COUNTRY-BY-COUNTRY REPORTING (CBCR) AS A TOOL FOR IDENTIFYING PATTERNS OF PROFIT SHIFTING BY MULTINATIONALS

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Abstract. The paper is devoted to analysing a database of CbCRs, which was developed as part of the AITAX13 project of the University of Luxembourg, and covers over 150 MNEs to identify patterns of profit shifting and aggressive tax planning. Several quantitative indicators were used for this reason, including effective tax rates, profit per employee, the share of profits declared in countries without employees, ultra-high pre-tax profit margins (exceeding 50%), and the share of total corporate profits taxed at rates below 15%. It was found that, based on these characteristics, many corporations transfer significant amounts of profits to low-tax jurisdictions where the presence of real economic activity is minimal. The findings confirm the effectiveness of CbCR reports as a tool for increasing transparency and detecting aggressive tax planning, consistent with the findings of recent studies and OECD estimates.

Keywords: Country-by-Country Reporting; profit shifting; effective tax rate; tax transparency; BEPS; aggressive tax planning

INTRODUCTİON.

Profit shifting by multinational corporations to low-tax jurisdictions remains a serious problem for the global tax base. Aggressive tax planning, particularly through the use of tax havens and discrepancies in national tax regimes, results in significant losses of tax revenue for governments. According to researchers, a significant share of international companies' profits is shifted to tax havens every year. For example, Alstadsæter et al. (2023) note that in 2022, multinationals transferred about USD 1 trillion, or about 15% of their foreign profits. USD, or 35% of their foreign profits, to low-tax jurisdictions. Similarly, Wier and Zucman (2022) demonstrated that approximately 37% of multinationals' profits are consistently declared in tax havens, corresponding to a loss of around 9-10% of global corporate tax revenues. These facts suggest that the issue of Base Erosion and Profit Shifting (BEPS) remains pertinent, even after the implementation of international countermeasures.

One of the key initiatives introduced to increase transparency and combat BEPS is Country-by-Country Reporting (CbCR), recommended by the OECD/G20 BEPS Action Plan 13. Since 2016, large multinational companies have been required to submit CbCR reports to the tax authorities (with mandatory reporting starting in jurisdictions that implemented OECD recommendations into domestic law; for instance, the United States required filing for fiscal years beginning on or after July 1, 2016 (IRS, 2016)). These reports contain aggregated financial data for each country of operation, including revenues, pre-tax profits, taxes paid and accrued, number of employees, tangible assets, etc. Initially, this data was used only by tax authorities for risk analysis purposes; however, in recent years, public CbCR reporting has undergone significant development.

In particular, mandatory disclosure of CbCR was introduced for banks and extractive companies under the current EU legislation. Additionally, on 24 November 2021, the EU Directive 2021/2101 was adopted, amending Directive 2013/34/EU and introducing new requirements for the public disclosure of information on corporate income tax. Under the new rules, large companies headquartered in the EU with consolidated revenues of more than EUR 750 million in two consecutive years, as well as foreign companies with equivalent revenues and at least one medium or large branch in the EU, are required to publish their CbCR reports.

Eligibility for the "medium or large branch" criteria is determined by meeting two of the three criteria:

- total assets of more than EUR 4 million,
- net income exceeding EUR 8 million,
- an average number of employees of more than 50 during the financial year (Directive 2013/34/EU, Art. 3).

Under Article 48g of Directive 2021/2101, EU Member States must ensure that the public disclosure provisions (Articles 48a-48f) are applied from the beginning of the first financial year, which will begin no earlier than 22 June 2024. Thus, for most EU countries, the first reporting year will be 2025, and the mandatory deadline for publishing reports will be 31 December 2026 (no later than 12 months after the end of the financial year). At the same time, some member states have provided for shorter deadlines: for example, Spain requires the publication of reports within 6 months, and Romania introduced the first mandatory reporting period as early as 2024, with a deadline of 31 December 2025.

Accordingly, there is an opportunity for independent analysis of CbCR data, which allows identifying characteristic patterns of profit shifting and assessing the effectiveness of this reporting as a tool for tax transparency.

The purpose of this study is to demonstrate a methodology for identifying signs of profit shifting based on public CbCRs and to present the results of an analysis of an extensive array of such reports. The study is part of the AITAX13 project (University of Luxembourg), which is dedicated to creating a database and analytical tools for CbCRs using artificial intelligence. Below, we describe the approaches to data collection and processing, the key indicators used to detect anomalies, the results obtained, and a comparison with the findings of the OECD and recent academic research in this area.

