RESEARCH·DEEP DIVE·NOVEMBER 15, 2026·19 MIN READ

# Issuer Discretion and Stablecoin Holdings after the Tornado Cash Sanction

*Only one of the two major stablecoin issuers followed suit. How do users of these stablecoin issuers react to the discretionary power to freeze accounts, if they do at all?*

INSTITUTIONS, MONETARY POLICY

ACCOMPANYING PAPER The full academic working paper is published separately as a PDF at nikkhosravipour.com. This document is the essay itself, for reading.

On 8 August 2022 the US Treasury sanctioned Tornado Cash and listed 38 addresses. Only one of the two major stablecoin issuers followed suit. So only Circle froze the USDC at these addresses that day; Tether didn't.

The question that arises is "How do users of these stablecoin issuers react to the discretionary power to freeze accounts, if they do at all?" Our hope is that this can function as a case study and a proxy for free banking theory: how consumers of competing currencies might react to an issuer's discretion.

We are looking at both wallets that used the Tornado Cash protocol and matched wallets with no recorded use before the event. We look at USDC holdings minus USDT holdings and divide by the usual combined holdings, with extreme values capped, calling this "the gap."

Our results found that the gap of wallets that had used the protocol before fell relative to matched wallets, meeting the rule set in advance for "supported"; the data shows that before the event the gap was already decreasing. Their combined USDC and USDT holdings, with extreme values capped, also fell relative to matched wallets.

It is important to note that the results don't show us a change from USDC to USDT. However, there are no clear signs where the money went. I currently work as a research intern with the Sound Money Project at the American Institute for Economic Research (AIER). I wrote this paper during the internship, and AIER will post it as a working paper later; the current version is linked at the end of this post.

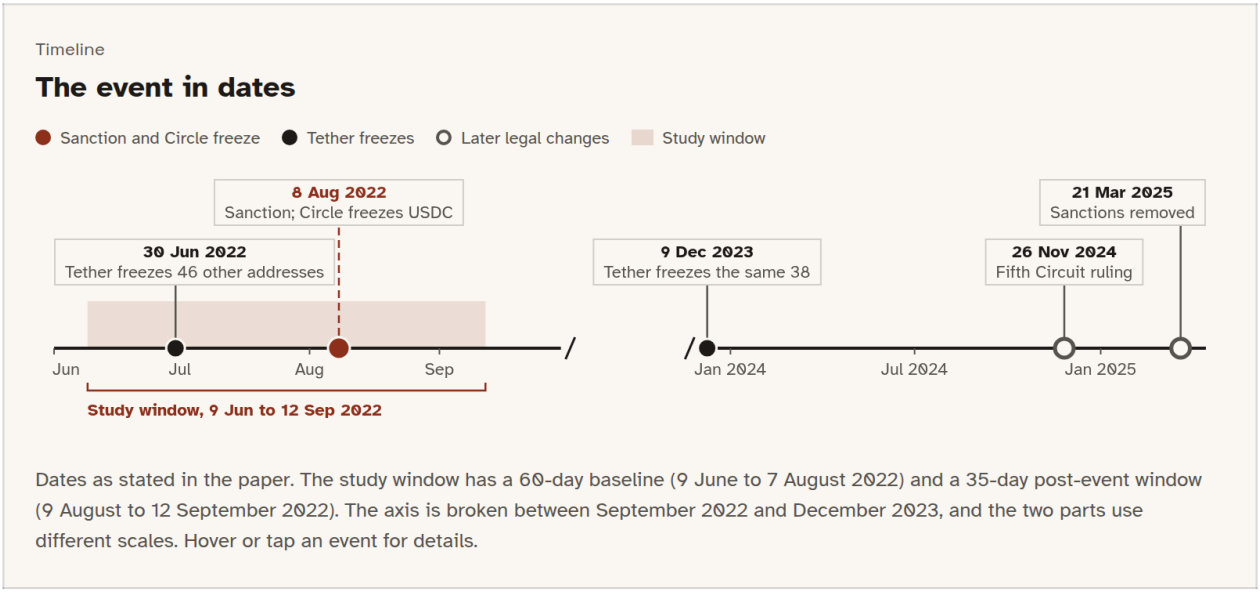



FIG. 1 · TIMELINE OF THE TORNADO CASH SANCTION AND THE ISSUERS' RESPONSES. ON 30 JUNE 2022 TETHER FROZE 46 OTHER ADDRESSES. ON 8 AUGUST 2022 THE US TREASURY SANCTIONED TORNADO CASH, LISTING 38 ADDRESSES, AND CIRCLE FROZE USDC AT THEM THE SAME DAY. THE STUDY WINDOW RUNS FROM 9 JUNE TO 12 SEPTEMBER 2022. ON 9 DECEMBER 2023 TETHER FROZE THE SAME 38 ADDRESSES. ON 26 NOVEMBER 2024 THE FIFTH CIRCUIT RULED THAT TORNADO CASH'S IMMUTABLE SMART CONTRACTS ARE NOT PROPERTY UNDER THE SANCTIONS STATUTE. ON 21 MARCH 2025 THE TREASURY REMOVED THE SANCTIONS.

## Competing private dollars

So, today almost every economy in the world works with a central bank. The central bank issues the money; in the US that's the Federal Reserve. But that has not always been the case.

Free banking theories foresee an economy based on the free exchange and open competition of privately issued currencies. It is our opinion that recent developments in blockchain technology, especially stablecoin use, can act as an interesting case study and a proxy for privately issued money. While these tokens are directly pegged to the US dollar, a fiat currency issued by an actively run central bank, the discretionary powers left to these issuers do exist and consumers do have a choice and low barriers to switch and leave one currency for another or the market altogether. This should in theory put some pressure on them to keep up with consumer demands.

I'm sure a lot of you have heard of Bitcoin. Bitcoin runs on the blockchain, which is a public ledger. Just imagine your bank statement, but publicly available for everyone: we see which address sent how much to which other address.

Circle is a so-called stablecoin issuer, meaning if approved customers give them US dollars, they will give them tokens of the equivalent amount, which they can then use to trade on the blockchain and on exchanges.

And we know the two biggest stablecoins are USDC, issued by Circle, an American company, and USDT, issued by Tether, an international company. Only approved, mainly institutional customers mint and redeem with the issuer; ordinary holders trade with other holders on exchanges or trading pools.

You would use these stablecoins to trade against cryptocurrencies like Bitcoin or Ethereum. Other uses include gaining exposure to the US dollar, especially in developing countries where access to

traditional dollars can either be difficult or expensive.

