Another coin bites the dust

Sergi Delgado Segura

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Another coin bites the dust: An analysis of dust in UTXO based cryptocurrencies
https://eprint.iacr.org/2018/513.pdf

sr_gi

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- Who decides the transaction inclusion order? **Miners**

Bitcoin fees 102

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- The block size is limited, so the “better” the fee, the higher the chance of inclusion

- Does better means higher? **Not always**

Calculating for the fees

- Two factors define the fee of a transaction:

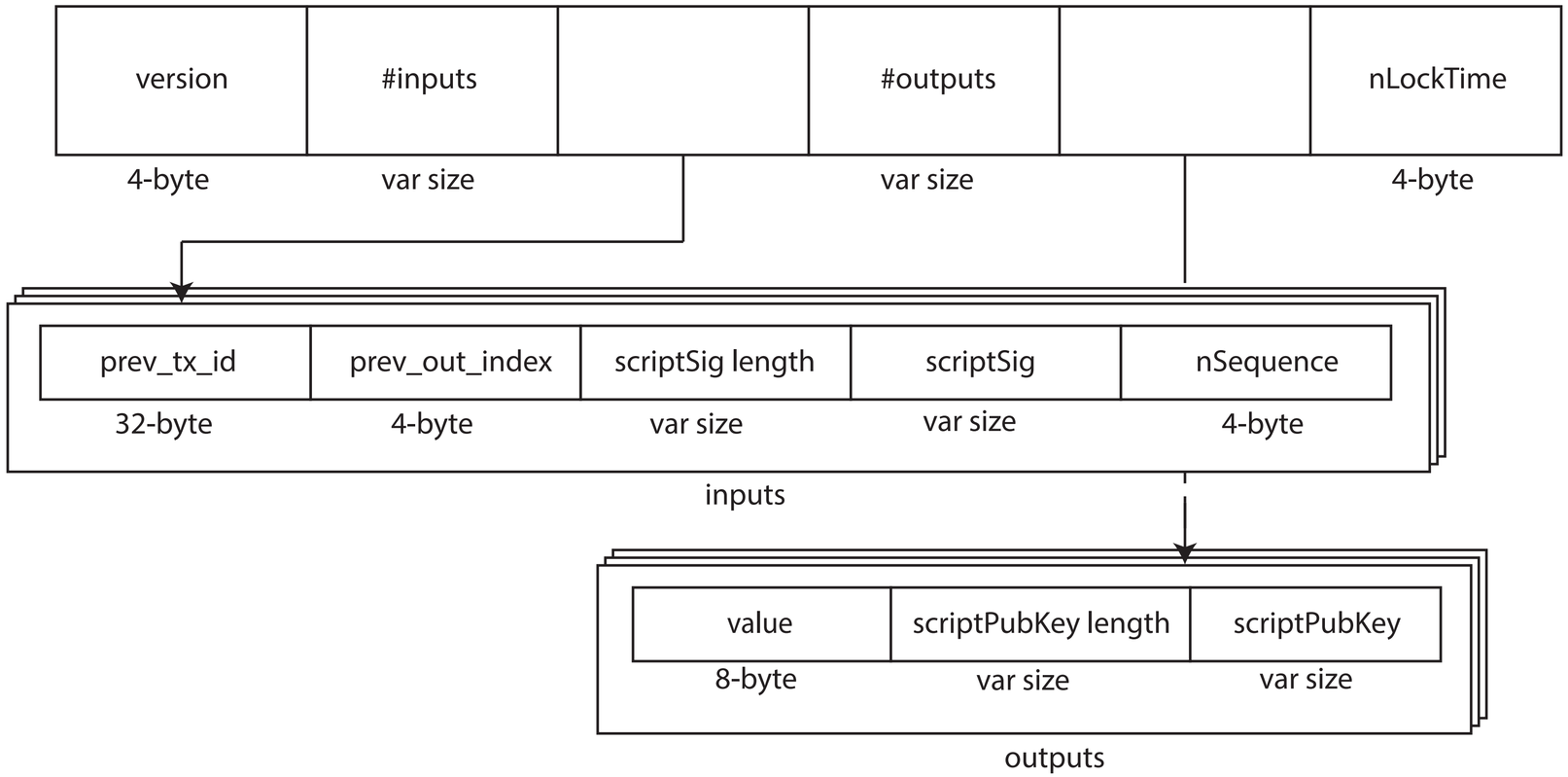
Calculating for the fees

- Two factors define the fee of a transaction:
  - Transaction size

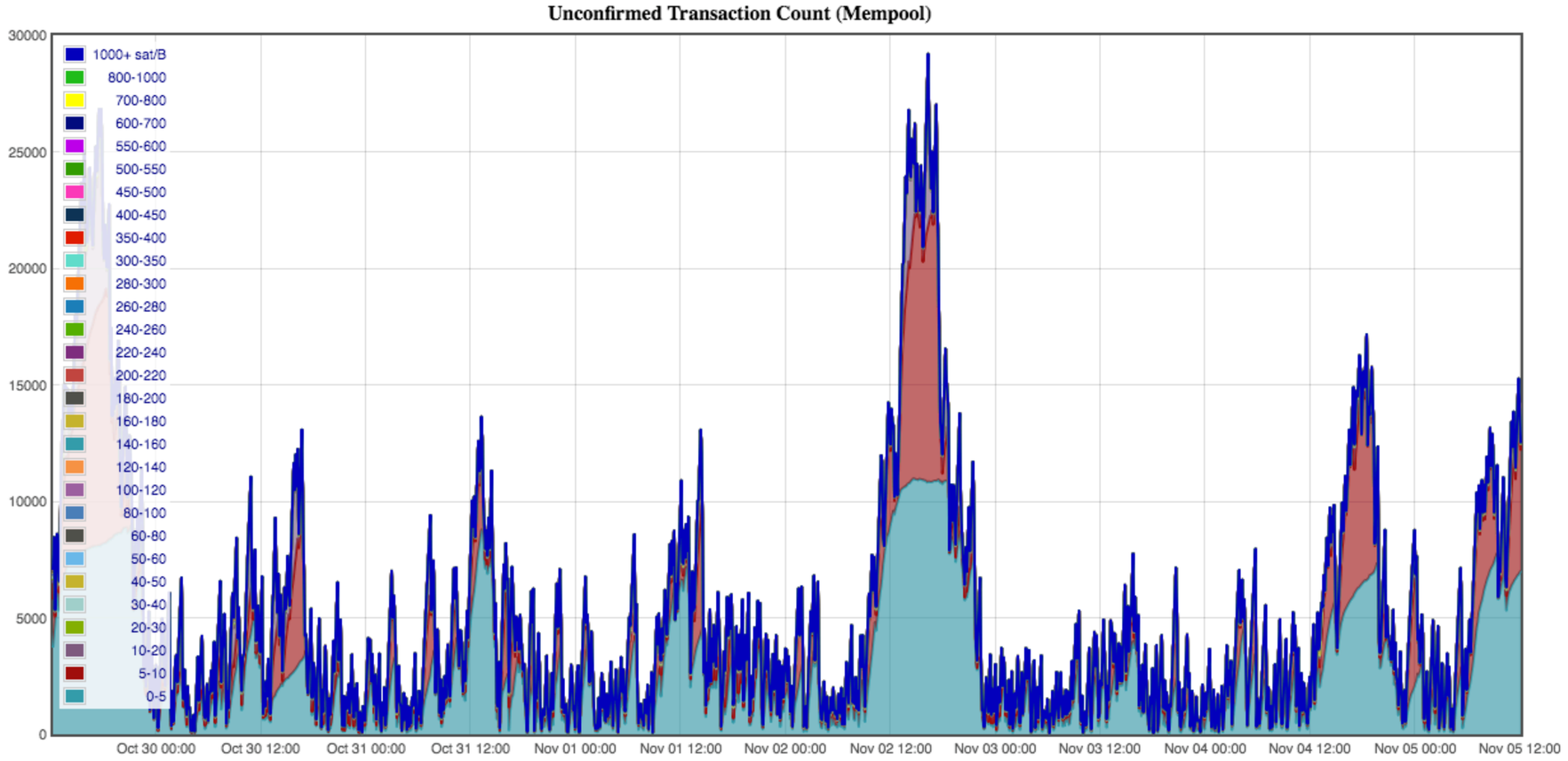
Calculating for the fees

- Two factors define the fee of a transaction:
  - Transaction size
  - Fee rate

Transaction size



Fee rate



Source: https://core.jochen-hoenicke.de

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- The definition is coined by the Bitcoin Core
- Dust is computed in terms of outputs, instead of transactions
- An output is said to be dust **if the value it is holding is lower than the fees required to spend it**
