How Global Is The Cryptocurrency Market?

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Abstract

Despite the size and global reach of crypto-markets we dont know how much individual countries have invested in cryptos (market exposure), what share of the market individual countries account for (market power), or how those two measures are related. Movements originating in high market power countries will impact high exposure countries, representing a new channel for financial contagion. This paper constructs multiple estimates of exposure and power, using purchases by state-issued currencies and including adjustments to account for the purchase of cryptocurrencies by other cryptocurrencies. All measures find that the market is highly concentrated in just three currencies—the US dollar, the South Korean Won, and the Japanese Yen account for over 90% of all crypto transactions. Market exposure and market power cannot be explained by economic size, income, financial openness, domestic stock market size, or internet access. This analysis also reveals that a country's Bitcoin market share is not representative of a country's crypto-market share: a warning for regulators or researchers focused exclusively on Bitcoin markets.

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1. Introduction

> *The FSB's initial assessment is that crypto-assets do not pose risks to **global financial stability** at this time. This is in part because they are small relative to the financial system. Even at their recent peak, their combined global market value was less than 1% of **global GDP**. In comparison, just prior to the global financial crisis, the notational value of credit default swaps was 100% of global GDP.*

> —Excerpt from Financial Stability Board (FSB) Chair's Letter to to G20
> March 13, 2018. Emphasis added.

The crypto-market—comprised of cryptocurrencies, cryptotokens, and cryptoassets—is a completely digital, online market that has the potential to financially connect economies around the world: If you have access to the internet, you have access to the crypto-market. Relative to the global financial market however, the crypto-market is small: measured in the Billions, instead of Trillions. This has led to an assessment, encapsulated in the FSB statement provided above, that the crypto-market does not pose risk to global financial stability. Consequently, this requires countries to engage in country-specific regulations as there is no perceived need to engage in a collaborative, global effort. This is problematic as effective regulation cannot occur at a country-level. The promise of the decentralized ledger technology upon which the crypto-market is based is that centralized agents —such as financial intermediaries who are the usual focus of financial regulations—are no longer necessary.

Even if the crypto-market does not pose a threat a global financial stability it does not necessary follow that it does not pose a threat to the financial stability of individual countries. This paper is the first to attempt to examine whether all countries equally exposed to the crypto-market, or whether the crypto-market exposure (relative to the country's financial market) varies across countries. I also examine whether the crypto-market exposure correlates with crypto-market power: If one country is highly exposed, but also wields a lot of power the financial threat posed by the crypto-market is a domestic one, not one of global financial contagion.

I consider multiple measures based on share of national currency transactions in the crypto-market, including an implicit currency exposure measure that replaces all crypto-to-crypto purchases with their underlying fiat components.[1] Regardless of measure, over 90% of all fiat transactions are conducted in just three currencies[2]—the South Korean Won, the US dollar, and the Japanese Yen—suggesting that these three currencies have significant market power in the crypto-economy.

I compare fiat purchases of cryptos to the size of the originating country's stock market. The results differ widely, with the crypto-market size varying from less than 1% to over 70% of the national stock market, with Korea, Poland, and India found to be the most exposed economies. I find no relationship between crypto-market exposure and crypto-market power, which suggests cryptos present a new channel for financial contagion where financial volatility from a powerful economy could disproportionately impact more exposed economies. Neither market power nor exposure also cannot be explained by an economy's size, income, financial openness, or internet access.

Hileman and Rauchs (2017b) examined the distribution of only Bitcoin purchases, and found that Bitcoin trades are dominated by four currencies: the US dollar, the Chinese Yuan, the Euro and the Japanese Yen. Since the time of their study, Bitcoin has come to account for less than half of crypto-market. My paper is the first to document that the distribution of currencies across the crypto-market is different from that of the Bitcoin-market. This implies that, contrary to expectation, some links between economies and the crypto-market are stronger (or weaker) than Bitcoin purchases would suggest.

In Section 2 I describe my data set: the daily transaction data from 151 exchanges for the top 50 cryptos, while in Section 3 I construct and contrast different measures of market shares. In Section 4 I compare measures of market power and market exposure. In Section

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[1] For example: Suppose the US dollar is used to purchase Bitcoin, which is then used to purchase Ethereum. The Ethereum is implicitly purchased by US dollars, but this would not show in the data set.