The issuer has a blacklist of addresses they "freeze". The idea is that these funds are not redeemable anymore: the balance stays at the address, but the token contract blocks transfers, so the tokens cannot be spent, sold or redeemed.

So the money becomes practically worthless. Stablecoin issuers are the same thing we talked about with free banking, with one difference: they don't issue money with its own value. They are tied to the US dollar: holders choose between issuers of claims on the same unit. Nevertheless, it is a rough proxy to see how consumers react to the actions these issuers take. If they do something consumers don't like, they can leave for a different issuer. Users of both USDC and USDT can easily change from one to another, so we want to see if they have actually used this option.

## Same sanctions list, different responses

So let's imagine your employer or your landlord. They send you money, so they know which address belongs to you, and whatever you do with the money on that address, they can follow along.

There's this protocol called Tornado Cash. A lot of users put their money into one shared pot, and out the other side they get it back in a new wallet. Each user deposits the same fixed sum from one address and withdraws later to a fresh one. Both transactions remain visible, but the protocol is designed to hide the match.

This has been used by many for privacy. For example, Vitalik Buterin, a big name in the crypto space, used it to donate to Ukraine. And I'm sure all of you would also like to have some privacy when it comes to your transaction history. Granted, it has also been used by criminals: the US Treasury accused North Korea of using it to hide the money trail from stolen funds.

On 8 August 2022, the US Treasury put sanctions on the Tornado Cash protocol. What happened on that day was the Treasury listed 38 addresses belonging to Tornado Cash itself. This was an administrative sanctions list, issued without a court ruling.

Circle froze the USDC at these addresses that same day. Tether did not freeze them. It is important to note that Tether has frozen addresses before. The difference in this case is the procedure. Tether stated that it would freeze a private wallet only on a verifiable law-enforcement request. Tether said none had been made for these addresses and that the Treasury's sanctions office had not signalled that a freeze was expected.

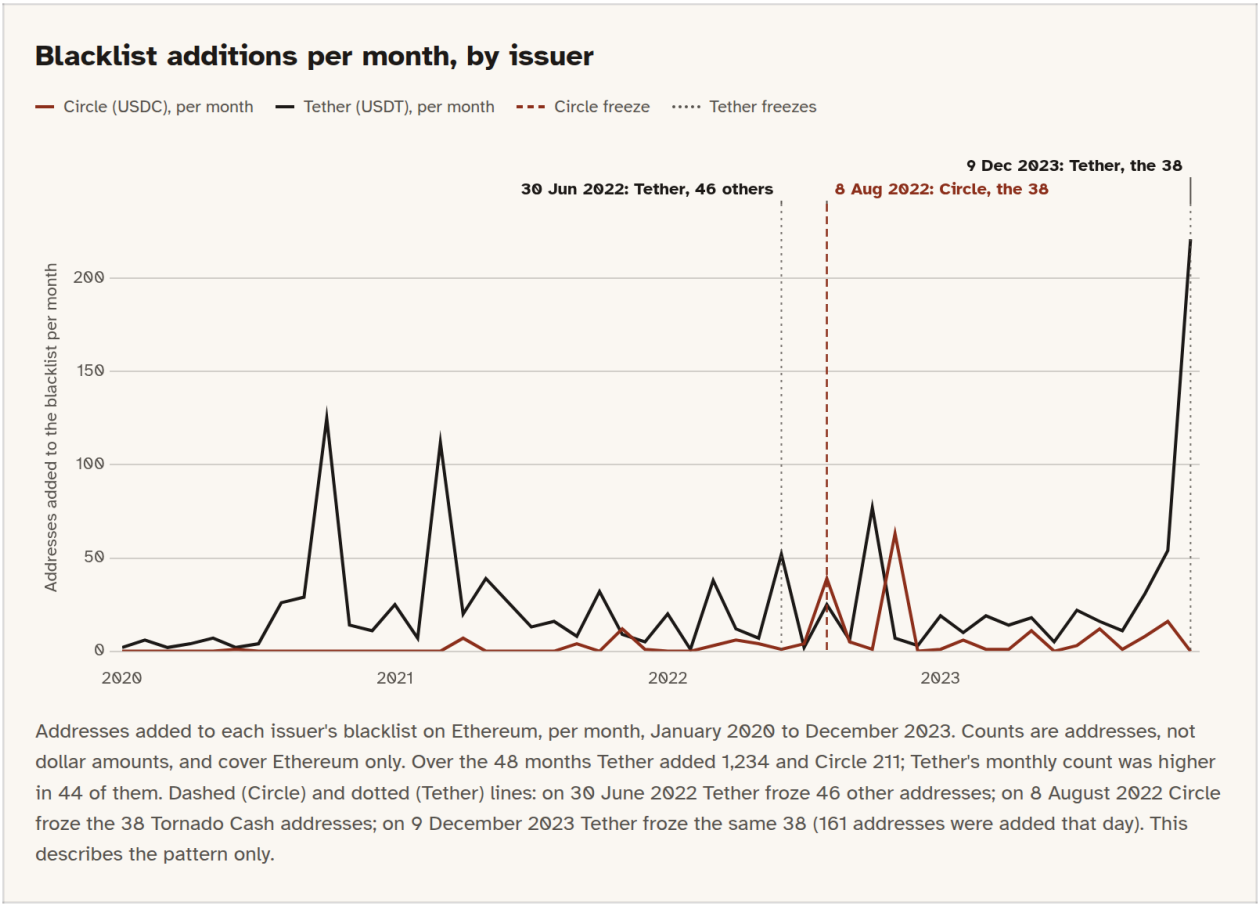



FIG. 2 · LINE CHART OF MONTHLY COUNTS OF ADDRESSES ADDED TO EACH STABLECOIN ISSUER'S BLACKLIST ON ETHEREUM, JANUARY 2020 TO DECEMBER 2023. TETHER'S COUNT IS HIGHER THAN CIRCLE'S IN MOST MONTHS AND PEAKS AT 221 IN DECEMBER 2023, 161 OF THEM ON 9 DECEMBER WHEN TETHER FROZE THE SAME 38 TORNADO CASH ADDRESSES THAT CIRCLE HAD FROZEN ON 8 AUGUST 2022. CIRCLE'S COUNT PEAKS AT 63 IN NOVEMBER 2022 AND WAS 39 IN AUGUST 2022, INCLUDING THE 38 TORNADO CASH ADDRESSES. TETHER ADDED 46 OTHER ADDRESSES ON 30 JUNE 2022. COUNTS ARE ADDRESSES ON ETHEREUM, NOT AMOUNTS; THIS DESCRIBES THE PATTERN ONLY.