- Dust depends, therefore, in the state of the network

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Relay rules $\neq$ **Consensus rules**

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The usual suspect

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Really low value outputs

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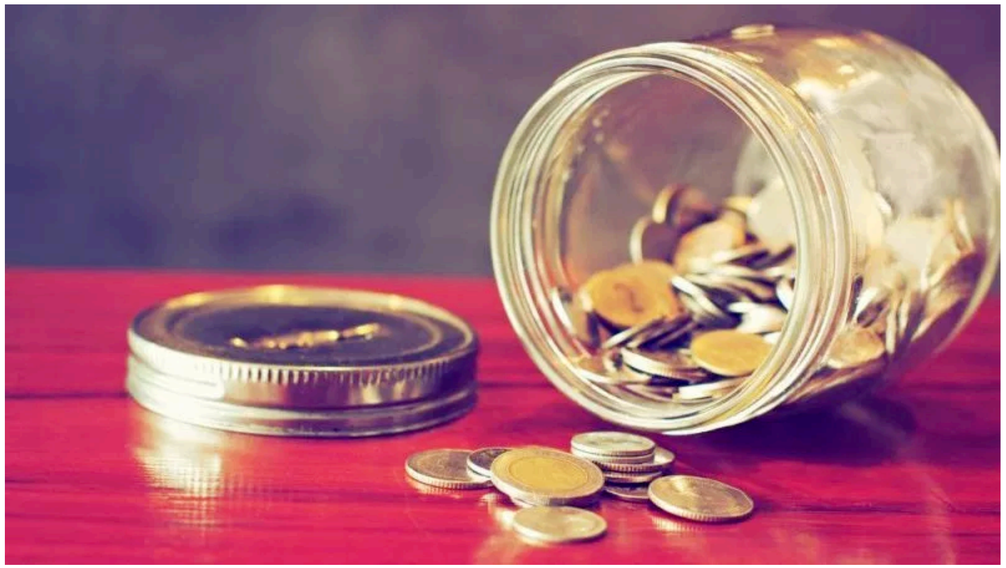

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The UTXO set

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- In general, **the larger the output script, the bigger the UTXO size**

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- We will see more about it during the working groups

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The question(s)

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- How much space is every full node devoting to store uneconomical outputs?

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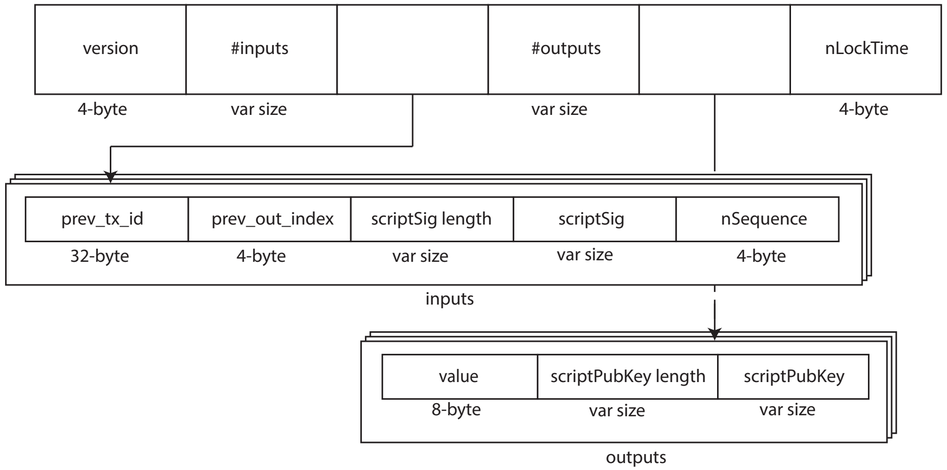

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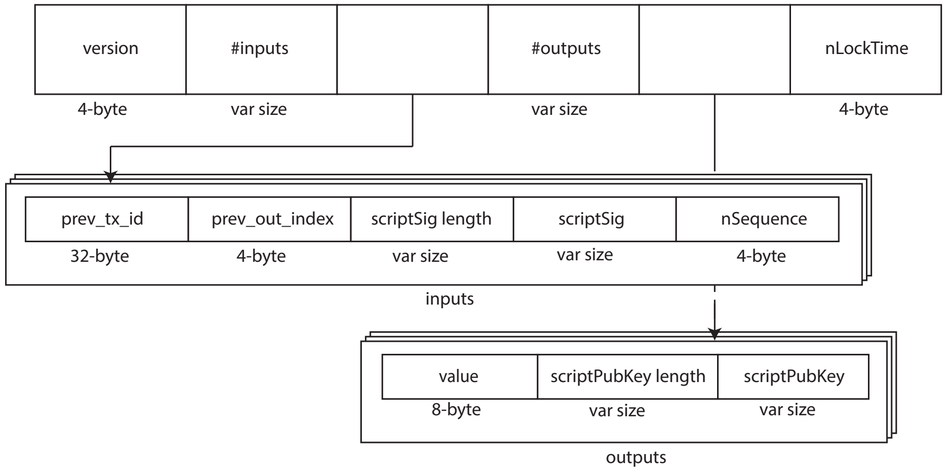

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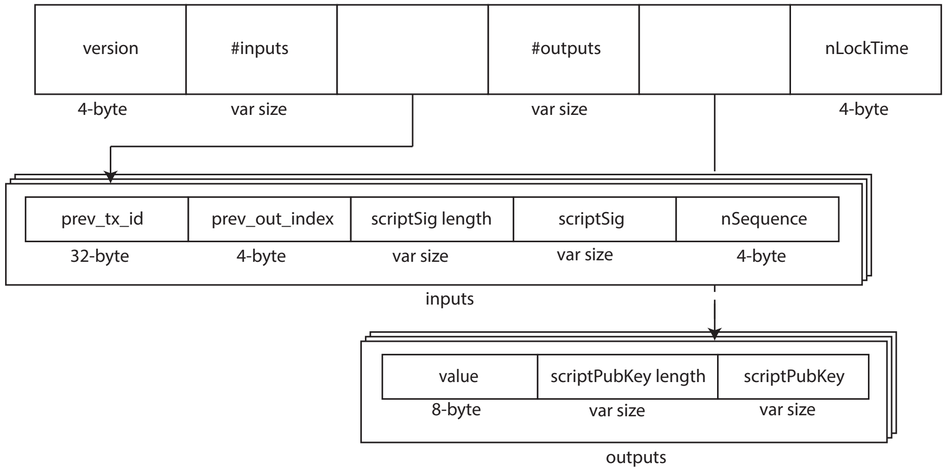