[2] I will use the term "currencies" to refer to recognized national monies, such as the US dollar, or Japanese Yen.

?? I show that fiat investment in the crypto-markets do not correspond to economy size, income, or financial openness. Section 7 concludes.

2. Data

2.1. Collection

I collected the 24 hour transaction volume (measured in USD) for the fifty largest cryptos as measured by market capitalization from CoinMarketCap[3] for Saturday, December 16, 2017. The data, shown in its original form in Figure 1, contains information on the total 24-hour transaction volume for each pairing on each exchange. All volumes are measured in USD dollars to ensure comparability. This data identifies 26 fiat currencies and 560 cryptos that traded across 151 exchanges for the top fifty cryptos.

2.2. Off-Chain and On-Chain Transactions

By construction, this data set does not report any transactions that do not occur on exchanges (for example, direct wallet-to-wallet transactions), however it does capture off-chain transactions that occur on exchanges. Off-chain transactions are transactions that are not reported to the decentralized ledger (the blockchain), and are instead merely recorded on the exchange's books. Off-chaining is employed by exchanges for transactions that occur between parties registered on the exchange to reduce transactions costs and increase transaction speed. The website blockchain.info[4] reports the transaction information from the Bitcoin blockchain, and reports that on December 16, 2017 Bitcoin's total on-chain transaction volume was 262,598 Bitcoins. In contrast, CoinMarketCap recorded a transaction volume on exchanges of approximately 808,042 Bitcoins. This shows that the off-chain transactions dwarf the number of non-exchange transactions, and that focusing exclusively on data from exchanges does not result in a significant information loss for Bitcoin. I will assume that

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[3]http://www.coinmarketcap.com

[4]https://blockchain.info/ It reports only the quantity of bitcoins exchanged between two wallets, it does not report what was received in return.

Figure 1: Sample of Data Source

Note: Screen capture from www.coinmarketcap.com showing the raw format of the data. For each crypto (Bitcoin in the example), Coinmarketcap reports 24-hour trade volume of pairs in each market. In the screenshot, the largest share of Bitcoin trades, 6.30%, occurred on exchange Bitfinex in which Bitcoin were traded for $796,043,000 US dollars over the course of 24-hours.

this pattern is sufficiently true for the other 49 cryptos as well, so that exchange transaction data reflects the majority of crypto-transactions.

2.3. Summary

Table 1 summarizes the age, market capitalization, and the the 24-hour transaction volume of the selected cryptos, and provides the full name associated with their code abbreviation. While the initial selection criteria required that the cryptos be one of the fifty largest by market capitalization (out of the 1,373 cryptos recorded as existing), the resulting selection varies greatly in age and transaction volume. Some are less than a month old (GNT), while others are over five years old (BCN). Some have amongst the highest daily transaction volume in the crypto market (BTC), while others are not in the top 10% (VERI).

Some cryptos are sold on over 100 exchanges (LTC), while others trade on only 2 (BNB). Some are only sold on exchanges where no fiat currencies are accepted (KMD), while others (BTC) are sold on over 50 exchanges that accept fiat currency.[5]

The total daily transaction value—including both fiat and crypto trades—is $29 billion dollars. This is approximately one quarter of the $115 billion dollar traded daily on USA stock markets.[6] Table 2 summarizes top 20 of the 587 currencies and cryptos used as a medium of exchange to purchase the fifty cryptos. Table 2 provides implicit evidence that part of Bitcoin's value comes from its high degree of convertibility: it is the only medium of exchange, out of the 587 in the data set, that can be exchanged for all the top cryptos in the market. The second highest convertibility comes from Ethereum, which can be exchanged for only 42 of the top 50 cryptos, and the third is Tether, which can be exchanged for 35. Interestingly, the volume of transactions and the variety of crypto's a medium of exchange can purchase is not strictly related. ADA has a higher transaction volume than DASH, but ADA is used to buy only 3 cryptos while DASH is used to purchase 11.

