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Digital Transformation of Tax Administration in Small EU Member States: Organisational Capacity, the Information Gap, and the Pre-DAC8 Baseline from Croatia (2020–2024)

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Background and Purpose: The Markets in Crypto-Assets Regulation (MiCA) and the eighth Directive on Administrative Cooperation (DAC8) reshape how EU tax authorities access cryptocurrency transaction data. This study examines the organisational-capacity deficit facing a small EU tax administration on the eve of DAC8, using Croatia's cryptocurrency sector as the empirical setting.
Methods: Monte Carlo simulation (n=10,000; triangular distributions) is applied to primary turnover data from the Croatian Financial Services Supervisory Agency (HANFA) for three tax streams: capital gains tax (CGT), value-added tax (VAT), and corporate income tax (CIT). The framework integrates digital-government and organisational-capacity theory with Allingham-Sandmo as secondary lens.
Results: Cumulative theoretical tax liability is €13.8 million (95% CI: €8.8M–€20.3M). VAT is more stable than CGT (coefficient of variation, CV, 0.136 versus 0.414). A 317.7% turnover rise in 2023 coincides with pre-MiCA registration and euro adoption. Four capacity deficits emerge: absent disaggregated tax data, minimal supervisory enforcement, classification ambiguity, and MiCA licensing lag (first licence 9 April 2026).
Conclusion: Realised compliance effects of digital reporting depend on the receiving authority's organisational capacity, not information availability alone. This is the first primary-data capacity assessment of a small EU tax administration's DAC8 readiness; the methodology is transferable across small EU economies.

Keywords: Digital transformation, Tax administration, Organisational capacity, DAC8, MiCA, Cryptocurrency taxation

1 Introduction

The digital transformation of public administration is reshaping how tax authorities access, process, and act on information about taxpayer activity (Mergel et al., 2019; OECD, 2022). Within the European Union, this transformation is most visible in the tax treatment of the cryptocurrency sector, where two regulatory instruments operationalise distinct aspects of a digital-first enforcement architecture. The Markets in Crypto-Assets Regulation

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(MiCA, Regulation (EU) 2023/1114) introduces mandatory licensing, record-keeping, and supervisory oversight for domestic crypto-asset service providers (CASPs), creating auditable digital transaction records as a condition of market access. The eighth revision of the Directive on Administrative Cooperation (DAC8, Directive (EU) 2023/2226) operationalises automatic exchange of cryptocurrency transaction data between national tax authorities from 2026, extending to crypto the digital information-sharing architecture previously applied to financial accounts under the Common Reporting Standard.

Both instruments are designed to close a well-documented information gap: cryptocurrency gains are pseudonymous, self-reported, and frequently generated on platforms operating outside national regulatory perimeters, producing a compliance shortfall that conventional audit mechanisms cannot systematically close (Baer et al., 2023; Chainalysis, 2025). Yet the compliance effects of digital reporting instruments are not automatic. As Janowski (2015) and Scholta et al. (2019) argue in the broader digital-government literature, the institutional outcomes of digital transformation depend on the organisational capacity of the receiving authority, its data infrastructure, specialist competencies, and operational protocols for acting on newly available information. For large EU economies with well-resourced tax administrations, this capacity is largely in place. For small EU economies, whose tax administrations face constrained personnel, smaller domestic market visibility, and limited dedicated IT infrastructure for emerging asset classes, the capacity question is open.

The trajectory of EU digital tax cooperation frames DAC8 as the sixth step in a fifteen-year sequence of cross-border information instruments (European Commission, 2024; OECD, 2025). The Savings Directive (2003) and the original Directive on Administrative Cooperation (DAC1, 2011) established manual exchange of financial-account information; DAC2 (2014) and the OECD Common Reporting Standard (CRS) automated this for bank accounts; DAC6 (2018) extended reporting to cross-border tax arrangements; DAC7 (2021) captured digital platform income. DAC8 closes the cryptocurrency perimeter. Each step has required the receiving administration to invest in data-matching infrastructure before the incoming information flow translates into compliance outcomes. The Croatian domestic CASP sector is of material scale for a small EU economy: aggregate turnover on HANFA-supervised exchanges rose from €62 million in 2020 to €670 million in 2023 before contracting to €340 million in 2024, with cumulative transacted value of €1.46 billion across the five-year window examined here (data source: Section 4.1; Rotter Krmpotić, 2025). This is not a marginal sector in fiscal terms for a tax base of Croatia's size.

The research gap addressed here is specific. Prior work has established three pieces separately: the digital-government literature has mapped the stages of tax-administration transformation (Janowski, 2015; Mergel et al., 2019; Scholta et al., 2019; OECD, 2025); tax compliance theory has formalised the dependence of compliance on detection probability (Allingham and Sandmo, 1972; Kleven et al., 2011); and the fiscal-gap literature has developed top-down methodologies for estimation in the absence of microdata (OECD, 2014b; Baer et al., 2023). Prior work has not addressed conditional dependence of realised compliance on the organisational capacity of small EU administrations, where capacity is contested. This matters because DAC8 transposition presumes the data-matching and specialist-competency infrastructure is in place; in small EU member states evidence for that presumption is absent. This paper contributes the first primary-data pre-DAC8 baseline for a small EU economy and, on the theoretical side, repositions organisational capacity from a downstream moderator of digital-transformation outcomes to a precondition for them.

Croatia offers a particularly instructive case. It is a small EU economy that implemented MiCA through national legislation (NN 85/2024) in 2024, adopted the euro in January 2023, and has maintained a statutory framework for cryptocurrency taxation since 2015. Despite this normative foundation, a formal information request to the Croatian Tax Administration (Porezna uprava), submitted for the purposes of this study, confirmed that the authority possesses no disaggregated data on cryptocurrency-related transactions reported under the JOPPD declaration form (Marković, 2025). This administrative data gap is itself a finding in the digital transformation literature: it quantifies the information-infrastructure deficit that MiCA and DAC8 are intended to address, and exposes the organisational capacity that must be built before DAC8 data flows commence.

This study addresses three research questions. First, what is the estimated theoretical tax liability arising from Croatia's domestic cryptocurrency market for 2020–2024, given the absence of direct observational data? Second, what organisational and information-infrastructure factors explain the persistence of non-compliance in this sector? Third, how does the ongoing digital transformation of EU tax administration through MiCA and DAC8 alter the enforcement environment, and what administrative capacity is required to translate the information advantage of automatic exchange into realised enforcement outcomes?

The contribution is threefold. Methodologically, the study demonstrates a Monte Carlo fiscal gap estimation approach for the common small-EU condition where aggregate supervisory data exist but disaggregated taxpayer records do not. Theoretically, it integrates digital-government and tax-compliance literatures to show how organisational capacity shapes realised compliance effects of digital reporting. Substantively, it provides the first primary-data pre-DAC8 baseline for a small EU member state

and identifies an organisational-capacity agenda for the pre-implementation window.

2 Theoretical framework and literature review

2.1 Digital transformation of tax administration: concepts and stages

Digital transformation in public administration has been conceptualised as a sequence of stages that progress from digitisation of existing paper processes, through digitalisation of service delivery, to transformation of the underlying organisational and institutional architecture (Janowski, 2015; Mergel et al., 2019; Scholta et al., 2019). In the taxation context, the OECD's Tax Administration 3.0 framework (OECD, 2022) describes a trajectory in which tax compliance is increasingly embedded within the digital systems where economic activity occurs, moving from voluntary declaration of past transactions toward real-time, system-integrated reporting. MiCA and DAC8 jointly operationalise an early stage of this trajectory for the crypto sector: MiCA creates the supervised digital environment in which transactions generate auditable records, while DAC8 establishes the cross-border information pipeline that brings those records to national tax authorities.

The digital government literature stresses, however, that digital transformation outcomes depend on more than regulation and data availability. Gil-Garcia et al. (2018), Desai and Manoharan (2024), and OECD (2020) identify three organisational prerequisites for public authorities to realise the benefits of digital transformation: (i) data infrastructure capable of ingesting, matching, and analysing incoming data at scale; (ii) specialist human capital able to interpret domain-specific transaction patterns; and (iii) operational protocols, legal, procedural, administrative, enabling the authority to act on data-driven findings. Where these prerequisites are absent, digital transformation produces data flows without enforcement outcomes. For small EU member states, whose tax administrations often lack dedicated crypto-sector expertise and may have invested less in data-matching infrastructure than larger peers, these prerequisites constitute a measurable organisational-capacity agenda for the pre-DAC8 period.

This study draws on the organisational-capacity tradition in public administration to structure the analysis of that agenda. Honadle (1981), Ingraham, Joyce and Donahue (2003), and Andrews and Boyne (2010) together define capacity as the ability of a public organisation to convert resources into sustained performance, with management capacity identified as the binding constraint. Applied to the digital transformation of tax administration, this literature locates the enforcement deficit not in legal-statutory inadequacy but in organisational factors, data systems, specialist competency, and procedural infrastructure, that determine whether a tax authority can convert available information into enforcement action. The four deficits identified empirically in Sections 5.4 and 6 map directly onto this organisational-capacity framework.

