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.*