Tether did not follow until 9 December 2023, when it froze the same 38 addresses. While both issuers had the ability to freeze, only Circle decided to do so that August.

Past Tornado users were able to see the stark difference between the two issuers almost immediately. This might lead them to believe that their money is safer with one issuer than another. None of the wallets we study was itself frozen, but their holders might fear that their own money could be frozen next.

Similarly, we cannot tell fear of freezes from other influences that might have hit Tornado users in a similar time frame. And we don't know if it was the actions of Circle itself, the sanctions, or something in between, since both came on the same day. Our study window ends on 12 September 2022, long before the later legal changes.[1]

## Our question

Now the question we ask is: did past Tornado users go away from USDC towards USDT? So what we are looking at is the gap. We look at the USDC holdings minus the USDT holdings and divide it by the usual combined holdings.

Here, a quick example. Someone has 700 USDC and 300 USDT: a gap of 0.4. If they converted 50 USDC to USDT, that would be a decrease in the gap of 0.1, to 0.3.

The bar we set before our main estimate ran was 0.10. This number means one tenth of a wallet's usual combined holdings. For the median wallet, about $7,924, that means about $792, as if roughly $396 moved from USDC to USDT. The idea was that we wanted to see a clear decrease of the gap. We decided the bar on 21 September 2026; the full rule was pre-specified, signed and hashed privately on 28 October 2026, before building any 9 August–12 September outcome panel or estimating any main post-event contrast. Supported means both 95 percent intervals—our margins of error, one by wallet, one by matching group (wallets matched together)—lie wholly below −0.10; neither interval without the cap on extreme values may lie wholly above it. An interval containing −0.10 is inconclusive.

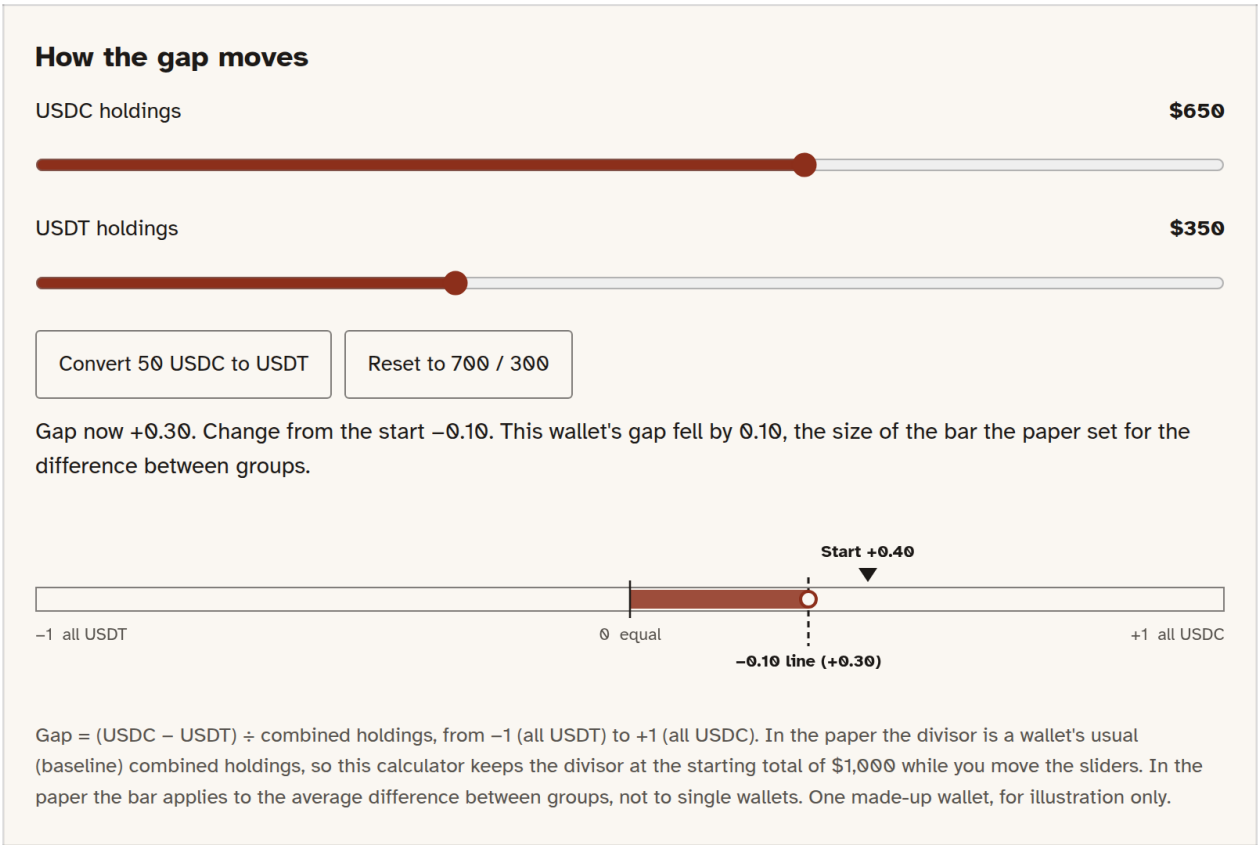



FIG. 3 · BAR ON A SCALE FROM &MINUS;1 TO +1 SHOWING THE GAP BETWEEN USDC AND USDT, AS A SHARE OF COMBINED HOLDINGS. A WALLET THAT STARTS WITH 700 USDC AND 300 USDT HAS A GAP OF +0.40. CONVERTING 50 USDC TO USDT GIVES 650 AND 350, A GAP OF +0.30, A FALL OF 0.10 FROM THE START AND EXACTLY AT THE &MINUS;0.10 LINE. THE SLIDERS AND BUTTONS ABOVE THE BAR CHANGE THE HOLDINGS.

We found 4,487 past Tornado users that met our criteria. We matched them with 11,495 wallets with no Tornado Cash history. All balances come from Ethereum records only; USDC and USDT held on other blockchains are not observed.