The theoretical position taken here goes one step further than the standard integration of these literatures. In much of the digital government literature, organisational capacity is treated as a moderator or downstream consequence of digital transformation. This study instead argues that organisational capacity is the constitutive condition under which digital information becomes enforcement at all. A DAC8 data feed delivered to a tax administration that cannot disaggregate cryptocurrency transactions does not produce partial enforcement because transformation is incomplete; it produces none because the data never enter the decision architecture that would render them actionable. Digital transformation provides the pipeline, but the pipeline is consequential only where the receiving authority has the capacity infrastructure to consume it. This positions the contribution at the level of central mechanism rather than mediational pathway: organisational capacity is not what digital transformation produces, it is what digital transformation requires to produce anything at all.

2.2 Tax compliance under information asymmetry: Allingham-Sandmo as secondary lens

The foundational framework for analysing taxpayer behaviour under information asymmetry remains the expected utility model of Allingham and Sandmo (1972). A taxpayer with income W chooses declared income $X \leq W$ to maximise expected utility, where undeclared income remains hidden unless an audit occurs with probability p and penalty rate θ applies to detected evasion. Compliance is predicted to rise with p and θ. Kleven et al. (2011) extended the model empirically to show that compliance is near-perfect for income subject to mandatory third-party reporting (such as wages), and far lower for self-reported income where detection probability is functionally low.

This framework complements the digital transformation perspective: it explains why the information gap matters for taxpayer behaviour, while the digital transformation literature explains how the receiving authority can translate new information into enforcement outcomes. Cryptocurrency gains are self-reported in all EU jurisdictions prior to DAC8. In Croatia specifically, the Tax Administration has confirmed it cannot identify cryptocurrency-specific declarations within aggregate capital income data (Marković, 2025). Under the Allingham-Sandmo framework, this implies a detection probability approach-

ing zero, creating the rational preconditions for systematic non-compliance irrespective of statutory rates. The digital transformation perspective then asks what organisational capacity is required for the post-DAC8 information advantage to raise effective p, a question the compliance model alone cannot answer.

2.3 The information gap in cryptocurrency taxation

Empirical estimates of cryptocurrency compliance gaps remain sparse and methodologically contested. The primary obstacles are threefold. First, the pseudonymous nature of blockchain transactions means on-chain data do not directly identify taxable persons; blockchain analytics heuristics for geographic attribution are not reproducible from public sources and carry substantial uncertainty. Second, jurisdictional fragmentation means domestic tax authorities observe only the subset of transactions on licensed domestic platforms; for small EU economies, the majority of retail crypto activity occurs on global platforms (Binance, Coinbase, Kraken) outside the domestic regulatory perimeter (Chainalysis, 2024). Third, the rapid evolution of crypto products, staking rewards, yield farming, NFT transactions, DeFi activity, creates classification ambiguity that generates genuine compliance uncertainty distinct from intentional evasion (Kicova et al., 2025).

Despite these challenges, the aggregate scale of non-compliance is substantial. Baer et al. (2023, p. 4) estimate global cryptocurrency tax non-compliance in the range of tens of billions of dollars annually, with compliance rates below 50% in most jurisdictions. The EU impact assessment for DAC8 projected €2.4 billion annually in additional EU-wide tax revenue from mandatory reporting (European Commission, 2022). Goel and Mazhar (2024), in a panel of 36 countries, show that greater cryptocurrency usage measurably reduces VAT collections and overall tax-to-GDP ratios. Meling et al. (2024), using de-anonymised Norwegian trading records linked to tax returns, demonstrate that crypto CGT non-compliance was near-universal prior to enforcement interventions and that targeted audit activity produced sharp compliance responses, evidence that directly motivates the organisational-capacity investment examined in this study.

2.4 MiCA and DAC8 as digital transformation instruments

MiCA and DAC8 can be read, through the digital transformation lens, as complementary instruments that address different organisational stages. MiCA is a regulatory digitalisation instrument: it formalises the digital record-keeping obligations that turn domestic CASPs into auditable entities. Conlon et al. (2024) document measurable market responses to MiCA announcements across crypto asset classes, suggesting that regulatory signalling itself affects market behaviour before formal obligations are operationalised. In Croatia, HANFA assumed supervisory responsibility under NN 85/2024; licensed CASPs are subject to annual statutory audit, transaction record retention, and periodic reporting obligations, creating a documentary basis for tax enforcement that did not previously exist in systematic form.

DAC8 operates as a cross-border information exchange instrument: a detailed legal commentary on its reporting architecture and scope vis-à-vis pre-existing CRS-DAC2 obligations is provided by Bernt (2023). From 2026, CASPs doing business with EU residents, including global platforms, must report transaction data to national tax authorities for automatic exchange, aligned with the OECD Crypto-Asset Reporting Framework (OECD, 2023). The analogy with the Common Reporting Standard (OECD, 2014a) is informative: Johannesen and Zucman (2014) document that bilateral information exchange reduced offshore bank deposits by approximately 34%, with the reduction concentrated in deposits previously hidden. DAC8 operationalises the same informational logic for crypto. Critical to this study's argument, however, Benson et al. (2024) and Scholta et al. (2019) separately emphasise that cross-border harmonisation of digital instruments is bounded by the fragmentation of national administrative capacity: where receiving authorities lack data infrastructure or specialist competency, the information advantage of automatic exchange is structurally underrealised.

2.5 Fiscal gap methodology under aggregate-data constraints

Fiscal gap estimation in the absence of microdata relies on top-down approaches comparing theoretical tax liability derived from macroeconomic aggregates with observed collections (OECD, 2014b). Where neither microdata nor reliable collections data are available, the predicament of Croatian cryptocurrency transactions, scenario-based estimation with calibrated parameters and explicit uncertainty quantification is the methodologically appropriate alternative (Baer et al., 2023; Saltelli et al., 2008).

3 Institutional and regulatory framework

3.1 Cryptocurrency tax law in Croatia

Croatian law has provided for cryptocurrency taxation since 2015, making Croatia an early mover among EU

member states in the normative treatment of digital assets. Three statutory instruments are relevant.

Capital gains tax is governed by the Income Tax Act (Zakon o porezu na dohodak, NN 115/16–152/24), Article 67. Gains from the disposal of cryptocurrency held for fewer than two years are subject to CGT at 10% for 2020–2023 and 12% from 2024. Cryptocurrency disposed of after a holding period exceeding two years is exempt. Losses may offset gains only within the same calendar year and within the capital income category; loss carry-forward is not permitted. FIFO is the prescribed acquisition-cost method. CGT is self-declared via the JOPPD form by 28 February of the year following the taxable event.

Value-added tax is governed by the VAT Act (Zakon o PDV-u, NN 73/13–52/25), Article 40(1)(e). Exchange of cryptocurrency for fiat currency is VAT-exempt under the CJEU ruling in Skatteverket v Hedqvist (C-264/14, 2015), as cryptocurrency functions analogously to a currency in exchange transactions. Exchange fees and brokerage commissions charged by CASPs are, however, subject to standard VAT at 25% as consideration for a distinct service.

The treatment of CASP exchange fees as taxable consideration for a distinct service is one of two defensible readings of Hedqvist in Croatian VAT law. Under CJEU composite-supply doctrine (CPP, Levob, Part Service), an explicit fee for the same exchange transaction may follow the principal exempt supply's treatment, in which case CASP fees would also be exempt under Article 40(1)(e). No published Porezna uprava opinion resolves this ambiguity, and EU-level guidance (VAT Committee Working Papers 892 and 1060) is non-binding. This study adopts the fee-taxable interpretation as the central estimate; implications of the alternative are addressed in §6.6.

Corporate income tax is governed by the Corporate Tax Act (Zakon o porezu na dobit, NN 177/04–114/23). CASPs organised as legal entities pay CIT on profits at 10% (for annual revenues ≤ €1 million) or 18% (for revenues > €1 million).

3.2 MiCA implementation and the digital supervisory architecture

Croatia transposed MiCA through the Act on Implementation of the MiCA Regulation (Zakon o provedbi Uredbe EU 2023/1114, NN 85/2024). The Act designates HANFA as the national competent authority for CASPs that are not credit institutions. Licensed CASPs are required to: (i) maintain comprehensive transaction records for a HANFA-defined minimum period; (ii) submit to annual statutory audit; (iii) segregate client assets; and (iv) report to HANFA on a periodic basis. Article 54 of the implementing Act establishes a supervisory fee, creating a fiscal instrument additional to conventional tax obligations. Collectively, these obligations constitute the digital supervisory architecture, the infrastructure of auditable records that digital transformation of tax enforcement presupposes.

As of 22 April 2026, operationalisation of this architecture remains in early transition. On 9 April 2026, HANFA granted the first MiCA authorisation in Croatia to Electrocoin d.o.o., the first entry in HANFA's public CASP register (HANFA, 2026). Existing pre-MiCA operators were required to submit licensing applications by 31 December 2025; the statutory deadline for HANFA to process these applications and issue remaining authorisations is 30 June 2026 (NN 85/2024, transitional provisions). Between the MiCA entry-into-force date (30 December 2024) and the first authorisation (9 April 2026), the Croatian CASP register remained empty for more than fifteen months, a transitional gap that defines the institutional context of the pre-DAC8 baseline examined here. Until the register is populated, the supervisory obligations that constitute the digital transformation infrastructure for tax enforcement are only partially activated, and the documentary basis for cryptocurrency tax enforcement remains incomplete in operational terms.

3.3 The information gap as organisational-capacity deficit

The near-zero detection probability posited by the Allingham-Sandmo framework is not a theoretical assumption in the Croatian context, it is measurable from two independent administrative sources and interpretable as an organisational-capacity deficit in digital transformation terms.

