Crypto Capture of Foreign Aid

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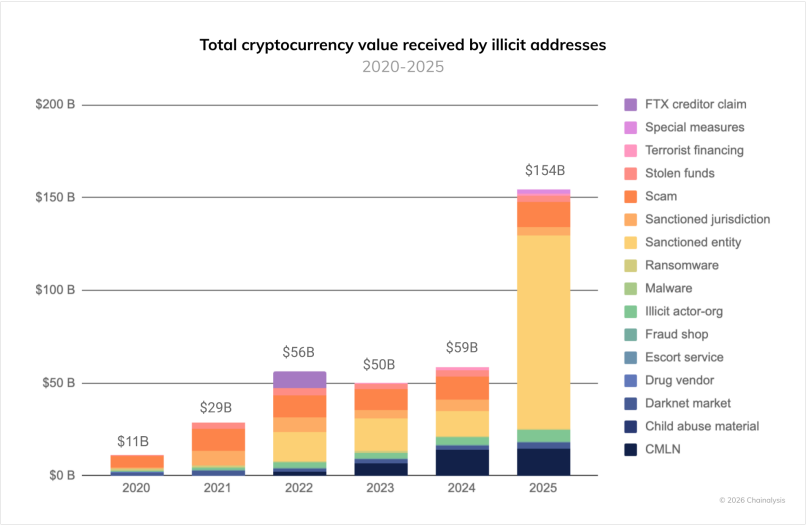
Motivation

- Traditional offshore laundering routes[1] ↓
- Cryptocurrencies (pseudonymity, speed, and decentralization) money laundering ↑

Public donations for aid allegedly redirected over a decade by NGO leaders to buy crypto, homes, jewellery — MACC probes RM26m abuse

[1] e.g. shell companies and trusts, offshore bank accounts.

Global Value of Crypto Laundered



Chainalysis Crypto Crime Report 2026

Research Question & Contribution

Research Question:

- Do foreign aid inflows trigger crypto laundering activity, and through which channels?

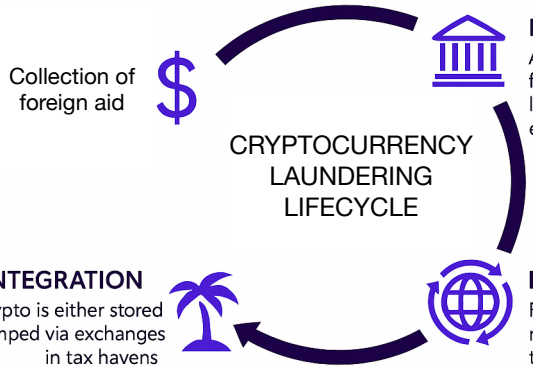
Headline claim:

- Diverted aid is laundered through crypto, especially through anonymous wallets and in tax-haven jurisdictions.
- Leakage through anonymous crypto channels is about 2–10 cents per aid dollar, roughly USD 511 million per year.

Contributions:

- **Concept:** one of the first systematic evidence that cryptocurrencies are used to launder proceeds from diverted foreign aid (crypto capture).
- **Illicit finance:** shows how blockchain forensics and exchange-level evidence complement traditional approaches to tracing illicit financial flows.
- **Method & evidence:** uses network analysis and web-traffic-adjusted measures of crypto transaction activity.

Conceptual Framework: Crypto Laundering Lifecycle



PLACEMENT

Aid funds are converied from fiat to cryptocurrency via regulated or semi.regulated exchanges (e.g., Coinbase, Binance)

- On-ramping is legal but tracable
- Often done through intermediaries or shell entities

LAYERING

Funds are fragmented across many addresses and cycled through mixers (e.g. Coinjoin. Wasabi)

- Involves circular flows, obfuscation, and timing strategies
- Goal is to sever link between origin and final holder

INTEGRATION

Crypto is either stored or off-ramped via exchanges in tax havens

- Common destinations include Seychelles, Malta, BVI.
- Enables eventual use in fiat economy or investment.