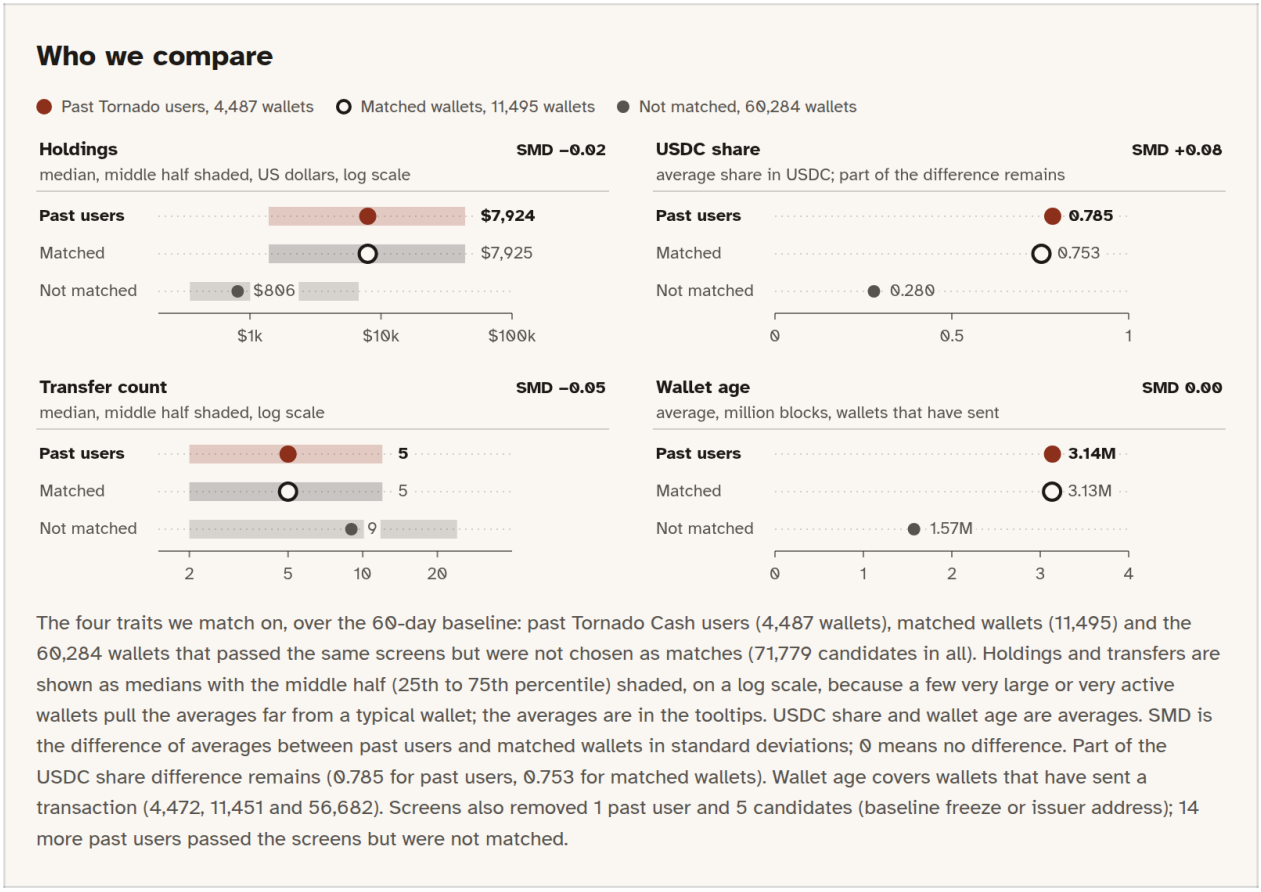



FIG. 4 · DOT PLOT IN FOUR PANELS, ONE FOR EACH TRAIT WE MATCH ON, COMPARING PAST TORNADO CASH USERS (4,487 WALLETS), MATCHED WALLETS (11,495) AND THE POOL OF CANDIDATE WALLETS THAT WERE NOT MATCHED (60,284). HOLDINGS, MEDIAN WITH THE MIDDLE HALF SHADED, LOG SCALE: $7,924 FOR PAST USERS, $7,925 FOR MATCHED WALLETS AND $806 FOR THE POOL (AVERAGES $133,554, $349,520 AND $184,270). USDC SHARE, AVERAGE: 0.785, 0.753 AND 0.280, PART OF THE DIFFERENCE REMAINS. TRANSFER COUNT, MEDIAN, LOG SCALE: 5, 5 AND 9 (AVERAGES 11.5, 81.2 AND 84.6). WALLET AGE, AVERAGE: 3.14, 3.13 AND 1.57 MILLION BLOCKS. THE STANDARDISED MEAN DIFFERENCES BETWEEN PAST USERS AND MATCHED WALLETS ARE &MINUS;0.02, +0.08, &MINUS;0.05 AND 0.00. THIS DESCRIBES THE GROUPS ONLY.

We look at the 60 days before the event and the 35 days after. We use these two groups to filter out the noise of the general crypto market. Just looking at past Tornado Cash users alone would mix in that noise with the actual reaction to the event. The matched wallets we chose saw the same news, so once we take the difference, we remove only its common effect.

And what we would see is, for example, past users having a change of minus 0.2. So again, let's remind ourselves, that's the gap. So if they have a minus 0.2, matched wallets only have a minus 0.05. We would estimate a decrease of the gap of 0.15.