First, a formal information request submitted to the Croatian Tax Administration (Marković, 2025) confirmed that: (i) cryptocurrency-related capital gains are reported under JOPPD declaration code 1006, together with all other forms of capital income including dividends, interest, and securities gains; (ii) the Tax Administration does not maintain disaggregated records enabling identification of cryptocurrency-specific declarations; and (iii) no statistics are compiled on audit findings attributable to cryptocurrency transactions.

Second, HANFA's 2024 Annual Report (HANFA, 2025a, Figure 9.1, p. 130) reports the number of regulatory infringement proceedings initiated by HANFA in the virtual assets category for 2019–2024: zero in 2019 and 2020, one in 2021, one in 2022, two in 2023, and three in 2024. Three proceedings in a year in which HANFA-supervised exchanges processed €340 million in turnover confirm that effective p for non-compliance is functionally close to zero from the supervisory side as well. Together, these two deficits constitute direct empirical evidence for the structurally rational non-compliance predicted by the Allingham-Sandmo framework and for the organisation-

al-capacity agenda identified by the digital-government literature.

4 Methodology

4.1 Data sources

Two primary data sources were obtained through formal requests for this study.

HANFA aggregate turnover data: Annual aggregate turnover of all domestic CASPs licensed and supervised by HANFA for each calendar year 2020–2024 was provided via official response under the Croatian Access to Information Act (Zakon o pravu na pristup informacijama, NN 25/13, 85/15, 69/22) (Rotter Krmpotić, 2025). Values for 2020–2022 were reported in Croatian kuna (HRK) and converted to euros using the official fixed conversion rate of HRK 7.5345 per EUR established upon Croatia's euro adoption on 1 January 2023 (Regulation (EU) 2022/1208); values for 2023–2024 were reported directly in euros. The data represent aggregate euro-equivalent value of transactions processed by domestic licensed exchanges. HANFA data do not extend to periods before 2020 and do not capture transactions by Croatian residents on foreign platforms. The aggregate nature of the data precludes identification of individual transaction patterns or profit realisations.

Tax Administration confirmation of data unavailability: The Croatian Tax Administration confirmed, via official response (Marković, 2025), that it does not hold disaggregated data enabling identification of cryptocurrency-specific declarations or audit findings. This confirmation is treated as a primary data point establishing the data-infrastructure deficit, not merely as a methodological caveat.

The applicable statutory tax rates for each year are derived from the legislative instruments identified in Section 3.1 and do not require primary data collection.

4.2 Monte Carlo fiscal gap estimation model

The fiscal gap is estimated for three tax streams, CGT, VAT on exchange fees, and CIT on CASP profits, using Monte Carlo simulation with 10,000 iterations and a random seed of 42 (for full reproducibility). The model is implemented in Python 3 and is available as supplementary material.

Capital gains tax (CGT)

The theoretical CGT liability for individuals is modelled as:

$$\text{CGT\_liability\_y} = \text{Turnover\_y} \times \text{profit\_margin} \times \text{CGT\_rate\_y}$$

where profit_margin, the share of annual turnover realised as taxable profit by individual traders, follows a triangular distribution:

$$\text{profit\_margin} \sim \text{Triangular}(\text{min}=0.01, \text{mode}=0.03, \text{max}=0.10)$$

The lower bound of 1% reflects documented bear market conditions: in 2022, HANFA-recorded turnover contracted by 30.2% from its 2021 peak, consistent with the global crypto bear market and the FTX collapse. The upper bound of 10% reflects peak bull market conditions, consistent with the 272.5% turnover growth observed in 2021 and the 317.7% growth in 2023. The mode of 0.03 (3%) represents a conservative central estimate for a five-year period spanning both market phases: it reflects that a substantial share of trades in any given year are either unprofitable, or involve assets held for more than two years (exempt from CGT under Croatian law), and that retail traders typically realise modest gains relative to total traded volume even in favourable market conditions. The three-parameter triangular distribution was selected over a point estimate precisely because the true aggregate profit rate is unobservable; the resulting 95% confidence interval (€8.8M–€20.3M) captures this parametric uncertainty explicitly.

Note: The model does not apply the two-year holding-period exemption, because the distribution of holding periods across Croatian retail traders is unknown. The resulting estimates represent a conservative upper bound on theoretical CGT liability; actual liability under full compliance would be lower, given that some proportion of disposed assets will have been held for more than two years.

VAT on exchange fees

VAT liability is modelled as:

$$\text{VAT\_liability\_y} = \text{Turnover\_y} \times \text{fee\_rate} \times 0.25$$

where fee_rate, the CASP exchange fee as a proportion of transaction value, follows a triangular distribution:

$$\text{fee\_rate} \sim \text{Triangular}(\text{min}=0.01, \text{mode}=0.015, \text{max}=0.02)$$

The distributional parameters are calibrated on publicly available fee disclosures from HANFA-registered CASPs. Electrocoin d.o.o. (electrocoin.eu) states that its rates "generally move around 2% in relation to popular EUR exchanges" (Electrocoin, 2024). Bitcoin Mjenjačnica (Electrocoin d.o.o., bitcoin-mjenjacnica.hr) discloses an average spread of 2–3% from the market BTC/EUR rate (Bitcoin Mjenjačnica, 2024). Bitcoin Store (bitstore.net) discloses a range of 0.5–5% depending on transaction type, with standard retail transactions toward the lower end of the range (Bitcoin Store, 2024). The minimum of 1% reflects the lower end of standard online retail transactions; the maximum of 2% reflects the commonly stated exchange rate for the two largest documented Croatian

CASPs; the mode of 1.5% is an inferred central tendency. The resulting VAT estimates are conservative: if actual fees cluster near 2%, consistent with the two primary sources, the model understates the VAT base.

Corporate income tax (CIT)

CIT liability is modelled as:

$$CIT\_liability\_y = Turnover\_y \times fee\_rate \times op\_margin \times CIT\_rate\_y$$

where op_margin, the operating profit margin on fee revenue, follows a triangular distribution:

$$op\_margin \sim Triangular(min=0.20, mode=0.30, max=0.40)$$

This range reflects operating margins consistent with regulated financial intermediary businesses of comparable scale: the lower bound of 20% represents a conservative efficient-but-not-high-margin operation, the upper bound of 40% represents a well-positioned exchange with strong market position, and the mode of 30% represents a plausible central estimate. CIT is the smallest component (8.5% of the cumulative total), and its calibration has limited effect on overall results; the full CI is presented to convey this uncertainty. The CIT rate is 10% where modelled annual fee revenue falls below the €1 million threshold, and 18% where it exceeds it.

4.3 Operationalising the organisational-capacity deficit

The analytical category "organisational-capacity deficit" is operationalised in this study as the measurable gap between (i) the organisational capabilities required for a tax administration to convert available cryptocurrency information into enforcement action and (ii) the capabilities observably in place, at the pre-DAC8 reference point of 2026. The construct is drawn from the capacity tradition in public administration (Honadle, 1981; Ingraham, Joyce and Donahue, 2003; Andrews and Boyne, 2010; Serrano Antón, 2021), adapted to the specific decision architecture of tax enforcement on a digital asset class.

Four indicators operationalise the construct. Each is measured from a distinct primary or officially published source.

Indicator 1, Data infrastructure. Dichotomous: presence (1) or absence (0) of the capability to disaggregate cryptocurrency-specific declarations within the Tax Administration's existing records. Data source: the Tax Administration's formal response under the Croatian Access to Information Act confirming that no such disaggregation exists (Marković, 2025). Measured value: 0.

Indicator 2, Enforcement activity. Count: number of regulatory infringement proceedings initiated in the virtual-assets supervisory category per calendar year for 2019-2024. Data source: HANFA (2025a) Annual Report 2024, Figure 9.1, page 130. Measured values: 0, 0, 1, 1, 2, 3.

Indicator 3, Specialist competency. Dichotomous: presence (1) or absence (0) of written administrative guidance interpreting taxation of (a) staking rewards, (b) yield farming, (c) decentralised finance (DeFi) lending activity, (d) NFT transactions. Data source: the Tax Administration's published opinions database (porezna.gov.hr). Measured value: 0 for all four instrument classes.

Indicator 4, Supervisory infrastructure. Composite: (a) number of active MiCA licences on the HANFA CASP register at the measurement date; (b) elapsed months between MiCA entry into force (30 December 2024) and the first active registration. Data source: HANFA (2026) CASP register, accessed 10 April 2026. Measured values: 1 active registration; 15 months from entry-into-force to first authorisation.

Combination rule. The four indicators are not combined into a weighted scalar index. Two reasons. First, there is no validated external benchmark against which weights could be assigned for cross-indicator trade-offs in the tax-administration setting. Second, the interpretive purpose is pattern analysis: the joint profile of the four indicators (zero on data infrastructure, minimal on enforcement, zero across four specialist domains, and a single registration on supervisory infrastructure) is the finding, not the sum of ranks.