Data

- **World Bank project-level disbursements** (International Development Association (IDA), the International Bank for Reconstruction and Development (IBRD), 2018–2024). Foreign Aid Data

- **Web traffic:** country-level visits and time-spent on crypto-exchange websites, used to construct geo-adjusted measures of on-chain activity.

- **Crypto transaction data:**
  On-Chain: Bitcoin blockchain transactions and addresses, 2018–2024. On-Chain Data
  - **Address attribution:** public and forensic sources (e.g., WalletExplorer and open-source investigations) identify exchanges, mixers, gambling platforms, dark markets, payment processors, and related services.
  - **Wallet clustering:** union–find clustering with common-input heuristics groups addresses into user clusters.

  Off-Chain (centralized exchanges): Volumes and jurisdictional data reflecting real-world activity (CoinMarket-Cap's API, etc.).

Event Study: Network difference one month before and after top 5 aid disbursements

Top five disbursements

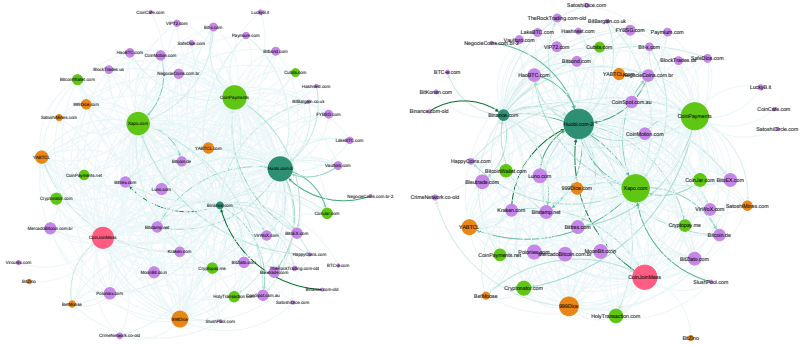
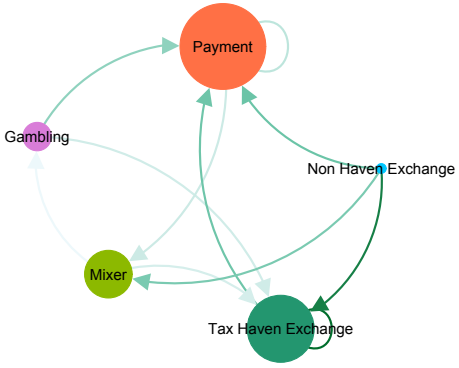


Figure: Network one month before One month after

- Purple dots: non-haven exchanges. Light green: payment. Orange: gambling. Pink: mixer.
- Dark green: tax-haven exchanges — more, thicker, darker edges after aid; network becomes more centralized.

Aggregated Changes Following Top Five Aids



(a) One week before/after top five aids

- Increased outflows from non-haven exchanges (placement phase)
- Increased inflows to tax-haven exchanges, mixers, and payment platforms (layering & integration phases)

Web Traffic as a Geo-Identifier

Challenge: Blockchain transactions do not report the country of the user behind a wallet or exchange interaction.

Idea: Use web traffic to crypto-exchange websites as a proxy for the geographic origin of exchange activity.

- Observe country-level **visits** and **time spent** on each exchange website.
- For each exchange p and month t, compute country shares

$$s_{cpt} = \frac{\text{WebTraffic}_{cpt}}{\sum_{c'} \text{WebTraffic}_{c'pt}}.$$

- Allocate exchange-level on-chain activity to countries using these shares:

$$\widehat{Y}_{cpt} = s_{cpt} \times Y_{pt}.$$

- This produces geo-adjusted country-level measures of transaction volume, frequency, and new wallet creation.

Appendix: Web Traffic Figure

Identification: Stacked Event-Study DiD

Challenge: Aid is targeted toward weaker-institution countries, which also face higher illicit-finance risk.

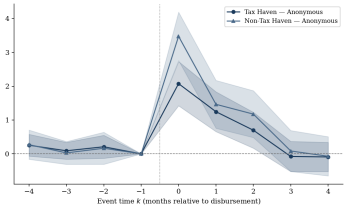
Solution: Stacked DiD event-study.