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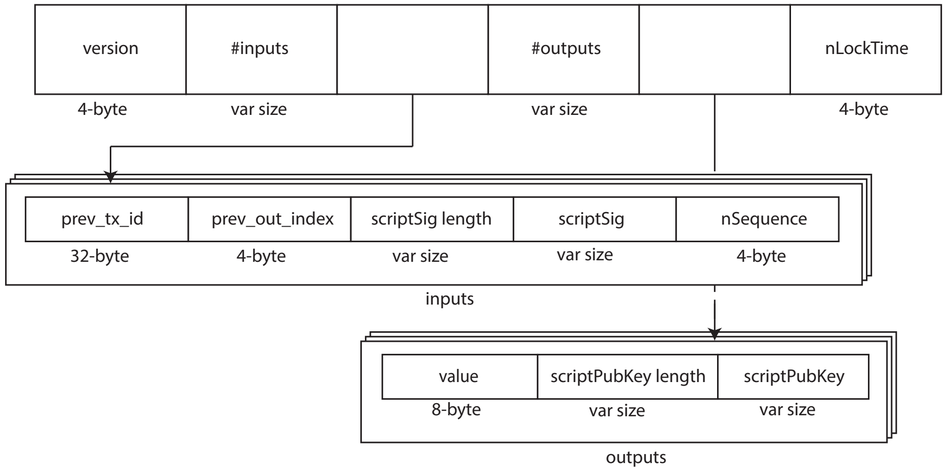

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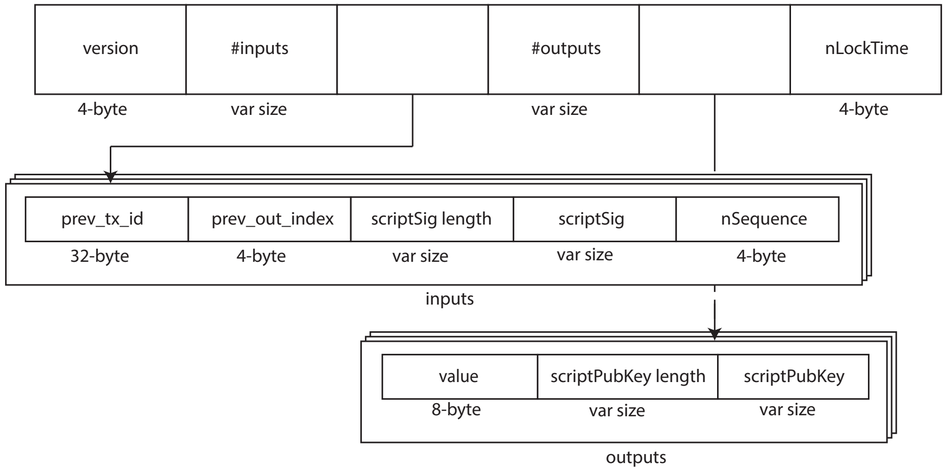

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Witness scripts discounted α = 1/4

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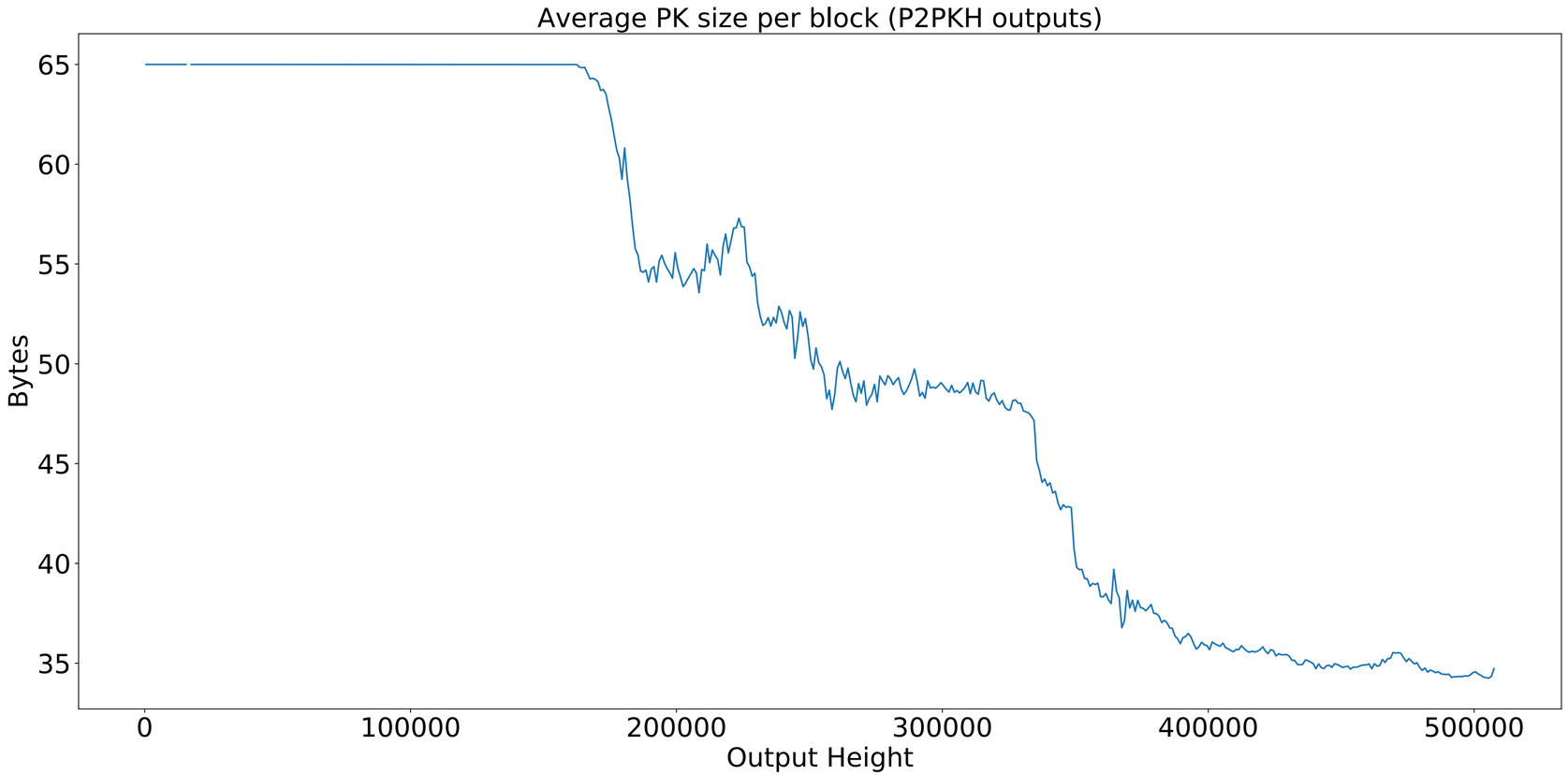
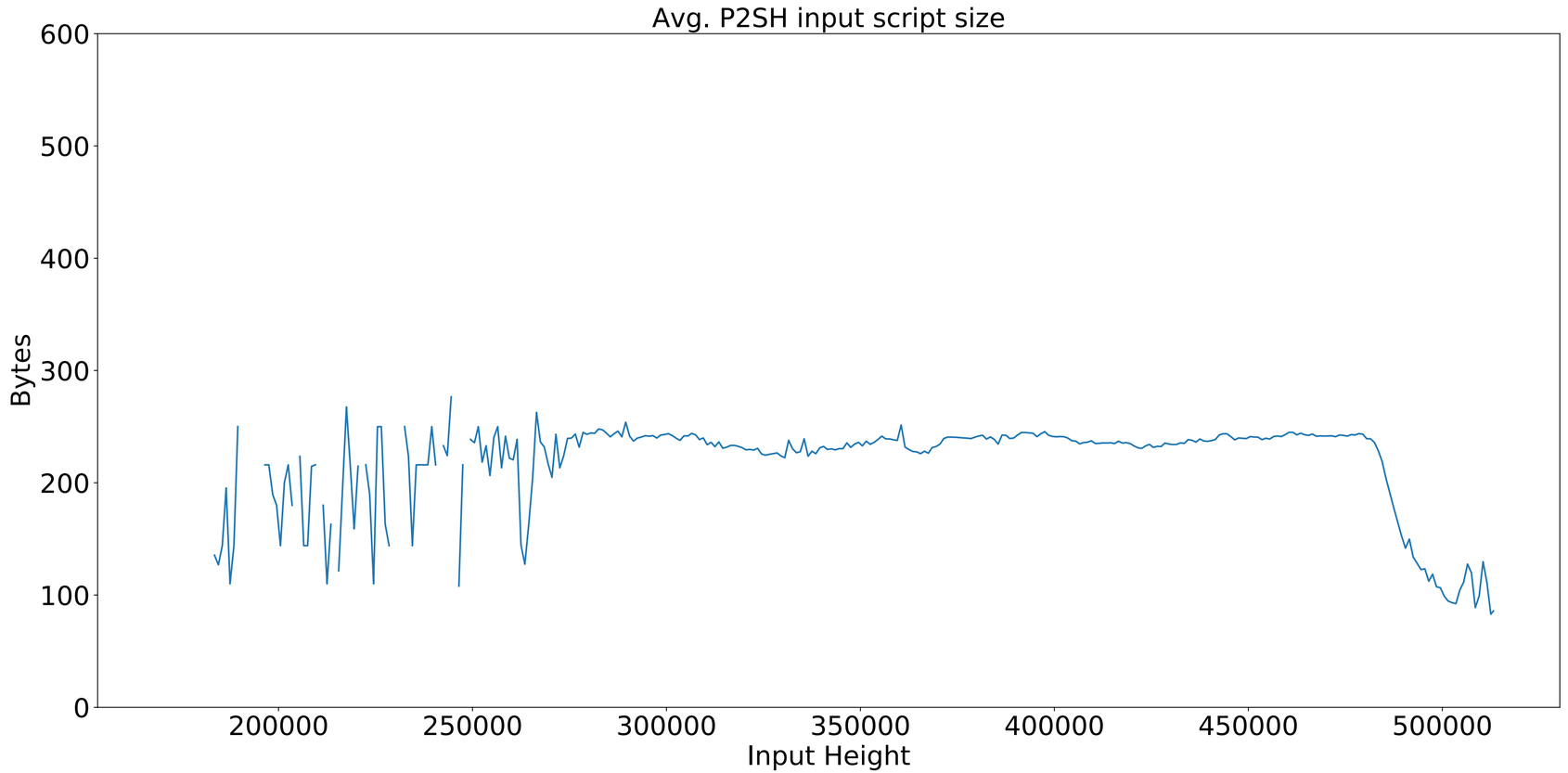
  - Uses BlockSci (public key sizes and redeem scripts sizes)