Table 1: Organisational-capacity deficit indicators, measurement procedure, and results (Croatia, 2020–2026 reference window)

Indicator	Type	Data source	Measured value	Interpretation
1. Data infrastructure	Dichotomous	Tax Administration response (Marković, 2025)	0	No disaggregated crypto records
2. Enforcement activity	Count per year	HANFA (2025a), Figure 9.1	Mean 1.4/year (0-3 range 2019–2024)	Near-zero effective detection probability
3. Specialist competency	Dichotomous across 4 classes	Tax Administration opinions database	0/4	No administrative guidance on DeFi, staking, yield farming, NFT
4. Supervisory infrastructure	Composite: licence count + months to first licence	HANFA (2026) register	1 active; 15 months lag	Supervisory architecture not yet operationally activated

Each indicator is presented separately in Section 5.4 and its policy implication is developed in Section 6.3. This is consistent with how public-administration capacity frameworks are typically operationalised when a single-jurisdiction, single-time-point measurement is the empirical setting (Andrews and Boyne, 2010; OECD, 2024).

Limitations of the operationalisation. Three. First, dichotomous coding of Indicators 1 and 3 is conservative: partial capabilities (for example, an internal technical specification that has not yet been promulgated as published guidance) are coded as absent. This biases the construct toward under-reporting capacity. Second, the single-country design precludes cross-country benchmark comparison; OECD (2024) Tax Administration 2024 provides cross-country comparators for broader administrative dimensions but not for crypto-specific operational indicators at this level of detail. Third, the measurement is a pre-DAC8 snapshot: the construct is designed to be re-measurable against the same indicators at one-year and three-year post-DAC8 observation points, enabling a pre-post design for future work. Table 1 summarises the four indicators, their type, data sources, measured values, and interpretation.

4.4 Hypothesis specification

H1: VAT on exchange fees is structurally more stable than CGT across the observation period, as measured by the coefficient of variation (CV = standard deviation / mean) of annual estimates.

Rationale: VAT liability is a linear function of turnover and fee rate, both of which vary less than individual trader profit margins. CGT liability depends additionally on profit_margin, which carries higher distributional variance. This structural difference has policy implications: VAT constitutes a more reliable revenue source than CGT under volatile market conditions.

H2: CASP turnover in 2023 exhibits a measurable inflection relative to trend, attributable to two concurrent regulatory events, mandatory CASP registration under pre-MiCA national regulations and Croatia's adoption of the euro on 1 January 2023.

Rationale: Regulatory certainty (licensing) and reduced transaction costs (euro elimination of currency conversion) are both predicted to increase transactional activity. A measurable turnover spike in 2023 relative to the preceding trend would constitute evidence of a compliance-stimulating regulatory effect.

Pre-specification and reproducibility. Both hypotheses were derived ex ante from the Allingham-Sandmo framework and the institutional context in Section 3, before the Monte Carlo model was run. The hypotheses were not pre-registered, which is acknowledged as a limitation relative to experimental best practice; pre-registration is not yet standard in fiscal gap estimation. Parameter calibrations in Section 4.2 were fixed before examining the simulated distributions, and no parameters were re-tuned after observing results. The random seed (42), Python model, raw Monte Carlo output, and sensitivity scripts are provided as supplementary files (see Data and Code Availability). Sensitivity analysis protocol and full results are reported in Section 5.5 and Supplementary Appendix A.

5 Results

5.1 Annual fiscal gap estimates

Table 2 presents annual mean estimates and 95% confidence intervals for each tax stream. Figure 1 presents the

Table 2: Estimated annual cryptocurrency theoretical tax liability, Croatia 2020–2024

Year	HANFA Turnover	CGT Mean	CGT 95% CI	VAT Mean	VAT 95% CI	CIT Mean	Total Mean
2020	€61.8M	€285,679	[€103K – €535K]	€232,078	[€172K – €292K]	€35,478	€553,235
2021	€230.1M	€1,064,235	[€384K – €1,992K]	€864,557	[€639K – €1,089K]	€186,666	€2,115,458
2022	€160.5M	€742,318	[€268K – €1,390K]	€603,040	[€446K – €759K]	€130,202	€1,475,560
2023	€670.2M	€3,100,371	[€1,119K – €5,805K]	€2,518,660	[€1,862K – €3,172K]	€543,802	€6,162,833
2024	€340.2M	€1,888,497	[€682K – €3,536K]	€1,278,471	[€945K – €1,610K]	€276,034	€3,443,003
Cumulative	**€1,462.7M**	**€7,081,100**		**€5,496,806**		**€1,172,182**	**€13,750,089**

Note: CIT 95% CI omitted from table for space; available in supplementary data. All values are mean estimates from 10,000 Monte Carlo iterations (seed=42). The cumulative €8.8M–€20.3M range cited in the Abstract and §7 is the proper MC 95% confidence interval of the cumulative total (per-iteration sum then percentile). Joint sensitivity scenarios (€8.78M–€22.11M, see §5.5) are scenario bounds, not MC percentiles.

same estimates in graphical form with 95% confidence error bars, and Figure 2 shows the stacked annual breakdown.

First, the dominant tax stream is CGT (51.5% of the cumulative total), reflecting the substantial potential liability associated with individual trader gains in a market characterised by high nominal returns. Second, VAT constitutes a meaningful and stable revenue source (40.0% of the cumulative total), with a narrower confidence interval than CGT in every year. Third, CIT, while the smallest contributor (8.5%), represents a relatively certain liability because it is borne by a small number of identifiable licensed entities rather than a dispersed population of individual traders.

The temporal pattern shows: 2023 alone accounts for €6.2 million (44.8%) of the five-year cumulative total. This concentration reflects the combined effect of record HANFA turnover (€670.2 million, representing 317.7% growth from the 2022 bear-market low of €160.5 million) and the application of CGT and VAT to a substantially expanded transactional base.

5.2 H1: VAT stability relative to CGT

The coefficient of variation (CV = σ/μ) for annual estimates provides a scale-independent measure of relative stability. Results are unambiguous: CGT exhibits a CV of 0.414, while VAT exhibits a CV of 0.136, a ratio of approximately 3:1. This structural difference arises from the parametric design of the model: CGT incorporates profit_margin as a distributional variable with high variance (triangular 1–10%), while VAT depends on fee_rate, which varies over a narrower range (1–2%).

H1 is supported: VAT is structurally more stable than CGT.

This finding has direct policy relevance. A tax administration seeking to develop a reliable revenue model for the crypto sector should weight VAT enforcement, operationally straightforward, dependent on licensed entities subject to supervisory obligations, over CGT enforcement, which requires individual trader-level data that are currently unavailable.

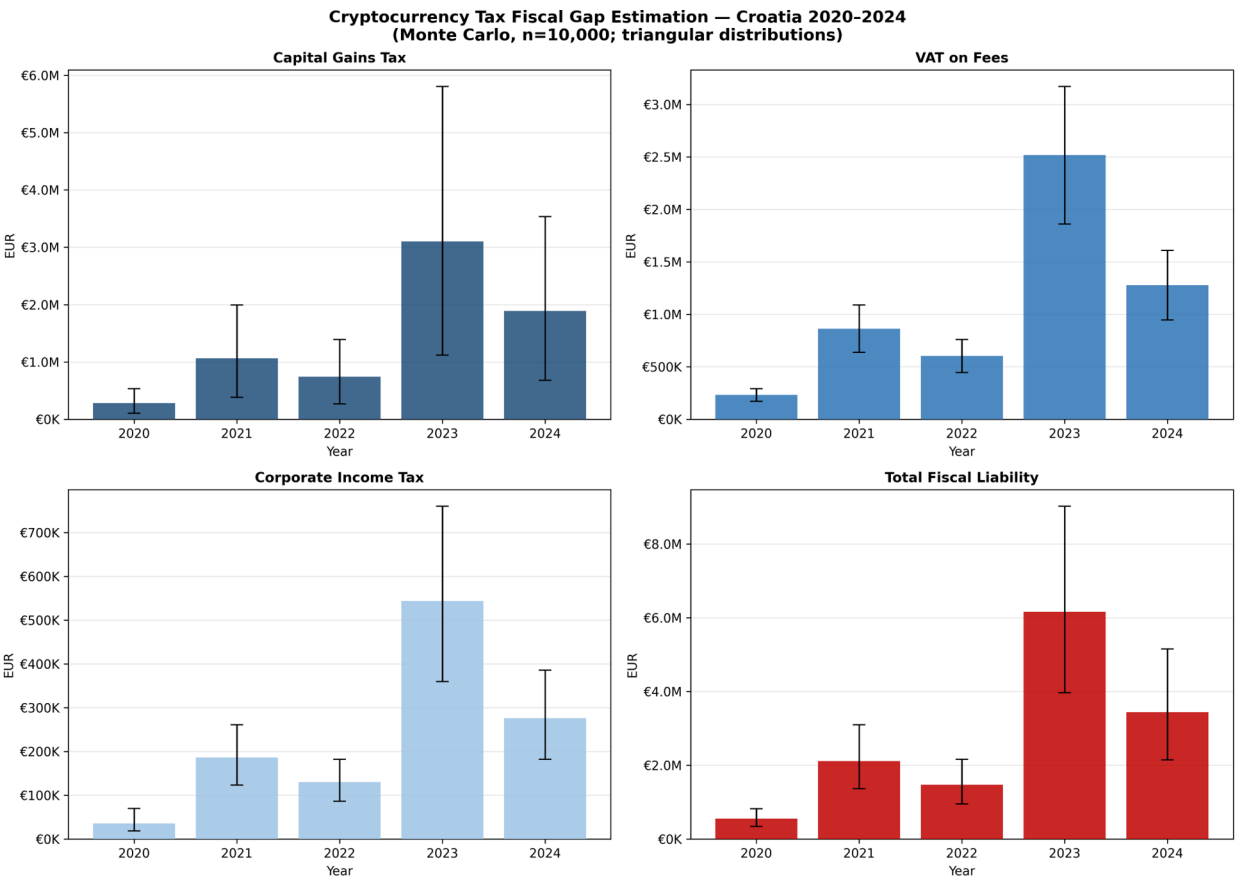

Figure 1: Estimated annual cryptocurrency tax liability by tax stream with 95% confidence intervals, Croatia 2020–2024 (Monte Carlo simulation, n=10,000)