- Build short event windows (± 4 months) for each disbursement.
- Stack all events and estimate dynamic effects by event time k (omit $k = -1$).
- Absorb common shocks with Country×Platform×Episode and Time FE

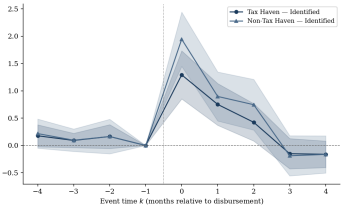
$$y_{cpt} = \sum_{k \neq -1} \beta_k \mathbf{1}\{K_{ct} = k\} + \alpha_{cp} + \gamma_t + \varepsilon_{cpt}.$$

- c: country; p: platform/jurisdiction group; t: month.
- y_{cpt}: outcome (web traffic, geo-adjusted volume / frequency / new accounts).
- K_{ct}: event time relative to disbursement month; $k = -1$ omitted.
- β_k: dynamic treatment effect at event time k.

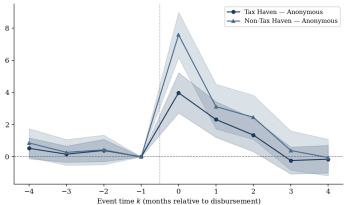
On-Chain Activity by Wallet Type and Exchange Group



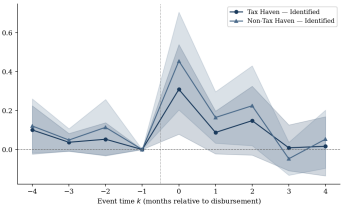
(a) Volume: anonymous



(b) Volume: identified



(c) New accounts: anonymous



(d) New accounts: identified

Main Analysis: Transaction Volume

	Tax Haven Exchanges			Non-Tax-Haven Exchanges		
	All	Anonymous	Identified	All	Anonymous	Identified
			Panel A: All Transactions			
Treat × Post	0.777***	0.770***	0.431***	1.235***	1.226***	0.647***
	(0.124)	(0.123)	(0.079)	(0.153)	(0.151)	(0.098)
Ctry. × Plat. × Ep. FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Obs.	9,096	9,096	9,096	9,096	9,096	9,096
Adj. R^2	0.02	0.02	0.01	0.04	0.04	0.03
			Panel B: Inflows			
Treat × Post	0.706***	0.695***	0.376***	1.116***	1.101***	0.602***
	(0.113)	(0.111)	(0.073)	(0.139)	(0.137)	(0.092)
Ctry. × Plat. × Ep. FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Obs.	9,096	9,096	9,096	9,096	9,096	9,096
Adj. R^2	0.02	0.02	0.01	0.04	0.04	0.03
			Panel C: Outflows			
Treat × Post	0.709***	0.706***	0.334***	1.120***	1.117***	0.465***
	(0.113)	(0.112)	(0.062)	(0.139)	(0.139)	(0.077)
Ctry. × Plat. × Ep. FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Obs.	9,096	9,096	9,096	9,096	9,096	9,096
Adj. R^2	0.02	0.02	0.01	0.04	0.04	0.03

Leakage Ratio

Calculation (anonymous volume on tax-haven exchanges):

Pre-disbursement baseline	$\bar{y}_0 = 1{,}271$ BTC
Post-period ATT	$0.770 \Rightarrow \Delta y \approx (e^{0.770} - 1) \times 1{,}271 \approx 1{,}474$ BTC
Dollar value	At avg. BTC price ($21,763): $\approx$ $32.1M/month $\times$ 5 months
Gross ratio	$\lambda_{\text{gross}} = \Delta\text{CryptoValue} \,/\, \text{Aid} \approx 10.5\%$

Turnover adjustment: each diverted dollar observed multiple times as funds traverse successive wallets.

Turnover multiplier (m)	2	3	5
Net leakage ratio	$\sim$5.3%	$\sim$3.5%	$\sim$2.1%

$\Rightarrow$ **Plausible range: 2–10% of disbursed aid.**

Comparable to Andersen et al. (2022) offshore banking estimate (7.5%) – entirely independent methodology.
Bitcoin only $\Rightarrow$ lower bound (excludes stablecoins, privacy coins, DeFi protocols).