BlockSci data (PKs)



BlockSci data (redeem scripts)



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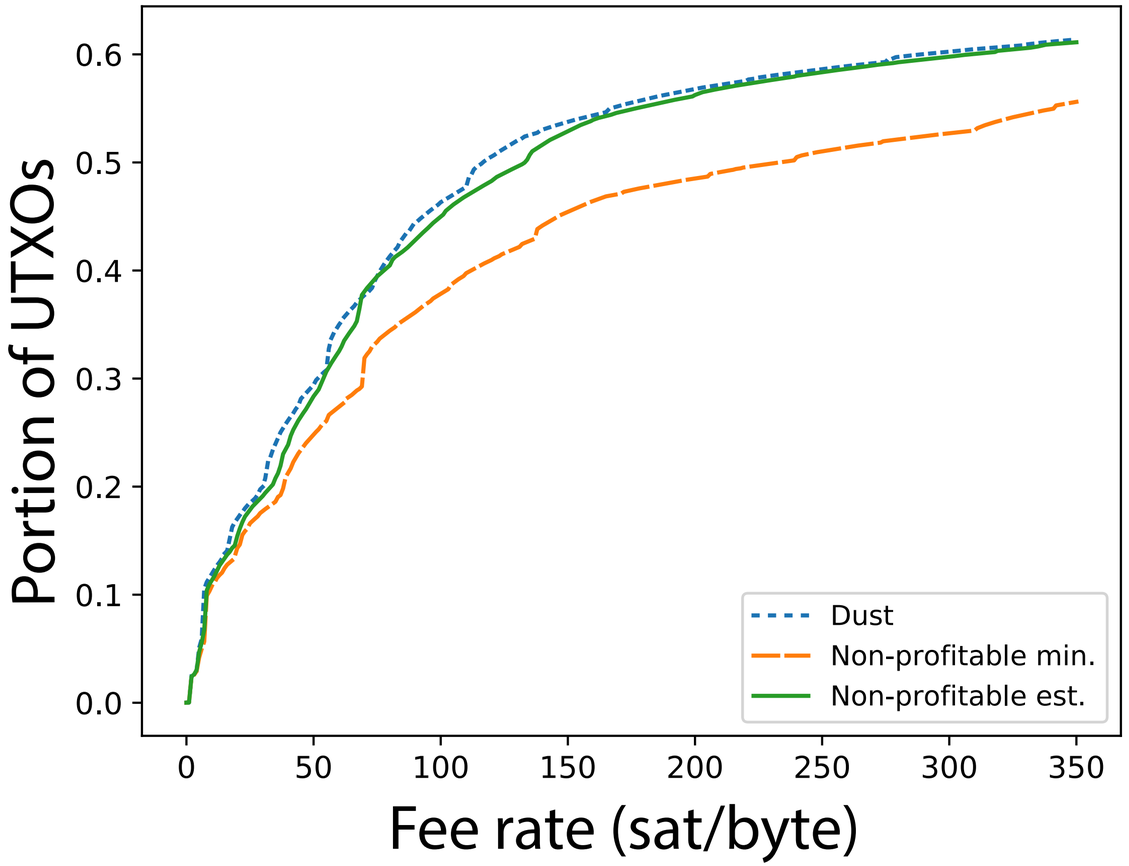