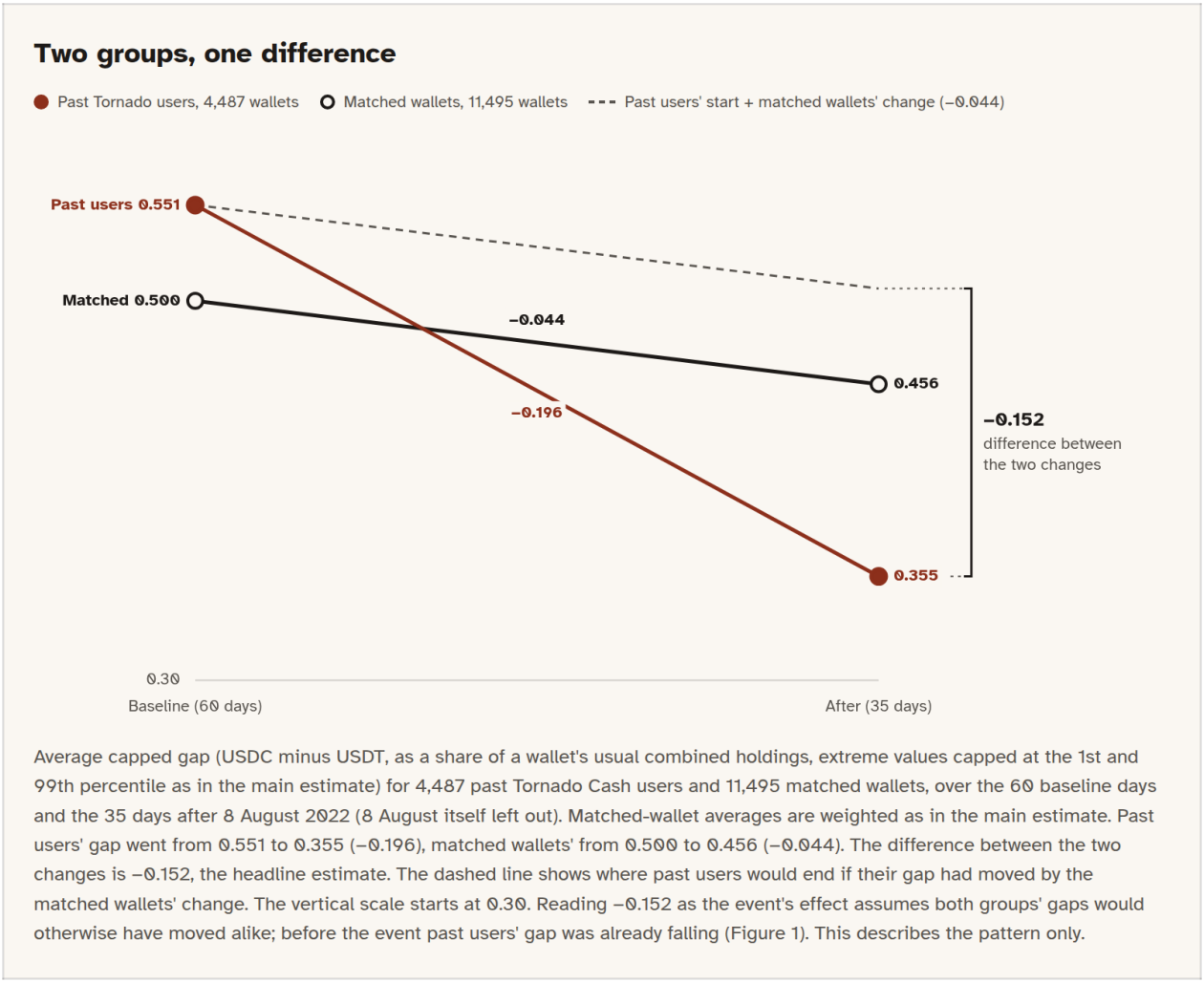



FIG. 5 · SLOPE CHART OF THE AVERAGE CAPPED GAP BETWEEN USDC AND USDT, AS A SHARE OF USUAL COMBINED HOLDINGS, FROM THE 60 BASELINE DAYS TO THE 35 DAYS AFTER 8 AUGUST 2022. PAST TORNADO CASH USERS (4,487 WALLETS) GO FROM 0.551 TO 0.355, A CHANGE OF &MINUS;0.196. MATCHED WALLETS (11,495, WEIGHTED AS IN THE MAIN ESTIMATE) GO FROM 0.500 TO 0.456, A CHANGE OF &MINUS;0.044. THE DIFFERENCE BETWEEN THE TWO CHANGES IS &MINUS;0.152, THE HEADLINE ESTIMATE. A DASHED LINE SHOWS WHERE PAST USERS WOULD END IF THEIR GAP HAD MOVED BY THE MATCHED WALLETS' CHANGE. THIS DESCRIBES THE PATTERN ONLY AND MAKES NO CLAIM ABOUT CAUSE.

The difference, however, cannot rule out trends or shocks affecting only one group, including different reactions to the same news. Then we take changes in the gap rather than its level. If we were to use the levels we might just see their different holdings, but the changes tell us how they behaved compared with their own usual levels. Furthermore, we look at the scaled gap, since the difference in holdings can be between $100 and millions of dollars. Using raw dollar amounts would lead to the larger wallets skewing the results. We cap extreme gap and combined holdings values at baseline wallet-days' 1st and 99th percentiles. We fixed this rule after seeing the capped and uncapped results of a fake-date check on 15–16 October 2026, and before any main post-event contrast was estimated.

For our basic assumptions we say (1) nobody reacted before 8 August, (2) without the event both groups' gaps would have moved alike, (3) we use similar wallets matched in size, USDC share, activity and age. Part of the USDC share difference remains.

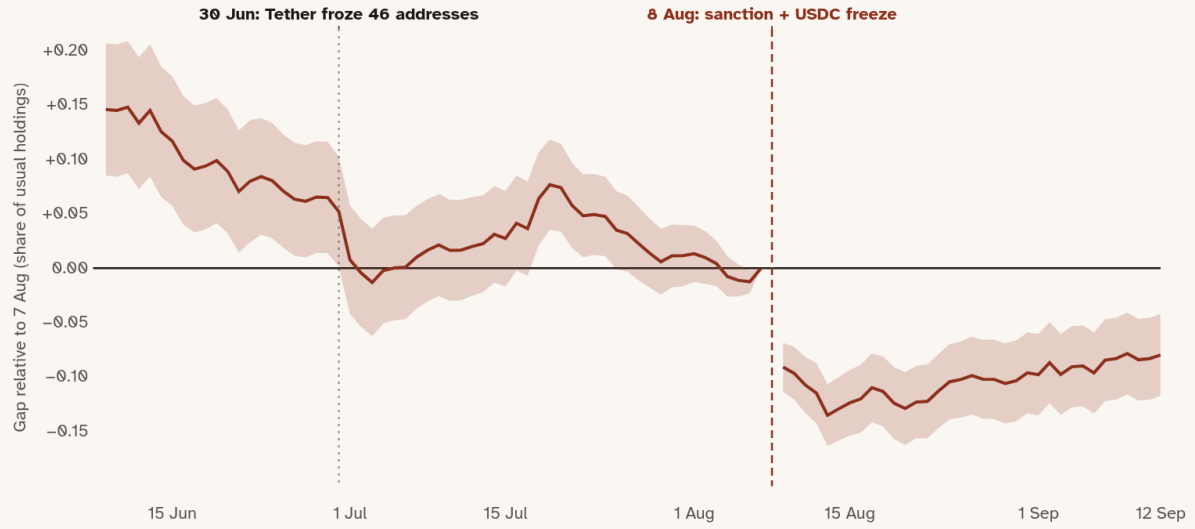
## Already falling, then a sharp drop

And that's a bit of a weakness in our data: the gap was already decreasing before the event. We did find an overall decline from early June. This decline does make our results a bit weaker. Its largest one-day move, 30 June–1 July, followed Tether freezing 46 other addresses. The daily difference (Figure 1) dipped below zero in early July, rebounding to about +0.08 around 19 July. Granted, we see it flatten out near zero from 29 July–7 August.