Bitcoin is the most popular exchange medium. The next most popular medium, and the most popular fiat currency, is the USA dollar, which is used to purchase 31 out of the fifty cryptos. Two Asian currencies, the South Korean Won and the Japanese Yen, are the third and fourth, though their combined volume is less than that of the US dollar. The fifth most used purchasing vehicle is a crypto known as US Dollar Tether (USDT). In theory, each USDT is backed by a US dollar held in reserve by the company Tether Limited.

3. Market Share

3.1. Construction

There is no precedent for measuring the share of a currency in the crypto-market. In part, this question is difficult because it requires a decision on whether to include crypto-to-

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[5]I will use implicit currency exposure to control for this difference in direct fiat access.

[6]Imputed by dividing the total value of 2016 USA stock trades according World Bank by 365 days.

Table 1: Summary of the Top Fifty Crypto

Abbreviation	Full Name	Launch Date	Market Capitalization		24-Hour Volume		Exchanges	
			Rank	USD Millions	Rank	USD Millions	Total	Fiat
ADA	Cardano	Sep 29, 2017	7	9,507	10	465.85	4	1
ARDR	Ardor	Jan 1, 2018	28	921	61	16.57	8	1
ARK	Ark	Mar 21, 2017	38	473	78	12.42	7	2
BCC	BitConnect	Jul 23, 2017	16	2,167	51	30.02	9	1
BCH	Bitcoin Cash	Aug 1, 2017	3	30,135	7	1,057.27	97	41
BCN	Bytecoin	Jul 4, 2012	31	652	96	8.96	3	0
BNB	Binance Coin	Jul 14, 2017	41	439	31	47.94	2	0
BTC	Bitcoin	Jan 3, 2009	1	324,300	1	15,639.73	94	55
BTG	Bitcoin Gold	Nov 12, 2017	11	4,886	22	141	33	16
BTS	BitShares	Jul 19, 2014	25	1,105	25	93.934	15	0
DASH	Dash	Jan 18, 2014	8	7,082	18	171.47	71	27
DCR	Decred	Feb 8, 2016	35	533	136	6.12	7	1
DOGE	Dogecoin	Dec 6, 2013	32	638	23	13	44	8
EMC2	Einsteinium	Mar 1, 2014	42	414	34	41.08	3	0
EOS	EOS	Jun 26, 2017	12	4,667	9	549.85	33	7
ETC	Ethereum Classic	Jul 30, 2015	14	3,423	6	1142.45	50	14
ETH	Ethereum	Oct 25, 2016	2	66,470	2	2089.92	97	39
GBYTE	Byteball Bytes	Dec 25, 2016	46	374	40	38.29	3	0
GNT	Golem	Dec 20, 2017	50	333	100	7.40	15	1
HSR	Hshare	Jul 5, 2017	27	999	26	105.16	19	3
KMD	Komodo	Sep 14, 2016	39	473	66	14.27	5	0
LSK	Lisk	Jul 24, 2016	23	1,226	33	45.89	19	6
LTC	Litecoin	Oct 7, 2011	5	16,101	5	1,300.63	119	48
MIOTA	IOTA	Nov 27, 2016	6	10,155	13	288.02	8	3
MONA	MonaCoin	Jan 1, 2014	29	791	69	20.18	11	3
NEO	NEO	Oct 1, 2016	15	3,152	21	157.97	24	7
NXT	Nxt	Nov 24, 2013	30	681	30	65.97	14	3
OMG	OmiseGO	Jun 23, 2017	20	1,434	12	30	30	7
PIVX	PIVX	Jan 29, 2016	48	341	123	5.87	10	3
PPT	Populous	Jun 24, 2017	19	1,981	114	6.01	5	0
QASH	QASH	Nov 8, 2017	45	385	42	39.77	8	2
QTUM	Qtum	Mar 17, 2017	18	2,143	8	751.38	32	7
REP	Augur	Oct 5, 2016	40	461	64	15.91	16	4
SALT	SALT	Aug 15, 2017	37	506	54	22.11	5	0
SC	Siacoin	Jun 7, 2015	44	387	90	14.5	6	0
SNT	Status	Jun 17, 2015	43	411	27	77.22	15	0
STEEM	Steem	Mar 24, 2016	36	525	120	5.55	5	0
STRAT	Stratis	Aug 9, 2016	26	1,055	39	38.55	14	5
TRON/TRX	TRON	Sep 9, 2017	17	2,146	11	419.57	12	1
USDT	Tether	May 1, 2014	24	1,126	3	1,642.93	24	5
VERI	Veritaseum	May 26, 2017	34	542	183	1.82	4	0
VTC	Vertcoin	Jan 10, 2014	49	335	60	17.72	9	2
WAVES	Waves	May 31, 2016	21	1,343	29	69.37	21	8
XEM	NEM	Mar 31, 2015	9	5,881	24	96.93	18	5
XLM	Stellar Lumen	Jul 31, 2014	13	3,754	14	210.55	20	5
XMR	Monero	Apr 28, 2014	10	5,022	19	159.87	31	11
XRB	RaiBlocks	Oct 4, 2015	47	351	115	6.28	4	1
XRP	Ripple	Dec 20, 2012	4	29,174	4	1,390.58	60	29
XVG	Verge	Sep 9, 2014	33	577	15	246.23	10	2
ZEC	ZCash	Oct 28, 2016	22	1,323	20	155.40	47	16
Total				553,302		29.402.84	151	94