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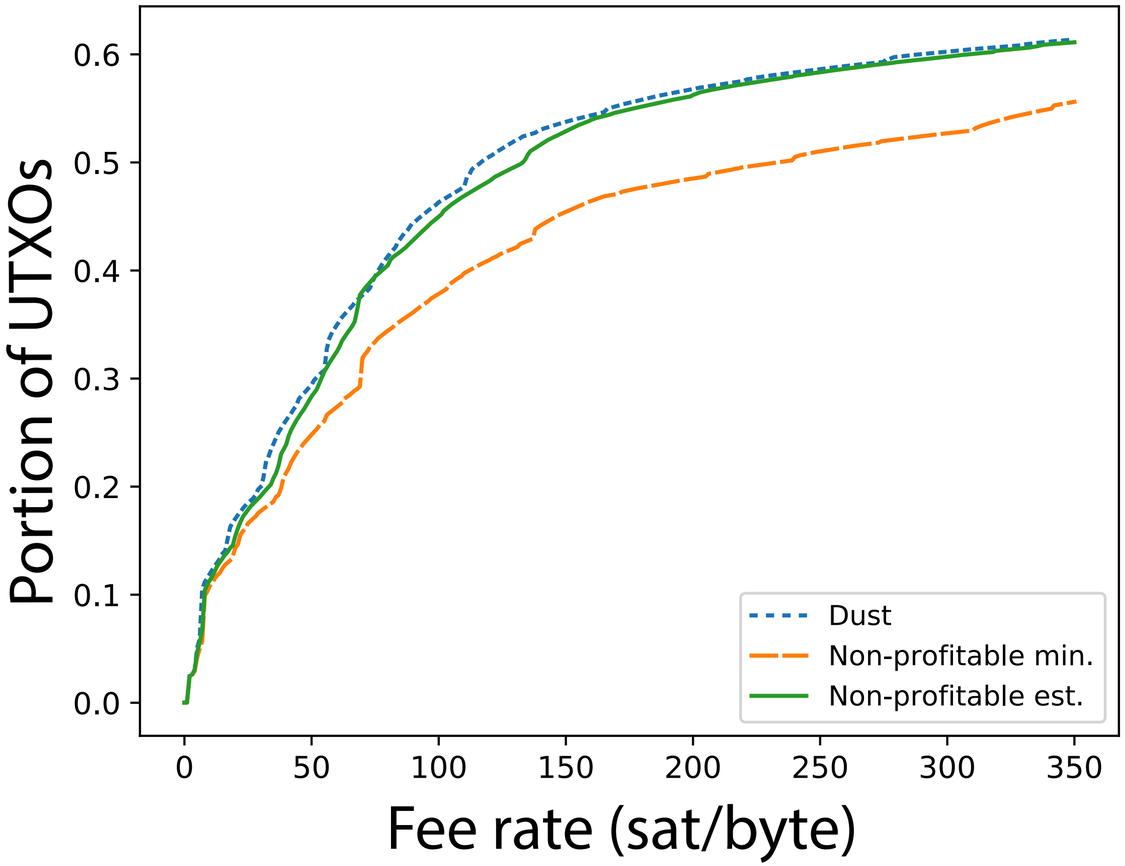

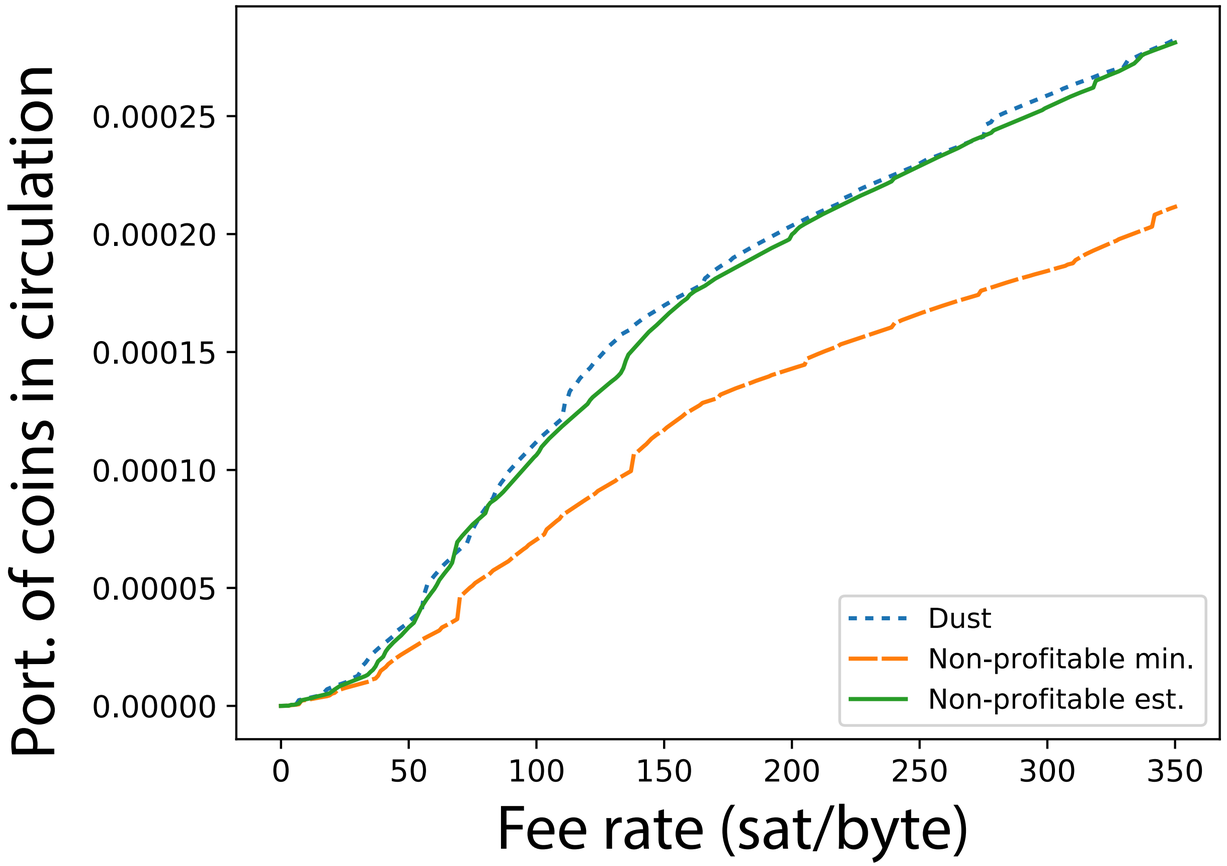

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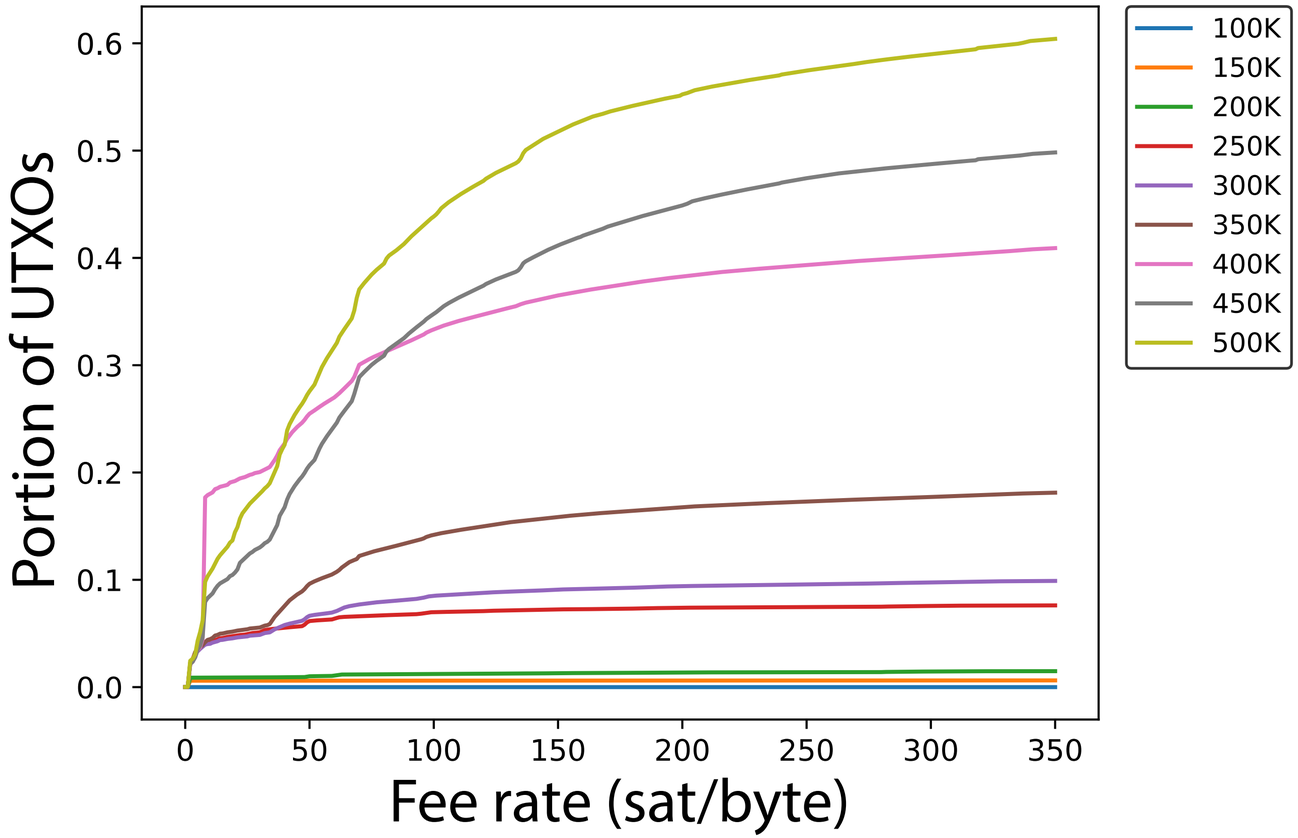