METHODOLOGY

Data and information collection: The analysis is based on AITAX13 database which consist of more than 800 public CbCR reports from over 150 multinational companies for the period 2013-2024. Our database cover different 25+ sectors of the economy (Banks, Oil, Gas & Consumable Fuels, Metals & Mining, Machinery, etc.) and were identified from open sources – official websites of companies in some cases on the open national registers (e.g., Companies House – UK). The paper is based on preliminary analysis of CbCR reports from MNEs for the period 2023.

The reports were identified as part of the AITAX13 project of the University of Luxembourg. AITAX13 is a data-driven solution that combines tax compliance and artificial intelligence. This project aims to develop a web-based platform that enables users to identify potential red flags and assess tax risks based on CbCRs. The future enhancements of our project are to transition from rule-based risk identification to predictive early warning systems. The Early Warning System (EWS) aims to complement the existing tax risk calculator. While the current calculator analyses historical data to detect potential tax risks, the EWS goes further. By integrating the AITAX13 system with the financial systems of MNEs, we intend to use real-time data to create early warnings of potential exposures. Combining our rule-based logic and AI techniques, the EWS aims to identify inherent tax risks as early as possible, allowing companies to proactively take corrective action before the data is submitted to the tax authorities (AITAX13, 2025).

In this paper, we do not disclose our methodology for identifying tax risks. However, we would like to demonstrate that CbCR is indeed able to detect aggressive tax planning by MNEs that leads to significant losses in corporate income tax revenues as a result of tax rule abuse.

Some of the reports were identified through an advanced Google search using the following keywords: "country by country" OR "Country-by-country" OR country-by-country OR CBCR OR CbCR OR "GRI 207-4" OR "GRI 207-4", and others were downloaded automatically using specialised scripts. In our project, AITAX13, we apply a Data Processing pipeline that combines manual and automated methods for ingestion, cleansing, validation, standardisation, mapping (using an extended template OECD, OECD (2014)) and several levels of enrichment of CbCRs data. A multi-step human validation process

supported by audit trails and manual consistency checks. A 'four-eyes' principle ensures each dataset is reviewed by at least two analysts.

CbCRs were extracted from PDFs using specialised scripts and then manually validated (as was mentioned above). All data mapped using extended OECD template: all indicators were consolidated by the jurisdiction of operation of each corporation, and after our database was enriched with information about Corporate Income Tax Statutory Rate from the OECD database (OECD. (n.d.). Unified identifiers for jurisdictions (Using ISO and currencies (ISO 4217), as well as other relevant details, were entered into the AI-driven dashboard. The latter has now been expanded to include features such as a tax risk calculator, net margin (proxy), and AI-driven media analysis. At the time of analysis, some of the collected CbCR reports were still being processed; therefore, the results are based on the part of the sample that had undergone complete standardisation.

Indicators of profit shifting. In order to identify possible patterns of aggressive tax planning, several key indicators and thresholds have been identified, above which a jurisdiction or an entire corporate group can be considered to have signs of profit shifting:

Effective tax rate (ETR) – the ratio of income tax accrued to profit before tax. Too low effective rates (especially below 15%) are a potential signal that significant profits are being diverted to jurisdictions with preferential taxation (given the global minimum rate of 15% agreed by the OECD). Since we analysed indicators from the public CbCR, we were unable to use the whole OECD approach to calculate effective tax rates (Corporate Effective Tax Rates, OECD, 2024). After careful analysis of the conceptual and practical arguments, we concluded that income tax expense (current year) / income before tax is a more appropriate indicator for calculating proxy ETR based on CbCR data when the objective is to compare with forward-looking (Devereux–Griffith) ETR. This approach aligns the numerator with the economic income of the current year and the impact of tax legislation on that income, reflecting the focus of the prospective methodology on the tax burden rather than the timing of cash inflows. By using current tax expenses, we take into account the impact of tax incentives and temporary differences on the reduction of the tax burden, as does the discounted cash flow-based ETR model. In contrast, using taxes paid on a cash basis would lead to discrepancies due to timing differences that do not reflect fundamental differences in the tax burden. While cash ETRs are helpful in specific analyses (especially in the long term to see if taxes are being paid), they are less reliable for comparison with a theoretical benchmark at a given point in time. The OECD recommendations suggest doing a sensitivity analysis when using CbCR statistics for ratios like ETR. By following these practices, the calculated ETR can be a powerful tool. A significantly lower retrospective ETR (calculated) compared to the prospective ETR in a jurisdiction is a strong indicator of aggressive tax planning or tax base erosion. At the same time, a slight difference can be explained by standard time effects or incentives that may already be taken into account in the prospective model. The use of the accrued income tax/income ratio provides a more conceptually consistent and interpretable basis for scientific analysis, allowing for a clearer ‘apples-to-apples’ comparison with prospective ETRs and better identification of where MNEs may be undertaxed relative to the benchmark tax structure.