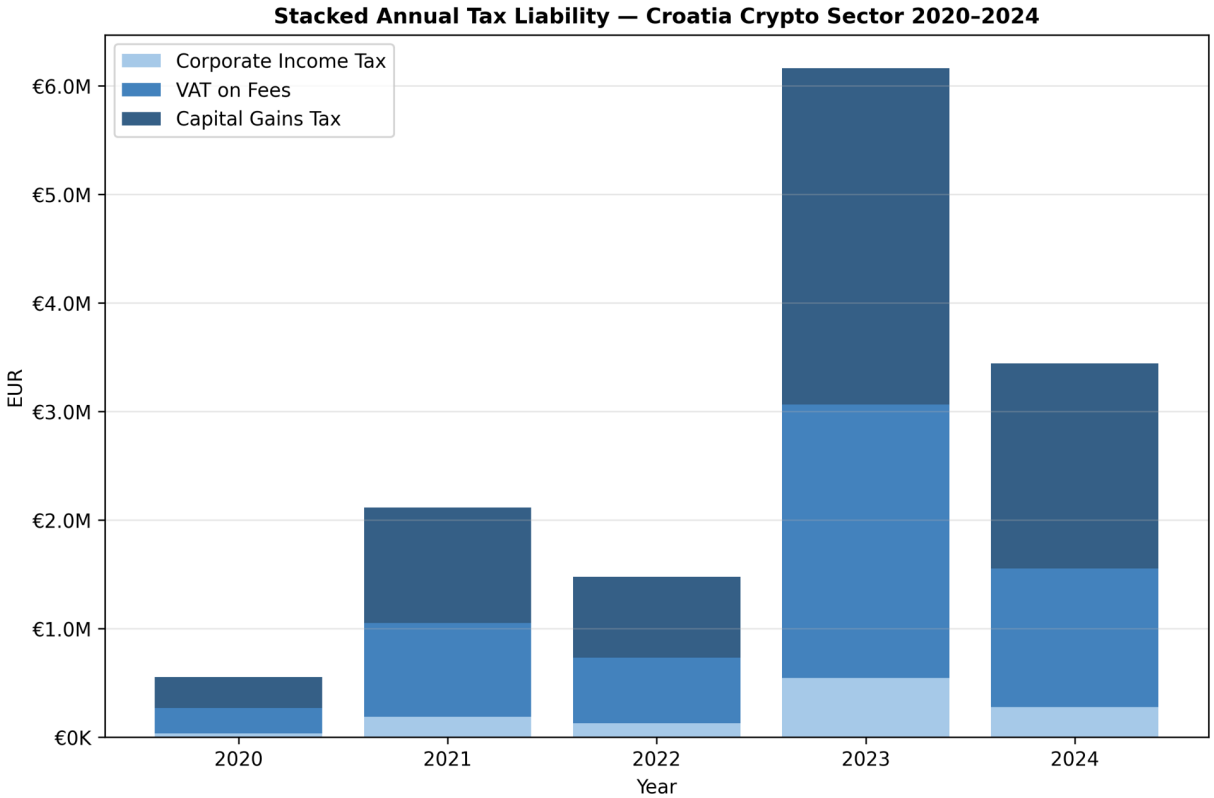

Figure 2: Stacked annual cryptocurrency tax liability by tax stream, Croatia 2020–2024

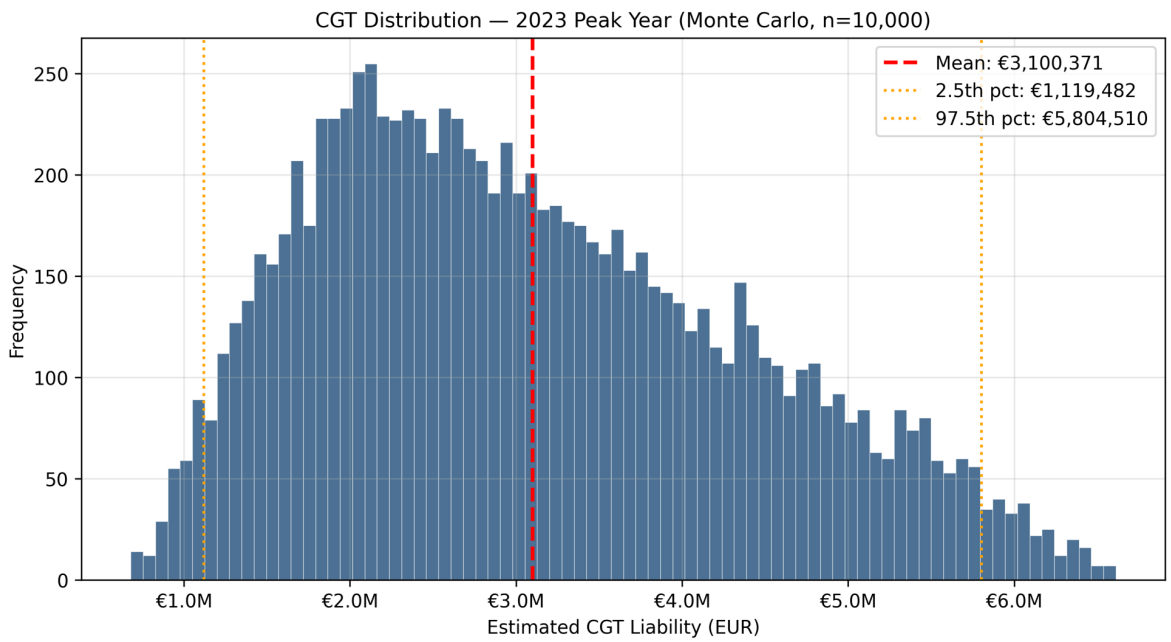

Figure 3: Monte Carlo distribution of estimated CGT liability for the 2023 peak year (n=10,000), with mean and 2.5th/97.5th percentile markers

5.3 H2: Regulatory inflection in 2023

Exchange turnover increased from €160.5 million in 2022 to €670.2 million in 2023, an increase of 317.7% over a single year. This is the largest year-over-year change in the five-year dataset. For context, 2020–2021 saw turnover increase by 272.5% (a bull market year), while 2021–2022 saw a contraction of 30.2% consistent with the global crypto bear market and the FTX collapse. The 2022–2023 spike therefore represents a departure from the preceding bear-market baseline rather than a continuation of general market growth. Two concurrent regulatory events coincided with this inflection: (i) the consolidation of CASP registration requirements in advance of full MiCA implementation under the Croatian anti-money-laundering framework transposing AMLD5 (Zakon o sprječavanju pranja novca, NN 108/17), which had introduced mandatory registration of virtual currency service providers and may have increased confidence in the legitimacy of domestic exchange activity; and (ii) Croatia's adoption of the euro on 1 January 2023, which eliminated currency conversion costs and frictions for euro-denominated cryptocurrency transactions. Figure 3 shows the full Monte Carlo CGT distribution for 2023, the peak year and dominant contributor to the cumulative total.

H2 is supported as a descriptive finding: the 2023 turnover spike constitutes a measurable regulatory inflection point. The study design does not permit causal attribution between this inflection and either specific regulatory event, as both occurred simultaneously and no counterfactual observation is available.

The practical implication is significant: regulatory certainty and reduced transaction friction appear to increase formal market activity, which in turn expands the taxable base accessible to domestic tax authorities. This suggests that enforcement investment in the licensed CASP segment is not zero-sum with market development, it may be complementary.

5.4 Four organisational-capacity deficits under low detection probability

Applying the measurement procedure set out in §4.3, four organisational-capacity deficits, interpreted through the digital transformation lens, are consistent with the persistence of non-compliance irrespective of the statutory framework. Each deficit is reported against its indicator from Table 1, with its corresponding digital-transformation category and policy implication.

Deficit 1, Data infrastructure (near-zero detection probability, $p \approx 0$). As established in Section 3.3, two independent administrative sources confirm that effective p for cryptocurrency non-compliance is functionally close to zero. The Tax Administration holds no disaggregated cryptocurrency data (Marković, 2025), preventing targeted audit selection.

Deficit 2, Cross-border information pipeline (foreign platform flows) HANFA data capture only domestic licensed exchange activity. Chainalysis (2024) estimates that the majority of retail cryptocurrency activity by residents of smaller EU member states occurs on global platforms outside national regulatory perimeters. For Croatia specifically, this implies that the €1.47 billion in HANFA-observed turnover represents a minority of total Croatian resident crypto activity over the period. This deficit corresponds directly to the cross-border information pipeline that DAC8 is designed to create, but which in operational terms will not produce enforcement outcomes without the data-matching infrastructure identified as Deficit 1.