Note: Market Capitalization is USD price multiplied by the quantity of coins in circulation, and is obtained from CoinMarketCap. The 24-Hour transaction volume is also measured in USD and obtained from CoinMarketCap. A large market cap does not correspond to large transaction volume (DCR), or vice verce (USDT). The cryptos have a mixture of ages: some are less than a month old (GNT), while others are almost five years old (XRP). Exchanges-Total is the number of exchanges where transactions in the indicated crypto occur, while Exchanges-Fiat is the number of exchanges that trade the crypto on which fiat transactions have occurred.

Table 2: Both Fiat Currencies and Cryptos Are Used As Mediums For Crypto Transactions

Rank	Currency	F/C	Volume (Million USD)	# of Crypto's
1	Bitcoin	Crypto	$6,669	49
2	US dollar	Fiat	$5,875	31
3	South Korean Won	Fiat	$3,616	19
4	Japanese Yen	Fiat	$1,645	10
5	US Dollar Tether	Crypto	$1,549	35
6	Ethereum	Crypto	$1,353	42
7	Litecoin	Crypto	$702	28
8	Ripple	Crypto	$657	9
9	Cardano	Crypto	$588	3
10	Euro	Fiat	$517	25
11	Ethereum Classic	Crypto	$497	6
12	Bitcoin Cash	Crypto	$451	9
13	Tron	Crypto	$350	3
14	BitConnect	Crypto	$284	6
15	Verge	Crypto	$268	5
16	Qtum	Crypto	$217	7
17	Eos	Crypto	$213	6
18	OmiseGo	Crypto	$201	5
19	Ink	Crypto	$184	4
20	Dash	Crypto	$154	11
	Remaining	Crypto	$2,926	
	Remaining	Fiat	$488	

Note: "Volume" represents the 24-hour traded volume captured in the data-set, while "Number of Crypto's" is the number of crypto's purchased using the indicated medium out of the 50 (or 49) in the dataset. Bitcoin, a crypto, is the most popular means by which to trade cryptos, with the US dollar, a fiat currency, second. Bitcoin can buy all of the crypto's, a feat that is not accomplished by any of the other medium.

crypto purchases, or merely focus on fiat-to-crypto purchases. There are also concerns about market manipulations such as those documented in Gandal et al. (2018) and Griffin and Shams (2018). I will construct and compare 13 different measures in this section, though ultimately, I show that most are reductive.