Off-Chain Analysis

Deposits, trades, and internal transfers recorded by centralized exchanges.

- Two dependent vars:
  - **Log-level change** in exchange volume (post-aid vs. pre-aid).
  - **Log-difference in volume ratio** between suspect platforms (e.g., tax havens) and regulated benchmarks.
  - **Benchmark exchanges:** Coinbase, Kraken, Gemini.
  - Benchmark-adjusted ratio captures jurisdiction-specific shifts, removing global market trends:

$$\log\left(\frac{\text{EX\_Haven}_t}{\text{Benchmark}_t}\right) - \log\left(\frac{\text{EX\_Haven}_{t-1}}{\text{Benchmark}_{t-1}}\right)$$

Where: EX_Haven_t = Transaction volume on suspect exchange at time t,
Benchmark_t = Aggregate volume on benchmark exchanges at time t

Off-Chain Analysis

	Lead - Lag			Lead - Lag Ratio		
	Tax Haven	Non-Haven	Δ	Tax Haven	Non-Haven	Δ
Panel A: Tax Haven vs. Non-Haven						
Foreign Aid$_{lagged}$	2.39***	1.51	0.88***	0.39***	-0.03	0.42***
	(0.55)	(1.16)	(0.31)	(0.11)	(0.14)	(0.02)
Controls	Y	Y		Y	Y	
Country FE	Y	Y		Y	Y	
Time FE	Y	Y		Y	Y	
Obs.	1,727	1,727		1,727	1,727	
Adj. R^2	0.29	0.21		0.39	0.14	
Panel B: Unregulated vs. Regulated						
Foreign Aid$_{lagged}$	2.38***	1.97***	0.41***	0.37**	0.03***	0.34***
	(0.64)	(0.55)	(0.05)	(0.16)	(0.01)	(0.08)
Controls	Y	Y		Y	Y	
Country FE	Y	Y		Y	Y	
Time FE	Y	Y		Y	Y	
Obs.	1,727	1,727		1,727	1,727	
Adj. R^2	0.25	0.19		0.29	0.21	
Panel C: Crypto-Friendly vs. Not Friendly						
Foreign Aid$_{lagged}$	2.41***	1.47**	0.94***	0.39**	-0.00	0.39***
	(0.64)	(0.58)	(0.03)	(0.16)	(0.00)	(0.08)
Controls	Y	Y		Y	Y	
Country FE	Y	Y		Y	Y	
Time FE	Y	Y		Y	Y	
Obs.	1,727	1,727		1,727	1,727	
Adj. R^2	0.25	0.37		0.29	0.50	

Robustness and Extensions

- **Pandora Papers** details
  Post-Pandora (Oct 2021), aid–crypto attenuates on tax-haven exchanges.
  $\Rightarrow$ substitution to less scrutinized channels.
- **Capital Flight Placebo: disasters without aid** details
  Disaster exposure + no disbursement $\Rightarrow$ *negative* crypto effects.
  Confirms aid inflows, not crisis shocks, drive the response.
- **Offshore banking complementarity** details
  Countries with higher AJZ offshore-to-GDP exposure show amplified aid–crypto responses.
- **Alternative geo-attribution** details
  Visit-duration ratio yields nearly identical results.
  Validated against Chainalysis Adoption Index ($\rho = 0.855$ by 2024).
- **Alternative controls and specification** details
  Developing-country-only controls, excluding neighbors; additive fixed effects.
- **DeFi boom exclusion** details
  Excluding May–September 2021 leaves the main on-chain results intact.

Pandora Papers (Post-Oct 2021)

The Pandora Papers leak is a transparency shock to offshore financial secrecy.

- Estimate pooled stacked DiD with `Treat` × `Post` × `PandoraPost`, where PandoraPost = 1 from **October 2021** onward.
- **Key finding:** attenuation is concentrated in **identified** transactions; **anonymous** channels remain largely unchanged.