Deficit 3, Specialist competency (classification ambiguity) Croatian administrative guidance covers spot trading CGT, mining, and CASP fee VAT, but provides no guidance on staking rewards, yield farming, liquidity provision, DeFi lending, or NFT transactions (Kicova et al., 2025). For taxpayers engaging with these instruments, genuine compliance uncertainty exists independently of intent to evade.

Deficit 4, Supervisory infrastructure (MiCA licensing lag) Despite MiCA entering into force on 30 December 2024, HANFA's public CASP register remained empty for more than fifteen months; the first MiCA authorisation (Electrocoin d.o.o.) was granted on 9 April 2026, with the processing deadline for remaining applicants set for 30 June 2026. The enforcement improvement theoretically attributable to MiCA licensing has not yet been activated for any of the previously registered domestic operators. Until the transitional period expires, the documentary basis for tax enforcement from MiCA-compliant records is in formation rather than deployment.

5.5 Robustness of the estimates: sensitivity analysis

Eleven sensitivity scenarios test robustness of the €13.75M baseline to Section 4.2 assumptions: one-way sensitivity on each triangular parameter (mode shifted, range widened), Beta(2,5) substitution, and joint lower/upper-bound scenarios. Full scenario table and interpretation are provided in Supplementary Appendix A and in supplementary file sensitivity_results.csv. The profit-margin mode is the dominant source of parametric uncertainty: a one-percentage-point shift moves the total by approximately 5 to 7 percent, while operating-margin variation produces around 1 percent swing. The Beta(2,5) specification yields an estimate approximately 20 percent below the triangular baseline, indicating some sensitivity to distributional shape that is reported here for transparency. The joint lower-bound (€8.78M) and upper-bound (€22.11M)

scenarios align closely with the baseline 95% confidence interval of €8.8M to €20.3M, confirming that the confidence interval already captures the parametric uncertainty without under-reporting it. Across all tested specifications, no scenario produced a cumulative estimate below €8.7 million or above €22.2 million, which bounds the plausible range given the calibration evidence.

6 Discussion

6.1 H1 implications for the revenue architecture

H1 identified VAT as structurally more stable than CGT across the observation period. The practical implication for tax-administration revenue design is direct. Under volatile market conditions, VAT provides a narrower uncertainty band and lower coefficient of variation, both because its base (CASP fee revenue) moves within a tighter distribution than individual trader profit margins and because it accrues from a small set of identifiable licensed entities rather than a dispersed population. Capacity investment weighted toward VAT enforcement is therefore proportionately less exposed to distributional uncertainty than investment weighted toward CGT enforcement; this should inform the phasing of post-DAC8 capacity expansion.

6.2 H2 implications: MiCA as partial digitalisation

H2 identified the 2023 turnover inflection as coinciding with two regulatory events: pre-MiCA registration and euro adoption. MiCA's subsequent operationalisation deserves its own evaluation within that regulatory frame. MiCA introduces the digital supervisory architecture, record-keeping, statutory audit, supervisory oversight, that transforms the documentary conditions of tax enforcement for the domestic segment. Conlon et al. (2024) document market responses to MiCA announcements, suggesting regulatory signalling affects behaviour before formal activation. However, as established in Sections 3.2 and 5.4, MiCA's effect in Croatia is nascent: the first licence was granted on 9 April 2026, the register held a single entry at time of submission, and the substantive effects on the documentary basis for tax enforcement will materialise only after the 30 June 2026 processing deadline for pre-MiCA operators.

Even once licensing is activated, MiCA's compliance effect will remain bounded by the foreign platform problem. Domestic CASPs account for a fraction of total Croatian resident crypto activity; transactions on Binance, Kraken, and comparable global platforms remain outside HANFA's supervisory perimeter regardless of MiCA status. The 2023 turnover spike identified in Section 5.3 preceded MiCA and cannot be attributed to it; it reflects regulatory confidence effects from pre-MiCA domestic registration requirements and euro adoption. MiCA is therefore best understood as a partial digitalisation of the supervisory layer, which DAC8 must complement to close the cross-border information pipeline.

6.3 P1 implications: the organisational-capacity agenda

P1 identified four empirical deficits in the pre-DAC8 baseline: data infrastructure, cross-border information pipeline, specialist competency, and supervisory infrastructure. Each maps to a specific component of the capacity framework set out in §4.3 and carries a distinct policy implication.

The data-infrastructure deficit (Indicator 1, Marković, 2025) is the binding constraint on targeted audit selection. Without disaggregated cryptocurrency-specific records, risk-based audit cannot function at the granularity the underlying tax framework requires; general capital-income screening cannot substitute for crypto-specific pattern detection. The specialist-competency deficit (Indicator 3) compounds this: even where disaggregated data become available through DAC8, audit staff without training in DeFi product structures, staking reward mechanics, or NFT transaction patterns cannot convert the data into findings. Cipollini (2024) makes the same point for DAC8 enforcement against non-EU operators: information volume without interpretive capacity produces no enforcement.

The cross-border information pipeline deficit (Deficit 2 in §5.4) is precisely what DAC8 is designed to remedy at the EU level. Two qualifications apply. First, the remedy is conditional on the receiving authority having the data-matching infrastructure to consume it (Deficit 1). Second, foreign-platform enforcement under DAC8 depends on the extraterritorial reach of the Directive on non-EU CASPs, a question Cipollini (2024) analyses in detail and flags as partially unsettled for small-administration contexts.

The supervisory-infrastructure deficit (Indicator 4) is a transitional phenomenon: the 30 June 2026 processing deadline for pre-MiCA operators, once met, will populate the CASP register and activate the record-keeping and statutory-audit obligations that form the domestic documentary basis for tax enforcement. Gorissen (2025) documents similar transition patterns across other EU member states, with compliance-readiness lag ranging from 9 to 18 months, placing Croatia's 15-month lag within the typical range rather than at either extreme.

The central theoretical claim follows: organisational capacity is not a moderator of digital-transformation outcomes but the constitutive condition under which digital

information becomes enforcement. Where the four indicators read as they do in Croatia, incoming DAC8 data do not produce partial enforcement; they produce none, because the data do not enter a decision architecture that can act on them. Pre-DAC8 organisational-capacity investment is therefore a prerequisite for information-infrastructure investment, not a supplement to it.

6.4 DAC8 as digital information infrastructure: theoretical prediction

DAC8 operationalises automatic exchange of cryptocurrency transaction data between EU tax authorities from 2026, including data from CASPs, global platforms included, doing business with EU residents. If operated as designed, this dramatically raises p for all reportable cryptocurrency transactions. The Allingham-Sandmo framework predicts a substantial compliance response: when detection probability rises from near-zero to a level comparable to third-party-reported income, compliance rates are expected to converge toward near-100% for reportable transactions (Kleven et al., 2011).

The CRS analogy supports this prediction. Johannesen and Zucman (2014) found that bilateral information exchange reduced bank deposits in targeted havens by approximately 34%, with the reduction concentrated in deposits previously hidden. Meling et al. (2024), working with Norwegian crypto-trader records, demonstrate a sharp compliance response to targeted audits, consistent with high initial non-declaration attributable to low perceived p. Applied conservatively to the Croatian context, a DAC8-induced compliance improvement of comparable magnitude would imply additional annual tax collections in the order of €1 to 4 million at prevailing market volumes. This is a counterfactual scaled from the baseline compliance gap by the 20 to 40 percent CRS reduction range, indicative of order of magnitude rather than a forecast: it assumes DAC8 delivers a CRS-comparable information advantage (not yet empirically established for crypto) and that the Tax Administration has the organisational capacity to act on incoming data (Sections 3.3 and 5.4 document that it does not yet).

The binding constraint is, however, precisely that organisational capacity. DAC8 generates transaction-level data requiring Tax Administration processing to identify non-compliance. The Tax Administration currently processes cryptocurrency declarations as an undifferentiated subcategory of capital income with no dedicated data infrastructure (Marković, 2025). Without pre-DAC8 investment in data-matching infrastructure and specialist competency, the information advantage conferred by automatic exchange will not translate into enforcement action.

6.5 Generalisability to other small EU member states

Croatia shares several structural characteristics with other small EU member states, Baltic states, Slovenia, Slovakia, that make it plausible that the organisational-capacity deficits identified here also obtain elsewhere. These include: a domestic CASP market too small to capture the majority of resident crypto activity; limited Tax Administration capacity for crypto-specific enforcement; MiCA implementation as a relatively recent development; and dependence on the DAC8 framework rather than bilateral arrangements for capturing cross-border flows. This profile supports a testable hypothesis, not a confirmed regularity: the single-country design cannot establish that the four-deficit pattern generalises; parallel baselines from other small EU jurisdictions would be required to test it.

The methodological approach developed here, fiscal gap estimation from CASP supervisory data using Monte Carlo simulation with externally calibrated parameters, is transferable to any jurisdiction where aggregate CASP turnover data are available from financial supervisors. This offers a route to constructing comparative baselines across small EU economies before DAC8 data become available, supporting cross-country learning about organisational-capacity requirements for the digital transformation of tax enforcement.