The fiat market share $(M^{f,F})$ is the expenditures of a given fiat (V_c^f) across all coins c as a share of all fiat expenditures $(\sum_g V_c^g)$ across all coins, while the total market share $(M^{f,T})$

uses all fiat and crypto (V_c^d) expenditures.

$$M^{f,F} = \frac{\sum_c V_c^f}{\sum_c \sum_g V_c^g} \tag{1}$$

$$M^{f,T} = \frac{\sum_c V_c^f}{\sum_c \left(\sum_g V_c^g + \sum_d V_c^d\right)}$$

The purchase share $(P^{f,F})$ differs from the market share in the denominator value. Purchase share uses only the market transaction value of cryptos purchased by the considered fiat, not the the entire market of cryptos.

$$P^{f,F} = \frac{\sum_c V_c^f}{\sum_{c|V_c^f>0} \sum_g V_c^g} \tag{2}$$

$$P^{f,T} = \frac{\sum_c V_c^f}{\sum_{c|V_c^f>0} \left(\sum_g V_c^g + \sum_d V_c^d\right)}$$

The denominator associated with the Purchase Share will always be less than or equal to that of the equivalent Market Share, so the purchase share of any given fiat will always be greater than or equal to that of its market share $(P^{f,F} \geq M^{f,F}$ and $P^{f,T} > M^{f,T})$.

Suppose ExampleFiat (EF) purchases \$100 of Crypto1 (C1), \$200 of Crypto2 (C2), and \$0 of Crypto 3 (C3), while the total fiat purchases of Crypto1, Crypto2, and Crypto3 is \$500 each. The Market Share of Example Fiat is $M^{EF,F} = \frac{\$100+\$200+\$0}{\$500+\$500+\$500} = 0.20$, while the Purchase Share is $P^{EF,F} = \frac{\$100+\$200}{\$500+\$500} = 0.30$.

I also use measures that reflect the diffusion of a currency across cryptos. The fiat share of a currency for a given crypto $(S_c^{f,F})$ is the USD denominated value of a given fiat currency's (f) purchase of the crypto (c) as a share all USD denominated fiat purchases (g) of that crypto:

$$S_c^{f,F} = \frac{V_c^f}{\sum_g V_c^g} \tag{3}$$

$$S_c^{f,T} = \frac{V_c^f}{\sum_g V_c^g + \sum_d V_c^d} \tag{4}$$

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Fiat shares reveal the distribution of a fiat currency across the crypto-market. If all cryptos are location-identical, the fiat share should be statistically similar across all cryptos and indistinguishable from the market share, $S_c^{f,F} = M^{f,F}$. If some cryptos are excluded from certain markets, then it should still be the case that $S_c^{f,F} = P^{f,F}$. The three crypto shares of ExampleFiat in the prior example is $S_{C1}^{EF,F} = \frac{100}{500} = 0.20$, $S_{C2}^{EF,F} = \frac{200}{500} = 0.40$, $S_{C3}^{EF,F} = \frac{0}{500} = 0.00$. I will consider both the average and median fiat share as a potential measure of market share.

While it is difficult for government to ban crypto purchases, it may be harder to obtain some cryptos than others. A way around this is to purchase an easily accessible crypto, for example Bitcoin, and then use that to purchase the desired crypto. I accommodate this issue by calculating the implicit currency exposure for each crypto-fiat pair.[7] This process continues iteratively until all purchases by cryptos are replaced by their underlying fiat components.

Under implicit currency exposure all fiats purchase some amount of all cryptos because Bitcoin purchases all cryptos. Even if a fiat doesn't purchase Bitcoin directly, the crypto(s) it does purchase will have some exposure to Bitcoin, which then links the fiat to all other cryptos. Because of this, the market share and the purchase share under implied currency exposure has the same value. I will also consider the mean and the median of the fiat, total, and implicit shares across all cryptos as a different measure of a currency's role in the crypto-market.

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[7]Suppose that another crypto, ExampleCoin, is purchased only by Bitcoin. That crypto then inherits 26.99% implicit exposure to the USD via the original Bitcoin purchases, assuming the same composition of purchasers. While this is a strong assumption, there is no empirical evidence that would allow a more refined analysis. It is highly probable that this behavior is more likely to be undertaken by highly regulated currencies, such as the USD, or by fiats associated with countries using capital controls or exchange rate manipulation (Pieters (2016)). Suppose ExampleCoin is 10% of the transaction share of another crypto, AnotherCoin. AnotherCoin would then inherent 2.699% (0.10x26.999%) exposure to the US dollar, in to addition to whatever direct US dollar exposure AnotherCoin already contained.