Treat × Post × PandoraPost	Tax Haven	Non-Tax Haven
Identified volume	−0.620***	−0.655***
Identified frequency	−0.479***	−0.480***
Anonymous volume	−0.315	−0.295
Anonymous frequency	−0.413	−0.336
Ctry.×Plat.×Ep. FE	Y	Y
Time FE	Y	Y
Obs. (pre)	9,432	9,432
Obs. (post)	8,760	8,760
Adj. R^2	0.01	0.01

Document-based exposure raises the cost of *traceable/KYC-linked* channels, but pseudonymous wallets remain insulated.

Capital Flight Placebo

Concern: Could the crypto response reflect capital flight from macroeconomic instability rather than aid diversion?

Timing Evidence: Disbursements lag triggering events by months. If capital flight drove the response, crypto activity should rise during this pre-disbursement window, yet pre-trends are flat and the spike occurs only at disbursement.

Natural Disaster Test: Placebo episodes = country-years with a natural disaster (EM-DAT, 2018–2024) but *no* subsequent World Bank disbursement.

	Tax Haven	Non-Tax Haven
Anon. transaction volume	-0.985^{***}	-1.065^{***}
Anon. transaction frequency	-1.007^{***}	-1.052^{***}
Anon. new accounts	-1.750^{***}	-1.904^{***}
Ctry.×Plat.×Ep. FE	Y	Y
Time FE	Y	Y
Obs.	13,399	13,399
Adj. R^2	0.00	0.00

Offshore Banking Complementarity

Is the aid–crypto response stronger where traditional offshore banking is already more developed?

- Interact baseline `Treat` $\times$ `Post` with the **AJZ offshore-to-GDP index** (standardized).
- Positive interaction means aid-induced crypto activity is amplified in countries with stronger pre-existing offshore ties.

Treat $\times$ Post $\times z$	Tax Haven	Non-Tax Haven
Transaction volume	0.223***	0.129**
Transaction frequency	0.232***	0.138**
New accounts	0.479***	0.333***
Ctry.$\times$Plat.$\times$Ep. FE	Y	Y
Time FE	Y	Y
Obs.	5,351	5,351
Adj. R^2	0.07	0.08

- Results imply **complementarity**, not crowd-out, between crypto laundering and traditional offshore infrastructure.
- Consistent with either the **same elites** using both channels or **shared institutional weaknesses** facilitating both.

Conclusion

- *Significant aid leakage occurs through crypto channels:*

1. Crypto activities jump at disbursement month and fade away after two months.
2. Anonymous flows rise more than identified flows on all exchanges.
3. New anonymous wallets surge at disbursement month.
4. Impact-period exposure implies a leakage ratio of 2–10%
5. Larger effects in weaker institutions.

Thank you so much!

Appendix

Top Aid Recipient Countries

Table: **Panel A. Top 15 Recipient Countries by Disbursed Aid Amount**

Country	Disbursed Amount (million USD)	Fraction
India	8,968.22	0.06
Indonesia	7,726.85	0.05
Colombia	7,116.32	0.05
Ukraine	6,750.47	0.04
Philippines	6,541.72	0.04
Nigeria	5,206.00	0.03
Bangladesh	4,892.92	0.03
Morocco	4,584.78	0.03
Pakistan	4,345.55	0.03
Ethiopia	3,740.17	0.02
Argentina	3,506.50	0.02
Turkiye	3,416.46	0.02
Ecuador	3,373.90	0.02
Egypt (Arab Republic)	3,326.24	0.02
Kenya	3,198.90	0.02
Total	76,694.99	0.50

Panel B. Regional and Regulatory Distribution

By Region

Region	Europe Islands	North America	Central America	South America	Oceania
Proportion	0.12	0.14	0.02	0.00	0.01

By Regulatory Type

Regulatory Type	Tax Haven	Regulated	Crypto Friendly
Proportion	0.45	0.18	0.70

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On-Chain Crypto Activity:

Table: Panel A. Distribution of Platforms by New Accounts and Transaction Volume

Platform	Accounts (k)	% of Accounts	Volume (24h, k)	% of Volume
CoinJoinMess	31,404.07	0.77	1,579.36	0.02
Binance	2,135.84	0.05	28,254.06	0.34
Kraken	2,050.89	0.05	20,808.49	0.25
CoinPayments	1,855.92	0.05	539.19	0.01
Luno	1,633.95	0.04	1,164.35	0.01
Huobi	1,229.52	0.03	19,029.29	0.23
Bittrex	495.58	0.01	3,482.29	0.04
YABTCL	16.92	0.00	1.75	0.00
999Dice	13.77	0.00	4.21	0.00
Bitstamp	13.17	0.00	5,639.09	0.07
Xapo	13.12	0.00	670.07	0.01
BetMoose	1.14	0.00	1.20	0.00
HitBTC	0.10	0.00	2.99	0.00
Cex	0.02	0.00	7.42	0.00
BitZino	0.01	0.00	0.06	0.00
Total	40,864.02	1.00	83,300.68	1.00

Country-Level Crypto Volume

Table: Panel B. Top Countries by Crypto Exchange Volume

Country	Volume (in billions USD)	Fraction
Malta	71,954.47	0.33
Singapore	60,677.21	0.27
Seychelles	26,541.83	0.12
South Korea	12,887.99	0.06
Hong Kong	11,673.39	0.05
UAE	10,125.61	0.05
USA	6,096.03	0.03
Australia	5,757.90	0.03
Estonia	3,793.66	0.02
Cayman Islands	2,792.98	0.01
Total	212,200.07	0.97

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Top Five Disbursements by Date and Amount

Description: Aggregate network dynamics for the five largest foreign aid disbursements between April 2018 and March 2024. The largest occurred on **2023-07-25** with $1.5 billion to *Tajikistan and Ukraine*.

Date	Amount (million USD)	Receiving Countries
2023-07-25	1,507.40	Tajikistan, Ukraine
2023-11-28	1,443.43	Turkiye, India
2022-12-05	1,386.16	Indonesia, Romania
2020-12-17	1,347.77	Kiribati, Cote d'Ivoire, Nigeria, Uganda, Malawi, PNG, Dominican Rep., Uzbekistan, Pakistan, BiH
2023-12-18	1,301.26	Senegal, Sierra Leone, Burkina Faso, India, Albania, North Macedonia, Ukraine, Turkiye

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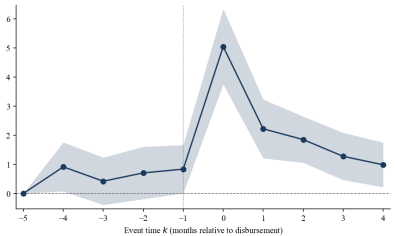
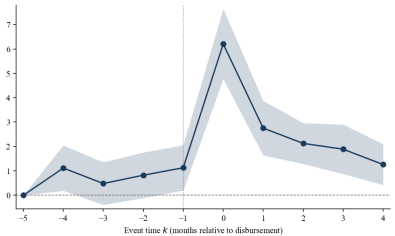
Web Traffic around Aid Disbursements

Figure: **Stacked DiD: Foreign Aid and Web Traffic to Crypto-Exchange Websites.** Panel (a) shows total visits and Panel (b) total visit duration around aid disbursement months. Event time $k = -1$ is omitted, and error bars denote 95% confidence intervals.



(a) Total visits



(b) Total time spent (seconds)

Treated countries show sharp post-disbursement increases in both visits and time spent on crypto-exchange websites.

Web Traffic

Tax-haven exchange web traffic responds strongly after disbursement, and the result is stable across control definitions.

	Baseline	Dev. Ctrl	No Neighbors
Panel A: Total visits	2.278***	2.278***	2.278***
	(0.330)	(0.330)	(0.331)
Panel B: Total visit duration	2.847***	2.847***	2.849***
	(0.346)	(0.346)	(0.346)
Ctry.×Plat.×Ep. FE	Y	Y	Y
Time FE	Y	Y	Y
Obs.	4,462	4,462	4,363
Adj. R^2	–	–	–

Interpretation: The web-traffic margin itself shifts sharply toward tax-haven exchanges following aid disbursement.

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Alternative Geo-Attribution

Concern: Geographic assignment of on-chain activity relies on web traffic.