Furthermore, we can see a sharp drop right after the event. We can see the gap dropped 0.091 relative to matched wallets over 7–9 August. We have run additional checks after calculating the main results. Exploratory comparisons back to March 2022 rank this first among 158 two-day moves capped, 88th uncapped, leaving the earlier fall unresolved.

Figure 1

**The gap was already falling before the event**




Difference in the capped gap (USDC minus USDT, as a share of a wallet's usual combined holdings) between 4,487 past Tornado Cash users and 11,495 matched wallets, each day against 7 August 2022. Band: 95 percent interval, clustered by wallet. The difference started at +0.146 on 9 June, was about zero from 29 July to 7 August, and sat near −0.09 on 9 August. Daily intervals are not adjusted for testing many days.

FIG. 6 · LINE CHART OF THE DAILY DIFFERENCE IN THE CAPPED USDC-MINUS-USDT GAP BETWEEN PAST TORNADO CASH USERS AND MATCHED WALLETS, EACH DAY AGAINST 7 AUGUST 2022: THE DIFFERENCE FALLS FROM ABOUT +0.15 IN EARLY JUNE TO JUST BELOW ZERO IN EARLY JULY, REBOUNDS TO ABOUT +0.08 AROUND 19 JULY, SITS ABOUT ZERO FROM 29 JULY TO 7 AUGUST, DROPS TO ABOUT &MINUS;0.09 ON 9 AUGUST, AND STAYS LOWER AFTER, WITH A 95 PERCENT BAND AROUND IT; THIS DESCRIBES THE PATTERN ONLY AND MAKES NO CLAIM ABOUT CAUSE.

## Supported under our rule

If we look at the average before and the average after, we see a drop of 0.152 relative to matched wallets. This is larger than the 0.10 bar. Our hypothesis is supported despite the earlier fall, since both 95 percent intervals (by wallet and by matching group) lie wholly below −0.10. About a third of the 0.152 comes from the baseline starting high in early June.

None of our safety rules were triggered. An important finding that reduces the impact of our findings is the prior trend. An exploratory test run after the main results rejects parallel pre-trends; “supported” remains the rule’s output.

Having a look at our checks decided before the analysis, we can see the capped ones all hold where estimable. The main-event checks use the same before-period, so their agreement cannot separate the event from the earlier fall.

The only check that disagrees is the version without the cap on extreme values: positive, not significant at 5 percent. But we don’t know how much we can actually attribute to the event.

## Was it the event? Three checks

First, if we start later and compare only with the days right before the event, we have to admit that the results are much weaker. So, we only see a 0.1 decrease, which is right at the rule that we set for ourselves. Across later baselines ending 7 August the fall is 0.098 to 0.129, and every interval contains −0.10, making these checks inconclusive under our rule (Figure 2). We ran these after the main results, along with the 1–7 August check: even assuming the groups would otherwise have moved alike, the post-event mean cannot clear −0.10, and this later check does not change the test set in advance.

Second, we also chose a date beforehand: 9 July. The signed pre-specification fixed its date and pass rule before the main contrast, though some placebo runs preceded signing. And if we use that date, we see almost no drop in the gap, −0.025 in the rebuilt sample, meaning there is a difference between just a random day and the actual date of the event. Its whole interval lies within ±0.10, so it passes; that band also admits this drift, so passing does not establish parallel trends. On the main sample, a run after the main results found a 0.045 fall, significant at 5 percent.

Third, heavier users had a larger decrease in their gap. This pre-specified split counts identified deposits, understating past use: the zero group includes withdrawal-only wallets and unresolved deposits. We also asked the question just to explore; we have no proof yet.

There is a case to be made for a correlation between wallets that used the protocol more and a sharper drop in the gap; the intervals of the low and high groups do not overlap. However, we can also see overlap for neighbouring groups and there has been no formal test of the difference, so it is a pattern but not a proof; additionally, the 109 wallets that deposited USDC itself into Tornado Cash’s later-frozen USDC pools dropped the most, but this small group gives no clear evidence of a difference either. The same before-period leaves the event inseparable from the earlier fall.

So we can say that the timing fits users noticing the sanction, while not being able to say how much of the fall is the event, or where the money went.