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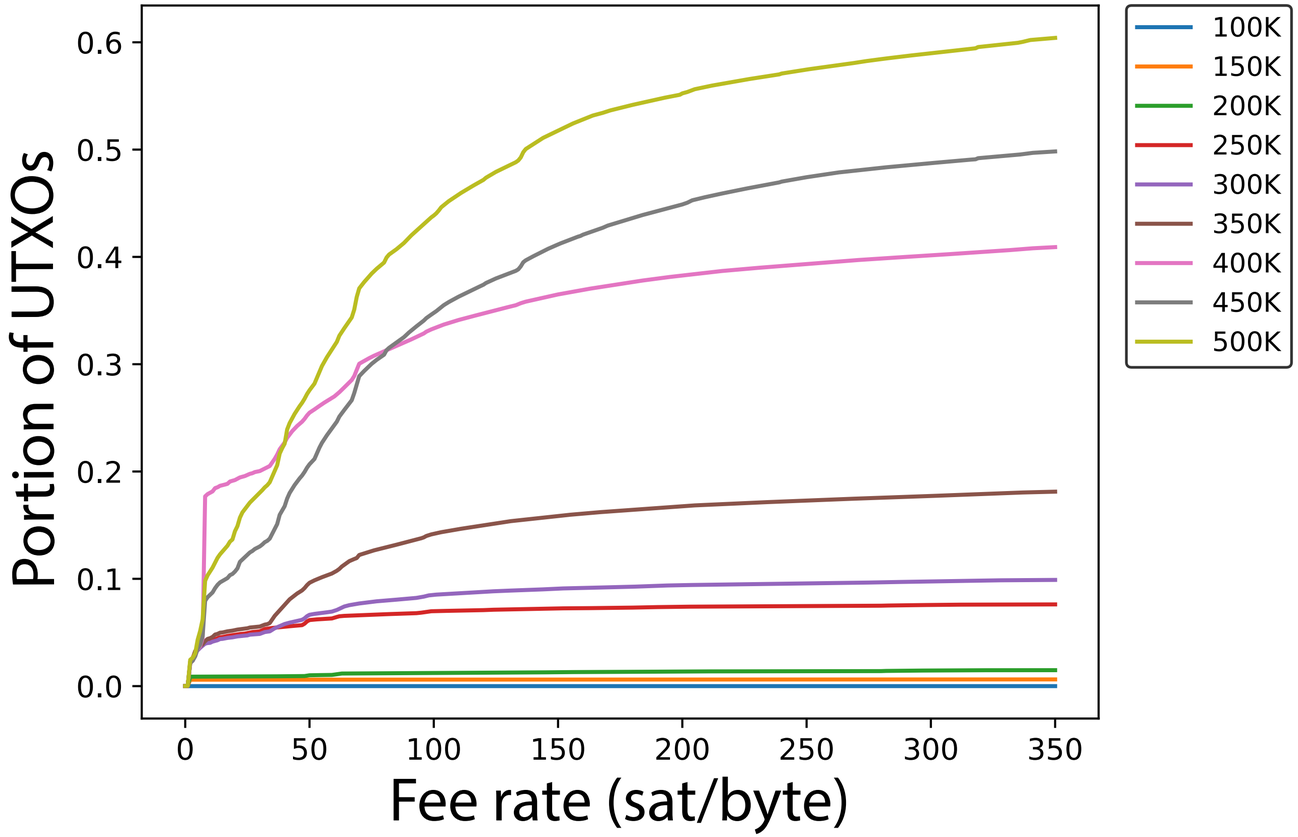

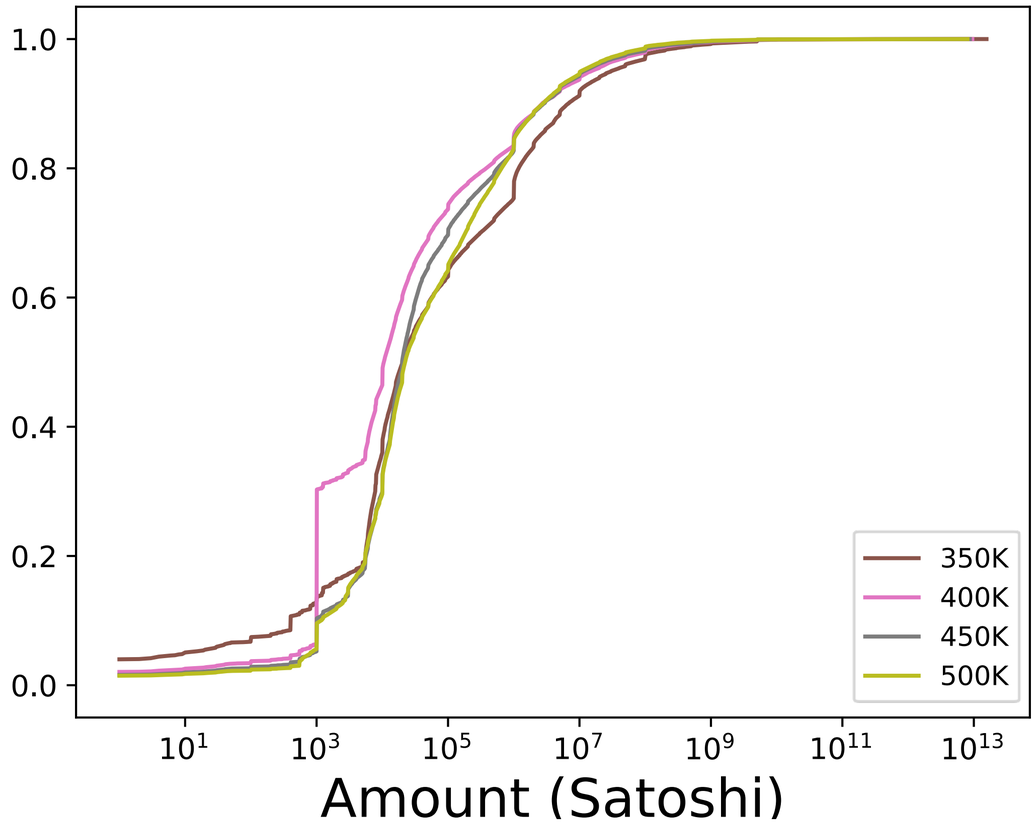

Results - Litecoin (extreme case)