- Replace the baseline **visits-ratio** allocator with a **visit-duration ratio** measure.
- Results are nearly unchanged, supporting the geographic attribution strategy.
- External validation: correlation with the **Chainalysis Global Crypto Adoption Index** rises from 0.689 (2021) to **0.855 (2024)**.

Web-traffic response at tax-haven exchanges	Baseline	Dev. Ctrl	No Neighbors
Total visits	2.278***	2.278***	2.278***
Total visit duration	2.847***	2.847***	2.849***
Ctry.×Plat.×Ep. FE	Y	Y	Y
Time FE	Y	Y	Y
Obs.	4,462	4,462	4,363
Adj. R^2	–	–	–

Takeaway: the aid response is not an artefact of one particular geo-allocation rule.

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Alternative Controls & Specification

Concern: Results may depend on the control pool or fixed-effects structure.

- Restrict controls to **developing countries only**.
- Exclude **neighboring countries** from the control group.
- Re-estimate with **additive country/month/platform fixed effects**.

Anonymous on-chain outcomes	Baseline	Dev. Ctrl	No Neighbors
Transaction volume (tax haven)	0.770	0.776***	0.768***
Transaction frequency (tax haven)	0.757	0.763***	0.755***
New accounts (tax haven)	1.457	1.456***	1.447***
Ctry.×Plat.×Ep. FE	Y	Y	Y
Time FE	Y	Y	Y
Obs.	9,096	9,092	9,010
Adj. R^2	0.02	0.02	0.02

Additive FE check: coefficients remain large and significant (e.g. anonymous volume: 0.802 on tax-haven, 1.430 on non-tax-haven exchanges).

DeFi Boom Exclusion

Concern: The May–September 2021 DeFi surge may mechanically inflate on-chain activity.

- Drop the entire **May–September 2021** window from both treatment and control samples.
- Main on-chain results remain positive, highly significant, and close to baseline magnitudes.

Anonymous on-chain outcomes	Tax Haven	Non-Tax Haven
Transaction volume	0.730***	1.037***
Transaction frequency	0.728***	0.980***
New accounts	1.353***	2.332***
Ctry.×Plat.×Ep. FE	Y	Y
Time FE	Y	Y
Obs.	8,918	8,918
Adj. R^2	0.01	0.03

Takeaway: the aid–crypto response is not driven by the temporary 2021 market-wide boom.

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Huobi Effect

In May 2021, Huobi–one of the largest crypto exchanges originally operating in China–relocated from **Hong Kong to Singapore.** Notably, Singapore, a crypto-friendly jurisdiction with moderate regulatory oversight, shows a particularly strong response to foreign aid inflows. back

	Hong Kong	Singapore	Seychelles	Islands	Malta	Huobi Effect
	(coefficients multiplied by hundreds)					
Panel A: Lead - lag						
Foreign Aid_{lagged}	3.35***	1.71***	2.80***	3.87***	1.90***	0.04
	(0.704)	(0.62)	(0.57)	(0.85)	(0.52)	(0.13)
Controls	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
# Obs	1,727	1,727	1,727	1,727	1,727	867
Adj. R^2	0.22	0.39	0.33	0.31	0.38	0.87
Panel B: Lead - lag ratio						
Foreign Aid_{lagged}	0.25***	0.01	0.16***	0.04**	0.18**	0.02**
	(0.06)	(0.03)	(0.04)	(0.02)	(0.08)	(0.01)
Controls	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
# Obs	1,727	1,727	1,727	1,727	1,727	867
Adj. R^2	0.47	0.27	0.29	0.56	0.15	0.87

Heterogeneity by Governance

- Stronger crypto responses are observed in countries with **low** CPIA governance scores, limited domestic credit, weak financial disclosure, and **high** corruption—consistent with patterns indicative of laundering behavior.

	Lead - lag							
	CPIA		Domestic credit		Control corrupt		Disclosure	
	High	Low	High	Low	High	Low	High	Low
Foreign Aid_{lagged}	0.03	0.03***	0.02	0.03***	0.02**	0.03***	0.01	0.12***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)	(0.04)
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
# Obs	267	701	736	605	696	691	53	152
Adj. R^2	0.35	0.29	0.30	0.28	0.46	0.29	0.40	0.45

back