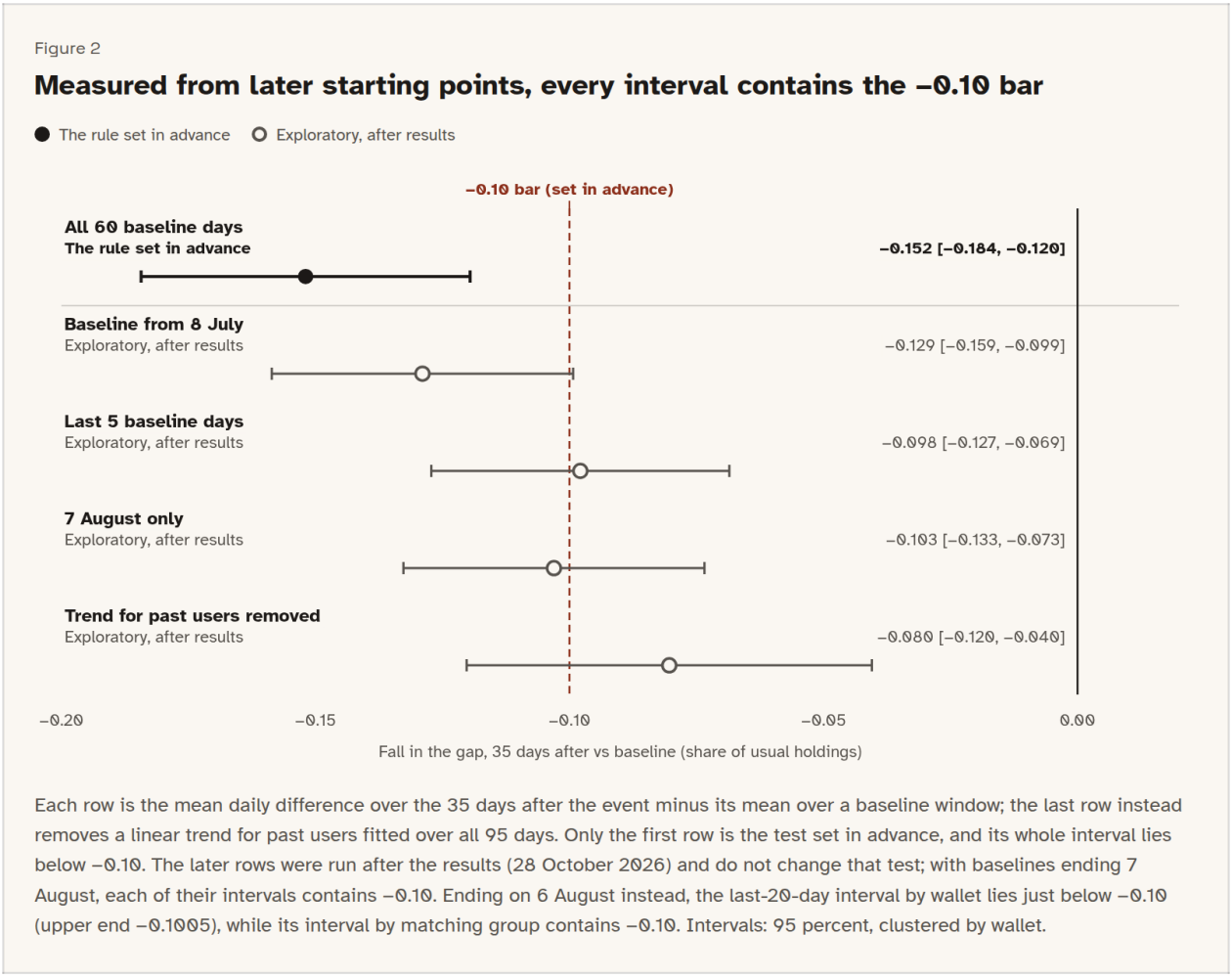



FIG. 7 · HORIZONTAL INTERVAL CHART OF THE FALL IN THE CAPPED USDC-MINUS-USDT GAP, 35 DAYS AFTER THE EVENT VERSUS FIVE BASELINES: THE RULE SET IN ADVANCE (ALL 60 BASELINE DAYS) GIVES &MINUS;0.152 WITH AN INTERVAL WHOLLY BELOW THE &MINUS;0.10 BAR, ALTHOUGH THAT BASELINE STARTS HIGH IN EARLY JUNE, WHICH ACCOUNTS FOR ABOUT A THIRD OF THE 0.152; THREE LATER EXPLORATORY BASELINES GIVE &MINUS;0.129, &MINUS;0.098 AND &MINUS;0.103, AND A LAST EXPLORATORY ROW THAT INSTEAD REMOVES A LINEAR TREND FOR PAST USERS FITTED OVER ALL 95 DAYS GIVES &MINUS;0.080, EACH OF THESE FOUR INTERVALS CONTAINING THE BAR; THIS DESCRIBES THE ESTIMATES AND MAKES NO CLAIM ABOUT CAUSE.

## Where did the money go?

The results don't show us a change from USDC to USDT. We calculated the relative holdings of USDC to USDT, so a decline in the gap doesn't necessarily mean that people used USDT more. In an exploratory check run after the main results, with the cap, USDC fell relative to matched wallets, while USDT alone showed no change (Table 1).

We can see that the combined holdings fell as well, by 0.148 of their usual combined holdings relative to matched wallets. Using our equation from before, this would also add to the decrease in the gap. Since USDC holdings were greater before, if a wallet cut both holdings by the same share, we would actually see a fall in the gap.

It is neither the case that, without the cap, USDC fell, nor that USDT rose, by an amount statistically significant at the 5 percent level. A few wallets ended far above their own baseline; this is why the uncapped USDC, gap and combined estimates are positive. So what we can actually say is that the

gap between the two coins fell compared with similar (matched) wallets, while capped combined holdings also fell relative to them.

This, however, does not prove that consumers switch to a competitor. Did they move to a competitor or rather out of that specific market? And this is a limit of our method: we can only see what happens on the blockchain itself. One address is not one person, and exchange addresses can hold money for many people.