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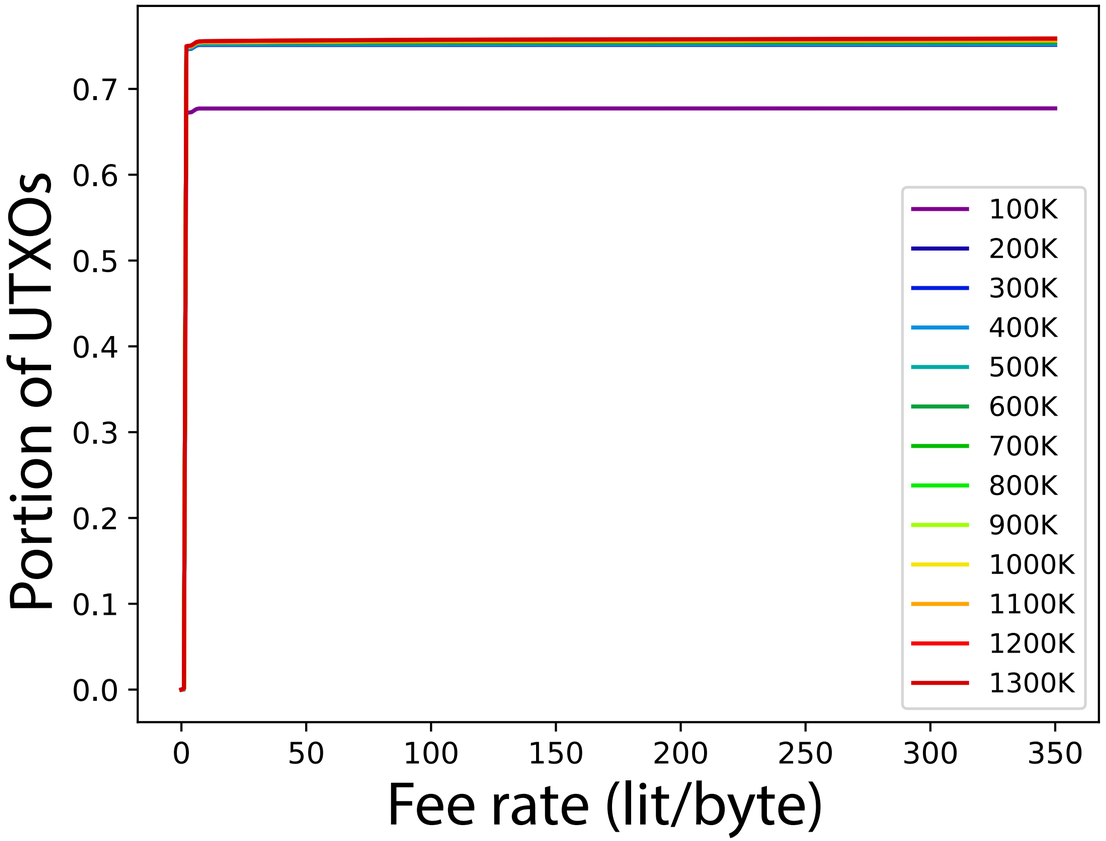

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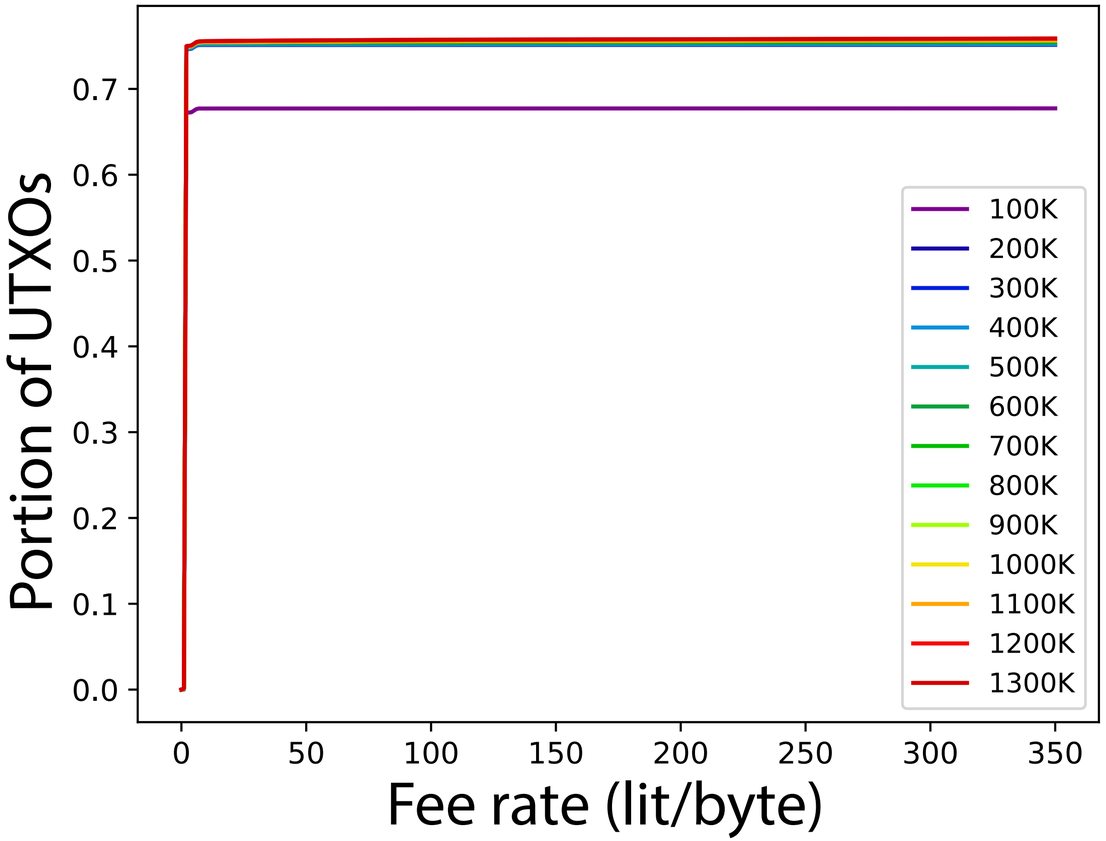