Profit before tax per employee – calculated as the ratio of profit to the number of employees in each country of presence. A significant difference in this indicator between investment hubs[1] and other jurisdictions may indicate artificial profit inflation, especially if actual activity is low. For example, if 5% of a company's staff generate 20% of the total profit of a group of investment hubs, this ratio (4:1) indicates a gap between profit and economic presence.

Revenue per employee is a similar indicator for revenue that complements productivity analysis and may indicate abnormally high activity per employee in investment hubs.

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[1] Investment hubs are defined as jurisdictions with a total inward Foreign Direct Investment (FDI) position above 150% of GDP and include Anguilla; Bahamas; Barbados; Bermuda; British Virgin Islands; Cayman Islands; Cyprus; Gibraltar; Guernsey; Hong Kong, China; Hungary; Ireland; Isle of Man; Jersey; Liberia; Luxembourg; Malta; Marshall Islands; Mauritius; Mozambique; Netherlands; Puerto Rico; Singapore and Switzerland (OECD, 2022)

The share of profits in countries without employees is the share of the company's total profits declared in jurisdictions where there are no employees, according to the report. The identification of profits in countries with zero employees directly indicates the fictitiousness of their presence - profits of real businesses can be accumulated on paper in such countries solely for tax purposes. Particular attention is paid to cases where a significant portion (e.g., more than 5-10%) of global profits are attributable to such non-personnel jurisdictions.

A pre-tax profit margin of more than 50% is an indicator of profitability (the ratio of pre-tax profit to gross revenue) in certain jurisdictions. Under normal circumstances, business profitability rarely exceeds 30-40%, even for highly profitable industries. Figures above 50% indicate that extremely high profits are being declared at the subsidiary level for relatively low sales. Such cases may signal the existence of profit centres (e.g. licensing or financial centres) where the group shifts revenues while leaving costs in other jurisdictions.

The share of profits taxed with ETR below 15% represents the proportion of the group's total profits attributable to countries with an effective tax rate of 15% or less. This aggregate measure across the corporation reflects the extent to which it uses tax-advantaged jurisdictions. If a significant portion of a company's global profits is taxed at very low rates, this indicates systematic tax planning to reduce taxes.

The above indicators were calculated for entities and each jurisdiction based on CbCR data. For the analysis, statistical methods of descriptive analytics were employed, including the identification of extreme values and a comparison of the distribution of indicators between groups of countries (investment hubs versus other countries). Additionally, a case study approach was used for individual companies that demonstrate the most pronounced signs of profit shifting. The results were also compared with external sources (in particular, official OECD data and academic research) to assess the validity and consistency of the patterns.

FINDINGS

The analysis of effective tax rates (ETRs) confirmed that a portion of the profits of MNEs continues to be subject to very low taxes. Most of the groups of companies studied had at least one jurisdiction where the effective tax rate was below 15%. Often, such rates were close to zero, especially in the classic tax havens (Guernsey, United Arab Emirates, Bermuda, Cayman Islands, British Virgin Islands, etc.) and in countries with special regimes. For example, there were many cases when, despite significant declared profits (hundreds of millions of dollars), the tax paid was only zero to 5% of the profit. For some corporations, more than half of their total global profits came from jurisdictions with ETRs < 15%, indicating the active use of low-tax business segments. Around 15% of the total profits of constituent entities are taxed at an effective rate below 15%, which is slightly lower than the OECD (2024) publications but fully confirmed by the cleaned and structured data from the open CbCR.