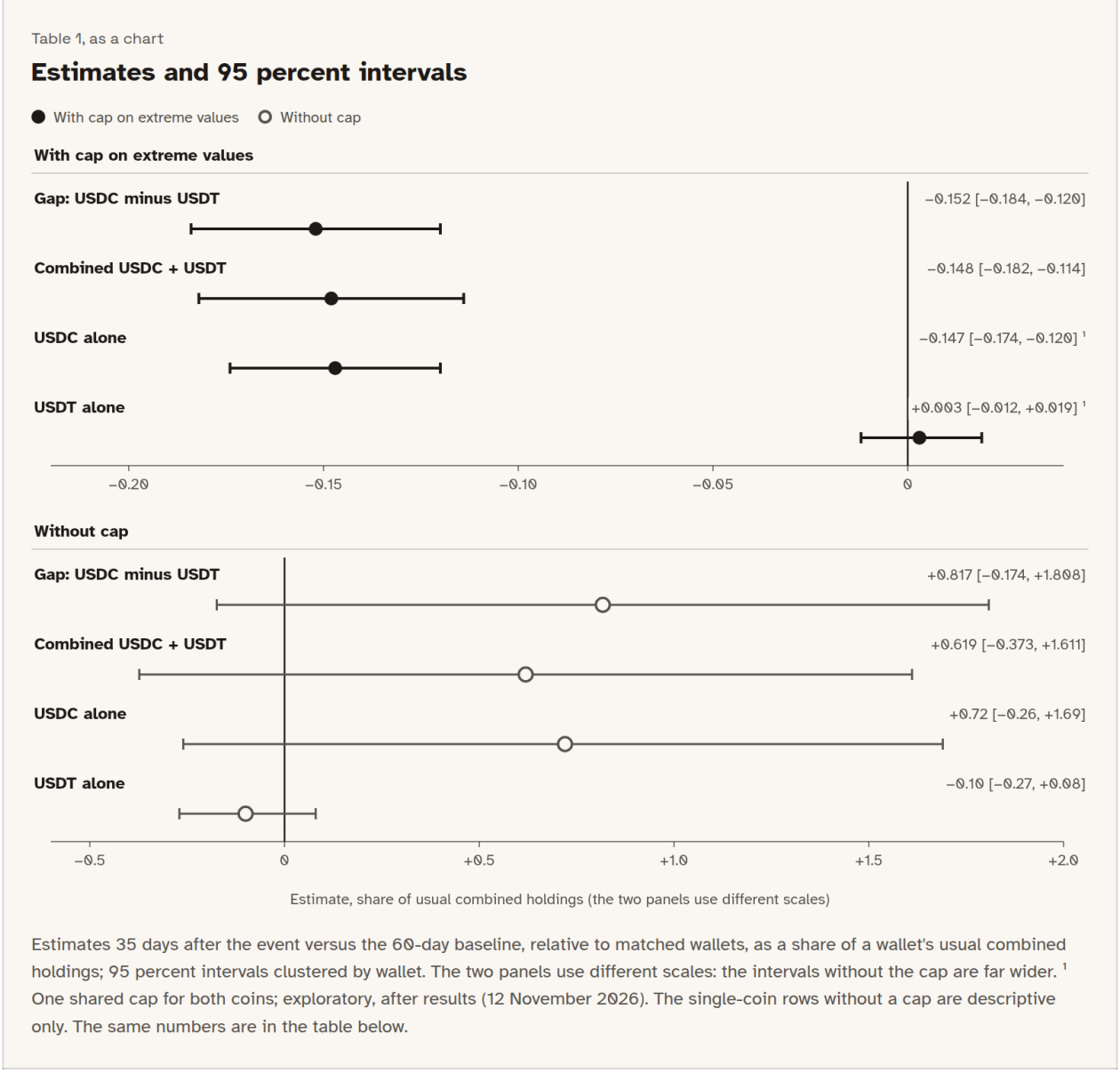



FIG. 8 · INTERVAL CHART OF TABLE 1 IN TWO PANELS WITH DIFFERENT SCALES. WITH THE CAP ON EXTREME VALUES: THE GAP BETWEEN USDC AND USDT, &MINUS;0.152 WITH INTERVAL &MINUS;0.184 TO &MINUS;0.120; COMBINED USDC AND USDT, &MINUS;0.148 (&MINUS;0.182 TO &MINUS;0.114); USDC ALONE, &MINUS;0.147 (&MINUS;0.174 TO &MINUS;0.120); USDT ALONE, +0.003 (&MINUS;0.012 TO +0.019). WITHOUT THE CAP: GAP +0.817 (&MINUS;0.174 TO +1.808); COMBINED +0.619 (&MINUS;0.373 TO +1.611); USDC ALONE +0.72 (&MINUS;0.26 TO +1.69); USDT ALONE &MINUS;0.10 (&MINUS;0.27 TO +0.08). THIS DESCRIBES THE ESTIMATES AND MAKES NO CLAIM ABOUT WHERE THE MONEY WENT.

**Table 1.** Share of a wallet's usual combined holdings; 95 percent intervals clustered by wallet (for the capped gap, clustered by matching stratum: [−0.188, −0.116]). The 60-day baseline starts high in

early June, which accounts for about a third of the −0.152; how much of the decline the event accounts for stays open. [1] One shared cap for both coins; exploratory, after results (12 November 2026). The single-coin rows without a cap are descriptive only.

35 days after the event vs the 60-day baseline, relative to matched wallets

Table 1

**Capped and uncapped estimates**

35 days after the event vs the 60-day baseline, relative to matched wallets

| OUTCOME | WITH CAP ON EXTREME VALUES | WITHOUT CAP |
|---|---|---|
| **Gap: USDC minus USDT** | **−0.152** [−0.184, −0.120] | **+0.817** [−0.174, +1.808] |
| **Combined USDC + USDT** | **−0.148** [−0.182, −0.114] | **+0.619** [−0.373, +1.611] |
| **USDC alone** | **−0.147** [−0.174, −0.120] [1] | **+0.72** [−0.26, +1.69] |
| **USDT alone** | **+0.003** [−0.012, +0.019] [1] | **−0.10** [−0.27, +0.08] |

Share of a wallet's usual combined holdings; 95 percent intervals clustered by wallet. [1] One shared cap for both coins; exploratory, after results (12 November 2026). The single-coin rows without a cap are descriptive only.

TABLE 1

## What we can say, and what we can't

So, to sum up: our rule says supported, although the gap was already decreasing before the event. We see a very sharp two-day drop at the event with the cap—an exploratory result that does not stand out without the cap—and capped combined holdings shrank relative to matched wallets.

However, we cannot say how much of it is the event itself. We don't know where the money went, or if people converted USDC to USDT at all. And we don't know if it was Circle or the sanction.

There are a number of ways the sanctions might have hit Tornado users in addition to the freezes: exchanges screening Tornado-linked deposits, fear of being named, to name a few. Any of these could make them pull money out without it being about Circle's freezes. It is possible that regulation of this kind might increase overall fear in the market and lead to people moving money to less regulated markets, which can mean leaving stablecoins behind altogether. But the matched wallets faced the same market, so these explanations account for the relative fall only if

Tornado Cash users reacted more strongly than matched wallets.

While stablecoins are not actually independent currencies with independent valuations, since they are tokenized claims on US dollars, they still offer a valuable case study for what happens if one issuer restricts its users more than another.

An important question to ask is how well informed these consumers are. Since the barrier to entry in these spaces is quite high in terms of technological know-how, one might assume that the overall information level both in terms of regulations and ongoing development might be higher than that of an average person. So to use this case study as a proxy for a free currency market could be misleading, since we can't assume the average consumer keeps up with regulations and differences in issuers on a daily basis.

But what we do know is that there was an option for people to leave for another issuer, which would not be the case if there were only a single issuer, as we see with traditional money in our central banking system. For free banking, our reading is that these results are consistent with holders who can leave responding to the joint sanction-and-freeze event.

In future research we can dive deeper into these open questions, mainly breaking down the outflows, a task we deferred, verifying exchange and lending labels, and possibly seeing how we can test to understand how less tech-savvy consumers would react to an issuer behaving in undesirable ways.

This could give us further insight into how consumers react to an issuer's actions. The question that comes up in such a situation is: how did people react and where did their money go?

**Links**

- Full paper (working version, 17 November 2026): PDF
- Code: https://github.com/nik110403/tornado-usdc (15 Oct construction code, replication release pending)

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1. The legal status of Tornado Cash changed after the study window, which ends on 12 September 2022. On 26 November 2024 the Fifth Circuit held that Tornado Cash's immutable smart contracts are not the property of a foreign national or entity under the International Emergency Economic Powers Act, so OFAC exceeded its authority in blocking them. On 21 March 2025 the Treasury removed the sanctions against Tornado Cash at its discretion.

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Retrieved November 15, 2026 · © Nik Khosravipour. This document is the web essay rendered for print; figures and data as published.

*Ceterum censeo argentarias centrales esse delendas.*
Furthermore, I am of the opinion that central banks must be abolished.