6.6 Limitations

Eight limitations are noted. First, the model's CGT estimates are upper-bound figures because the two-year holding-period exemption is not applied; to the extent that Croatian retail investors hold significant portions of their portfolios beyond the two-year threshold, actual CGT liability will be lower than estimated. Second, HANFA data capture only domestic licensed exchanges; the majority of Croatian resident crypto activity on global platforms is unobserved, and the compliance gap for that segment cannot be estimated from available data. The study's estimates are therefore lower bounds on the total compliance gap. Third, the model assumes that all theoretically liable CGT is, under full compliance, actually payable in the year of the modelled turnover; in practice, many transactions will involve losses or assets held beyond the exemption threshold, reducing actual liability below the theoretical estimate. Fourth, data for 2025 were not available at the time of submission; HANFA's annual report for 2025 is expected in mid-2026, and 2025 represents a transitional year with partial MiCA operationalisation. The study's 2020–2024 scope is therefore a clean pre-DAC8 baseline uncontaminated by transition dynamics.

Fifth, the study design does not support causal inference in the strict sense. The 2023 turnover inflection under H2 coincides with two simultaneous regulatory events

(pre-MiCA CASP registration and euro adoption), and the single-country, single-time-series design provides no counterfactual to separate their contributions; H2 is therefore a descriptive association, not a causal attribution. The DAC8 €1 to 4 million projection in Section 6.3 is a counterfactual calibrated on the CRS analogy and Norwegian audit-response evidence, not a forecast. The central theoretical claim that organisational capacity is the constitutive condition for digital transformation outcomes is a proposition supported by mapping four documented deficits onto the Allingham-Sandmo and organisational-capacity frameworks; it is not causally tested here. A pre-post design across Croatian Tax Administration capacity investments following DAC8 activation would provide stronger causal evidence. Sixth, the Monte Carlo simulation samples profit_margin, fee_rate, and op_margin independently; cross-parameter correlation under joint market regimes would widen the reported €8.8M–€20.3M interval, which should be read as a lower bound on full parametric uncertainty. Seventh, omitting the CGT two-year holding-period exemption inflates the CGT component: if 30 to 40 percent of disposed assets are held beyond the threshold, the €7.1M CGT baseline would fall to €4M to €5M, reducing the cumulative central estimate to €10M to €12M. Eighth, the VAT component (€5.5M, 40% of the cumulative total) rests on the interpretation that CASP exchange fees are taxable consideration for a distinct service rather than ancillary to the exempt currency exchange (Section 3.1). Under the composite-supply alternative, VAT would approach zero and the cumulative central estimate would fall to approximately €8.3 million. The absence of Croatian Tax Administration guidance on this point is itself an organisational-capacity finding.

7 Conclusions: organisational-capacity agenda for the pre-DAC8 window

Author's assessment of the findings. Four evaluative observations follow from the empirical pattern reported above. First, the information-deficit finding (Indicator 1) indicates that statutory sophistication in the tax treatment of cryptocurrencies has preceded administrative capacity in Croatia by a measurable margin: the legal framework for taxing crypto gains has existed since 2015, yet the data system required to identify those gains at the taxpayer level does not. This mismatch is not unique to Croatia but is characteristic of the small-EU administrative pattern documented in OECD (2024); it indicates a systematic under-investment in the back-end infrastructure required to convert legal rules into enforced liability. Second, the fifteen-month MiCA licensing lag (Indicator 4) illustrates that the operational cost of digital supervisory architecture has been systematically underbudgeted in small EU states during the pre-activation window; Gorissen (2025) documents analogous patterns in other member states. Third, the €13.8M theoretical liability estimate should be read as a floor on the realised compliance gap, not a ceiling: the HANFA data capture only domestic licensed exchanges, and the majority of Croatian resident crypto activity on global platforms (Chainalysis, 2024) is unobserved. A post-DAC8 extension of the methodology, incorporating cross-border reported flows, would be expected to increase the central estimate substantially. Fourth, the paper's principal theoretical contribution is the repositioning of organisational capacity from a downstream moderator of digital-transformation outcomes to a constitutive precondition for them; this reframing matters because policy design under the moderator interpretation treats capacity investment as optimisation, while under the constitutive-condition interpretation it treats capacity investment as prerequisite. For the 2026 transposition window, the distinction is not rhetorical.

This study has estimated Croatia's cryptocurrency theoretical tax liability for 2020–2024 at approximately €13.8 million in cumulative mean terms (95% CI: €8.8M–€20.3M), with VAT proving structurally more stable than CGT and 2023 representing a regulatory inflection point attributable to CASP registration and euro adoption. The structural analysis has identified four organisational-capacity deficits, data infrastructure, cross-border information pipeline, specialist competency, and supervisory infrastructure, that collectively explain the persistence of non-compliance independent of the statutory tax framework.

Four measures follow:

Measure 1, Digital data infrastructure for crypto transaction disaggregation HANFA should require licensed CASPs to provide quarterly reports disaggregating aggregate client gains and losses by client residency status, transaction type, and instrument category. The Tax Administration should, correspondingly, introduce a disaggregated cryptocurrency code within the JOPPD declaration architecture, enabling identification of crypto-specific declarations within its existing data system. This closes the data-infrastructure deficit (Deficit 1) without requiring microdata integration: it establishes the minimum categorical resolution necessary for risk-based audit selection.

Measure 2, Digital capital gains declaration with exchange data import The Tax Administration should develop a dedicated JOPPD supplement for cryptocurrency capital gains, with a mechanism for importing transaction data directly from CASP platforms. Several EU member states (Germany, France, Netherlands) have implemented comparable tools that have increased CGT declaration rates. This reduces compliance cost for good-faith taxpayers, increases voluntary compliance, and allows enforcement resources to focus on systematic non-declarants. This shifts from post-hoc audit to taxpayer-facing system inte-

gration (Tax Administration 3.0; OECD, 2022).

Measure 3, Pre-DAC8 organisational-capacity investment The Tax Administration should, before DAC8 data flows commence in 2026, develop the data-processing infrastructure and specialist competency necessary to utilise incoming crypto transaction data. This includes: (i) database architecture capable of matching DAC8 data to existing taxpayer records; (ii) training for audit staff in cryptocurrency transaction analysis, including DeFi and NFT product structures; and (iii) legal and operational protocols for acting on DAC8-sourced information. Without this investment, the enforcement potential of DAC8 will be systematically underrealised, the data arrive, but the organisation cannot act on them.

Measure 4, Expanded administrative guidance on novel digital instruments The Tax Administration should issue formal guidance on the taxation of staking rewards, yield farming, DeFi lending activity, and NFT transactions. Classification ambiguity in these areas not only creates genuine compliance uncertainty but also limits the deterrent effect of penalties by enabling good-faith defences. Clear guidance reduces compliance cost for willing taxpayers and closes the interpretive space available to deliberate evaders. This addresses the specialist-competency deficit (Deficit 3) at the output layer: it translates internal expertise into external rule clarity.

The broader significance of this analysis extends beyond Croatia. The pre-DAC8 period offers a narrow window in which small EU economies can establish the measurement baselines, data infrastructure, and administrative protocols needed to convert the information advantage of automatic exchange into realised enforcement outcomes. Croatia's experience, a normatively advanced jurisdiction whose supervisory infrastructure (MiCA licensing) achieved its first operational entry fifteen months after regulation entry-into-force, and whose tax administration possesses no disaggregated data on a sector that generated an estimated €13.8 million in theoretical liability over five years, illustrates that statutory sophistication without organisational operationalisation produces a compliance gap of material scale. The methodological contribution of this study is to demonstrate that this gap can be quantified, and its organisational determinants identified, from the administrative data that financial supervisors already collect. The theoretical contribution is to reposition organisational capacity from moderator of digital transformation outcomes to prerequisite for them: information that cannot be processed, matched, and interpreted by the receiving authority does not produce partial enforcement, it produces none.

Data and Code Availability

The Python simulation model, sensitivity analysis script, complete Monte Carlo raw output (50,000 rows), aggregated summary, and sensitivity scenarios are submitted as supplementary materials. Random seed 42 is fixed in both scripts so any reader can reproduce every point estimate, confidence interval, and sensitivity result exactly. Readers who wish to substitute alternative distribution parameters, distribution families, or additional years of data can do so directly in the supplied scripts.

Primary data sources, HANFA aggregate turnover 2020–2024 and the Croatian Tax Administration confirmation of data unavailability, were obtained through formal information requests under the Croatian Access to Information Act (Zakon o pravu na pristup informacijama, NN 25/13, 85/15, 69/22). The requests and responses are documented with dates and agency contacts in the references section; Secondary data (statutory tax rates, public CASP tariff disclosures, HANFA annual reports) are cited with URLs and access dates. No microdata or personally identifiable data were used in the study.

This study was not pre-registered. Hypotheses H1 and H2 were specified ex ante from theory and institutional context (Section 4.3) and parameter calibrations were fixed before running the simulation; neither was adjusted after observing the results. The authors acknowledge that pre-registration is the stronger open-science practice and recommend its adoption for future comparative baseline studies once the empirical template established here has been extended to additional jurisdictions.