Disparities in profit before tax or revenue before tax/headcount. Profit per employee turned out to be one of the most apparent indicators of profit shifting. According to our calculations, the average profit per employee varied significantly between countries: in high-tax jurisdictions (with typically larger staff and real operations), it was usually tens of thousands of dollars, while in well-known tax havens, it was hundreds of thousands or even millions of dollars. Numerous examples were found where corporations in countries with very few employees reported large profits, corresponding to significant figures per employee (for example, $5-10 million in profits per employee). Such anomalies were observed, in particular, in financial centres such as Luxembourg, Ireland, Singapore, and offshore zones. This indicates that disproportionately large profits are concentrated where labour resources and real activity are minimal, which is a typical sign of artificial profit shifting for tax optimisation. An analysis of the aggregated data showed that the profit per employee in investment hubs in 2023 was $ 12.3 million, and in other jurisdictions, it was $11.3 million. An analysis of the aggregated data reveals that the revenue per employee in investment hubs was $143.7 million, whereas in other countries, it was $38.0 million. Although only 6% of staff work in investment hubs, they account for more than 20% of global revenue.

Revenues in jurisdictions without employees. Particular attention is paid to cases where a company reports profits in a country where, according to the CbCR, it has no employees at all. It was found that many of the analysed MNEs had at least one such jurisdiction in their reporting. Such a gap between profits and employment is a direct signal of fictitious income shifting, where profits are generated in other countries but are transferred to the balance sheet of an enterprise in a jurisdiction that exists only "on paper" through intra-group transactions. The analysis of the aggregated data revealed that 3% of global profits are declared in jurisdictions where companies have no employees, indicating profits without economic presence - a typical sign of aggressive tax planning.

Ultra-high profit margins in investment hubs. The profitability analysis confirmed that subsidiaries in investment hubs have significantly higher profit margins (proxy) compared to those in other countries. In our sample, 5% of the profits in investment hubs in 2023 came from jurisdictions with profit margins (proxy) above 50%, indicating abnormal profitability and likely the artificial shifting of profits from countries with actual business activity. Often, such units combined excessive profitability with modest revenue and a small number of employees, indicating that they have a specialised function (receiving royalties, interest, dividend payments or other passive income from the rest of the group). By comparison, in high-tax countries, most companies showed margins of no more than 20-30%, and losses were concentrated mainly in high-tax jurisdictions, which is consistent with the strategy of shifting profitability to "cheaper" countries from a tax perspective.

Overall picture and comparison with other studies. The aggregate results of analysing CbCR reports in the AITAX13 database in 2023 indicate that a significant share of the global profits of the studied corporations is concentrated in the investment hubs, where the effective tax burden is less than in other jurisdictions and economic presence is limited. These conclusions correlate with macro-level estimates made by independent researchers and organisations. In particular, according to the OECD (2024), aggregate CbCR reporting shows systematic underreporting of profits in home countries and corresponding overstatement in low-tax countries, while Wier and Zucman (2022) and Alstadsæter et al. (2023) quantify that more than a third of multinationals' profits globally still "leak" to offshore centres. Our micro-level analysis complements these findings by illustrating how profit-shifting patterns are reflected in the reported figures of individual companies and industries.

CONCLUSİONS

The results of the study confirm that public Country-by-Country reporting is an effective tool for detecting aggressive tax planning and profit shifting. The analysis of CbCR reports in the AITAX13 database in 2023 has revealed clear indicators that many multinationals continue to actively exploit tax discrepancies between jurisdictions: significant profits are directed to countries with low or zero taxes, often in the absence of any real activity there. Signs such as minimum effective rates, abnormally high profits per employee, profitability in countries without employees, and ultra-high margins are all red flags that are made visible by CbCR.

It is important to emphasise that the CbCR is now proving to be an effective tool for increasing tax transparency. Although these reports were initially designed for use by tax authorities, our research demonstrates that public analysis of CbCR can also reveal significant patterns that were previously hidden within corporate structures. Our results are consistent with the findings of the OECD and independent researchers: for example, the OECD, in its report (2024), emphasises that aggregated CbCR data reveals a significant concentration of profits in low-tax jurisdictions, while studies by Wier and Zucman (2022), Alstadsæter et al. (2023), and others confirm the global scale of this phenomenon. This demonstrates that disclosure through the CbCR effectively helps identify and quantify aggressive tax practices.

Thus, the Country-by-Country Reporting mechanism is already playing an important role in identifying tax avoidance schemes and strengthening international tax discipline. Further expansion of the public CbCR

(in particular, the implementation of the relevant EU directive) and improvement of methods for analysing such data (including the use of artificial intelligence, as in the AITAX project13) can further increase the effectiveness of this tool. Public and regulatory efforts should build on the analytical findings to implement measures that limit profit shifting, such as the global minimum tax rate and strengthening transfer pricing rules. Identification of problematic patterns is the first step towards their elimination, and in this context, the CbCR has proven to be a necessary element of the modern tax transparency architecture.

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