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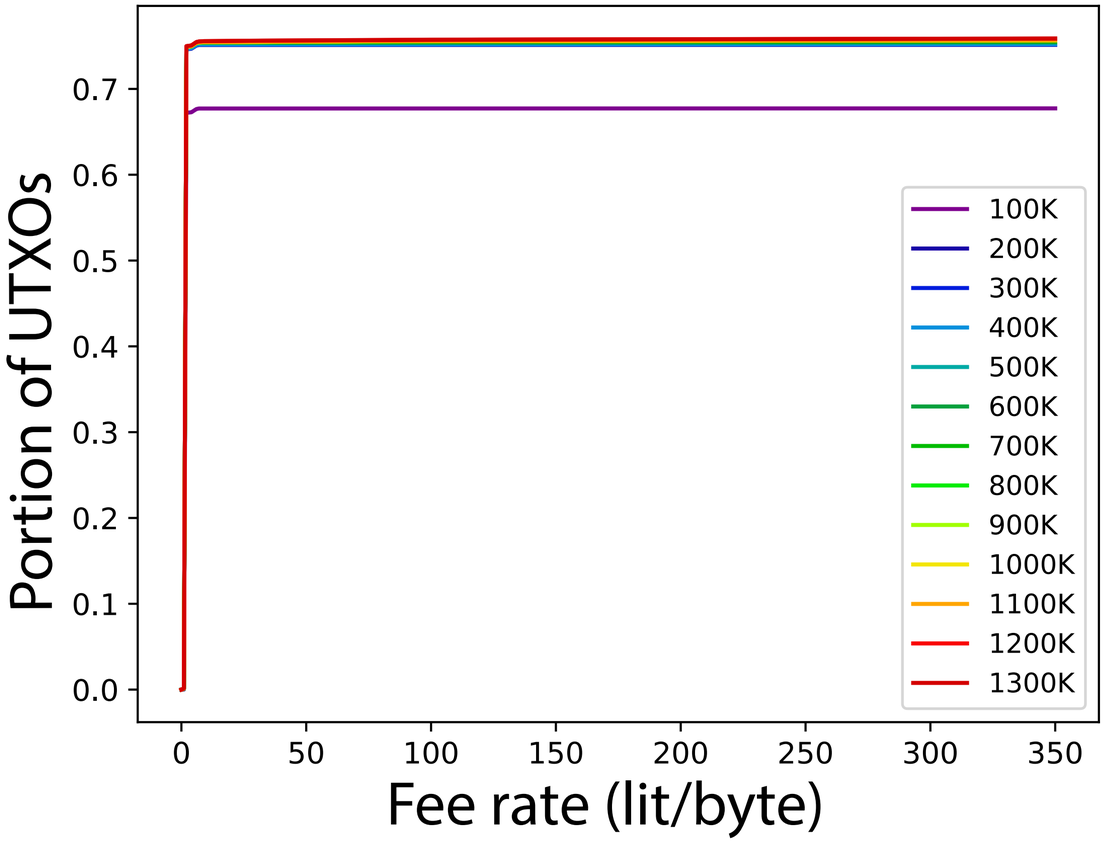

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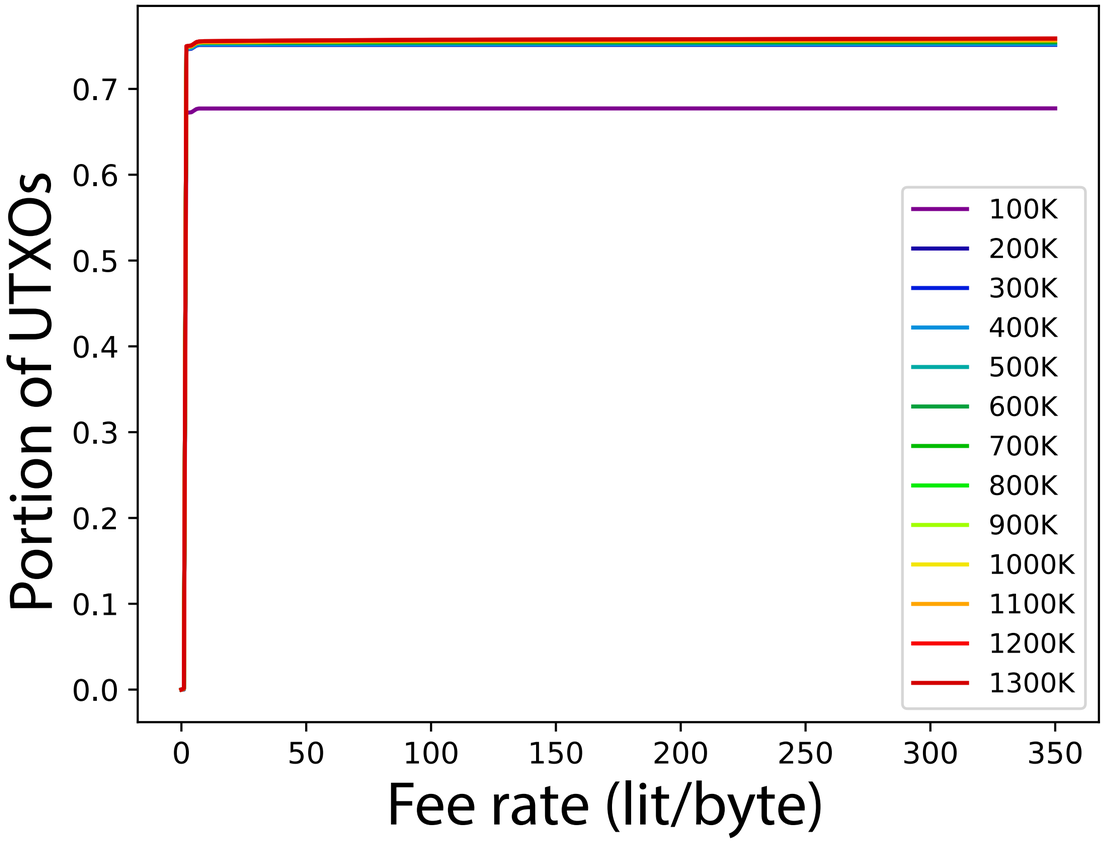

- 70%+ UTXOs are dust for $\approx 1\ lit/byte$
- 50% are worth exactly 1 litoshi
- Spam attack 2011/2012

Not your keys, not your coins

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Posted by u/coblee **Litecoin Founder** 25 days ago

What should we do about the 50+% of Litecoin's UTXO which are 1 litoshi?

Recently, Sergi Delgado Segura and Jameson Lopp has brought this an issue to the forefront: https://twitter.com/lopp/status/1048380552691310592 The issue is that more than 50% of Litecoin's UTXO set is unspendable because they are only 1 litoshi (0.00000001 LTC) each.

Background

In late 2011 through April 2012, Litecoin was attacked with various forms of spam/dust attacks that bloated the blockchain and unspent transaction output (UTXO) set. For some context, you can read up more about what happened and how we handled it: https://bitcointalk.org/index.php?topic=47417.msg626303#msg626303

Bottom line is that the attacker was able to create a lot of dust transactions for little to no cost. Here's an example transaction: https://blockchair.com/litecoin/transaction/c3ed2cea60de33cb59c8ea6f053930e9c06cd7b4805e70ef60173c07dc2e00b9

In total there are 12,272,034 1-litoshi outputs that were created before 4/1/2012. (https://blockchair.com/litecoin/outputs?q=is_spent(false),value(1),time(..2012-04-01)#)

This is out of about 23,538,000 UTXOs in total today. So about 52% of the whole UTXO set is 1-litoshi spam. Total value of all these outpus is 0.12272014 LTC, which is about $7 today.

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- A fairly big percentage of the UTXO set is by dust
- The current implementation of the UTXO set can grow unbounded
- The bigger the set, the less suitable running a full node in optimal conditions
- Spam attacks can be performed to make the set grow

Solutions

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- May be more

What can YOU do?

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- Output consolidation when fees are low

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- Good coin selection algorithm (specially for exchanges)

Another coin bites the dust

Sergi Delgado Segura

Cristina Pérez-Solà, **Sergi Delgado-Segura**, Guillermo Navarro-Arribas, Jordi Herrera-Joancomartí
Another coin bites the dust: An analysis of dust in UTXO based cryptocurrencies
https://eprint.iacr.org/2018/513.pdf

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