References

Allingham, M. G., & Sandmo, A. (1972). Income tax evasion: A theoretical analysis. Journal of Public Economics, 1(3-4), 323-338. https://doi.org/10.1016/0047-2727(72)90010-2

Andrews, R., & Boyne, G. A. (2010). Capacity, leadership, and organizational performance: Testing the black box model of public management. Public Administration Review, 70(3), 443-454. https://doi.org/10.1111/j.1540-6210.2010.02158.x

Baer, K., de Mooij, R., Hebous, S., & Keen, M. (2023). Taxing cryptocurrencies (IMF Working Paper No. WP/23/144). International Monetary Fund. https://doi.org/10.5089/9798400246586.001

Benson, V., Adamyk, B., Chinnaswamy, A., & Adamyk, O. (2024). Harmonising cryptocurrency regulation in Europe: Opportunities for preventing illicit transactions. European Journal of Law and Economics, 57(1-2), 37-61. https://doi.org/10.1007/s10657-024-09797-w

Bernt, M. (2023). DAC8: Commentary on the European Union's new crypto tax reporting regime. European Taxation, 63(9). https://doi.org/10.59403/1cqgwag

Bitcoin Mjenjačnica. (2024). Naknade i tečajevi. Electrocoin d.o.o. https://bitcoin-mjenjacnica.hr/ (accessed 29 March 2026).

Bitcoin Store. (2024). FAQ, fee and exchange rate information. Bitcoin Store d.o.o. https://www.bitstore.net/

en/help/faq/ (accessed 29 March 2026).
Chainalysis. (2024). The 2024 geography of cryptocurrency report. Chainalysis Inc. https://www.chainalysis.com/blog/2024-geography-of-cryptocurrency-report/ (accessed 29 March 2026).
Chainalysis. (2025). Crypto crime report 2025. Chainalysis Inc. https://www.chainalysis.com/blog/crypto-crime-report-2025/ (accessed 29 March 2026).
Cipollini, C. (2024). DAC8 and extraterritoriality: How to enforce compliance for non-EU operators. EC Tax Review, 33(1), 19-32. https://doi.org/10.54648/ecta2024003
Conlon, T., Corbet, S., & Oxley, L. (2024). The influence of European MiCA regulation on cryptocurrencies. Global Finance Journal, 63, Article 101040. https://doi.org/10.1016/j.gfj.2024.101040
Desai, A., & Manoharan, A. (2024). Digital transformation and public administration: The impacts of India's digital public infrastructure. International Journal of Public Administration, 47(9), 575-578. https://doi.org/10.1080/01900692.2024.2350762
Electrocoin. (2024). Naknade, uvjeti korištenja. Electrocoin d.o.o. https://electrocoin.eu/hr (accessed 29 March 2026).
European Commission. (2022). Proposal for a Council directive amending Directive 2011/16/EU on administrative cooperation in the field of taxation (DAC8) (COM(2022) 707 final). European Commission.
European Commission. (2024). DAC8: Q&A on administrative cooperation in the field of taxation with respect to reportable crypto-assets. DG TAXUD, European Commission. https://taxation-customs.ec.europa.eu/taxation/tax-cooperation-and-control/governance-tax-matters/tax-cooperation-and-fight-against-tax-fraud-and-evasion/administrative-cooperation_en (accessed 22 April 2026).
Gil-Garcia, J. R., Dawes, S. S., & Pardo, T. A. (2018). Digital government and public management research: Finding the crossroads. Public Management Review, 20(5), 633-646. https://doi.org/10.1080/14719037.2017.1327181
Goel, R. K., & Mazhar, U. (2024). Cryptocurrency use and tax collections: Direct and indirect channels of influence. Journal of Financial Stability, 72, Article 101251. https://doi.org/10.1016/j.jfs.2024.101251
Gorissen, A. (2025). Compliance countdown: DAC8 implementation status and the future of crypto-asset reporting. Finance and Capital Markets, 26(3). https://doi.org/10.59403/1v3vbt3
HANFA. (2025a). Godišnje izvješće 2024 [Annual report 2024]. Hrvatska agencija za nadzor financijskih usluga. https://www.hanfa.hr/media/ieqnyuvd/godišnje-izvješće-2024.pdf (accessed 29 March 2026).
HANFA. (2026). Registar društava ovlaštenih pružati usluge povezane s kriptoimovinom (MiCA) [Register of authorised CASPs]. Hrvatska agencija za nadzor financijskih usluga. https://www.hanfa.hr/registri/trziste-kriptoimovine/registar-drustava-ovlastenih-pruzati-usluge-povezane-s-kriptoimovinom-mica/ (accessed 10 April 2026).
Honadle, B. W. (1981). A capacity-building framework: A search for concept and purpose. Public Administration Review, 41(5), 575-580. https://doi.org/10.2307/976270
Ingraham, P. W., Joyce, P. G., & Donahue, A. K. (2003). Government performance: Why management matters. Johns Hopkins University Press.
Janowski, T. (2015). Digital government evolution: From transformation to contextualization. Government Information Quarterly, 32(3), 221-236. https://doi.org/10.1016/j.giq.2015.07.001
Johannesen, N., & Zucman, G. (2014). The end of bank secrecy? An evaluation of the G20 tax haven crackdown. American Economic Journal: Economic Policy, 6(1), 65-91. https://doi.org/10.1257/pol.6.1.65
Kicova, E., Fabus, J., Stalmasekova, N., & Kvasnicova-Galovicova, T. (2025). Bitcoin, cryptocurrencies and tax evasion: A systematic literature review on global approaches to cryptocurrency taxation and the challenges for harmonising regulatory frameworks. Data Science in Finance and Economics, 5(2), 234-257. https://doi.org/10.3934/DSFE.2025011
Kleven, H. J., Knudsen, M. B., Kreiner, C. T., Pedersen, S., & Saez, E. (2011). Unwilling or unable to cheat? Evidence from a tax audit experiment in Denmark. Econometrica, 79(3), 651-692. https://doi.org/10.3982/ECTA9113
Marković, J. (2025, May 6). Re: Molba za dostavom statističkih podataka o oporezivanju kriptovaluta (2016-2024) [Personal communication, email to P. Topić]. Croatian Tax Administration, Zagreb.
Meling, T. G., Mogstad, M., & Vestre, A. (2024). Crypto tax evasion (NBER Working Paper No. 32865). National Bureau of Economic Research. https://doi.org/10.3386/w32865
Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. Government Information Quarterly, 36(4), Article 101385. https://doi.org/10.1016/j.giq.2019.06.002
OECD. (2014a). Standard for automatic exchange of financial account information in tax matters. OECD Publishing. https://doi.org/10.1787/9789264216525-en
OECD. (2014b). Tax compliance by design: Achieving improved SME tax compliance by adopting a system perspective. OECD Publishing. https://doi.org/10.1787/9789264223219-en
OECD. (2020). The OECD digital government policy framework: Six dimensions of a digital government (OECD Public Governance Policy Papers No. 02).

OECD Publishing. https://doi.org/10.1787/f64fed2a-en
OECD. (2022). Tax administration 3.0: The digital transformation of tax administration, progress report. OECD Forum on Tax Administration. OECD Publishing.
OECD. (2023). International standards for automatic exchange of information in tax matters: Crypto-asset reporting framework and 2023 update to the common reporting standard. OECD Publishing. https://doi.org/10.1787/896d79d1-en
OECD. (2024). Tax administration 2024: Comparative information on OECD and other advanced and emerging economies. OECD Publishing. https://doi.org/10.1787/2d5fba9c-en
OECD. (2025). Tax administration digitalisation and digital transformation initiatives. OECD Publishing. https://doi.org/10.1787/c076d776-en
Rotter Krmpotić, K. (2025, May 22). Re: Molba za dostavu statističkih podataka o domaćim pružateljima kripto-usluga (2016-2024) [Personal communication, email to P. Topić]. Croatian Financial Services Supervisory Agency (HANFA), Zagreb.
Saltelli, A., Ratto, M., Andres, T., Campolongo, F., Cariboni, J., Gatelli, D., Saisana, M., & Tarantola, S. (2008). Global sensitivity analysis: The primer. John Wiley & Sons. https://doi.org/10.1002/9780470725184
Scholta, H., Mertens, W., Kowalkiewicz, M., & Becker, J. (2019). From one-stop shop to no-stop shop: An e-government stage model. Government Information Quarterly, 36(1), 11-26. https://doi.org/10.1016/j.giq.2018.11.010
Serrano Antón, F. (2021). Artificial intelligence and tax administration: strategy, applications and implications, with special reference to the tax inspection procedure. World Tax Journal, 13(4), 575–608. https://doi.org/10.59403/bcs8j9

Legislation and case law cited

Court of Justice of the European Union (2015), *Skatteverket v David Hedqvist*, Case C-264/14, 22 October 2015.
Directive (EU) 2023/2226 of the Council of 17 October 2023 amending Directive 2011/16/EU on administrative cooperation in the field of taxation (DAC8), *Official Journal of the European Union*, L 2023/2226.
Regulation (EU) 2022/1208 of the Council of 12 July 2022 fixing the irrevocably fixed conversion rate for the euro for Croatia, *Official Journal of the European Union*, L 187/1.
Regulation (EU) 2023/1114 of the European Parliament and of the Council of 31 May 2023 on markets in crypto-assets and amending Regulations (EU) No 1093/2010 and (EU) No 1095/2010 and Directives 2013/36/EU and (EU) 2019/1937 (MiCA), *Official Journal of the European Union*, L 150/40.
Zakon o porezu na dobit (NN 177/04–114/23) [Corporate Tax Act] Zakon o porezu na dodanu vrijednost (NN 73/13–52/25) [VAT Act] Zakon o porezu na dohodak (NN 115/16–152/24) [Income Tax Act] Zakon o pravu na pristup informacijama (NN 25/13–69/22) [Access to Information Act] Zakon o provedbi Uredbe (EU) 2023/1114 o tržištima kriptoimovine (NN 85/2024) [MiCA Implementation Act]

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