Figure 2: Eight Different Measures of Crypto-Share
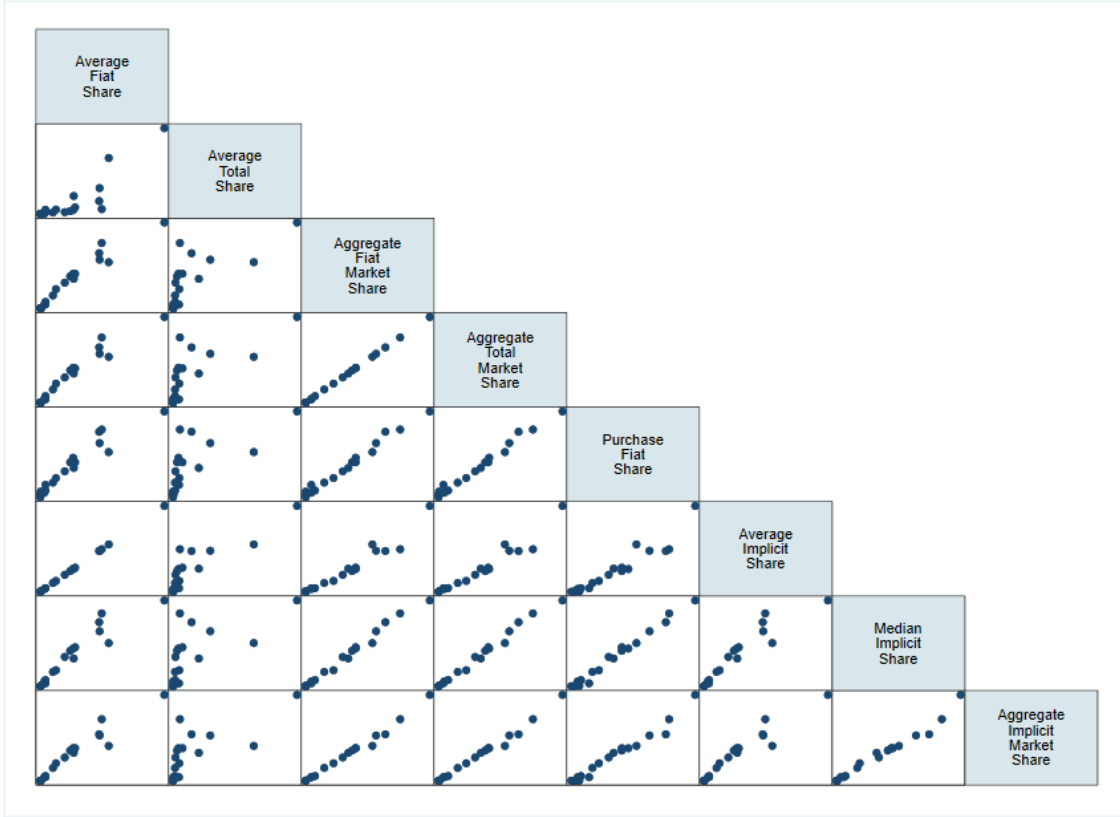
Note: N=19. Visualization of the eight different measures of shares, removing the outliers of USA, KRW, JPY, CNH+CNY and EUR. The various measures of market shares are closely related to each other, with correlation coeffients between 0.98 and 1.00 for all except the Average Total Share (second column)

3.2. Comparing Different Measures of Market Share

The previous section described the eleven different market shares constructed: fiat market share $(M^{f,F})$, aggregate market share $(M^{f,T})$, fiat purchase share $(P^{f,F})$, total purchase share $(P^{f,T})$, the mean and median of the fiat share of fiat transactions (S_c^f, F), the mean and median of the fiat share of total transactions $(S_c^{f,T})$, the mean and the median of the implicit share, and the implicit aggregate market share.

The median of both the fiat and total market shares are zero. Figure 2 contrasts the remaining eight measures, excluding the outliers of USA, KRW, JPY, China (CNY+CNY), and EUR. Except for the average total market share $(S_c^{f,T}$, second column), all measures are clearly strongly related to each other in the graph. Their correlations coefficients all fall in the range of 0.98 and 1.00 and for the purpose of the paper any could be used.

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The average total market share differs from other measures as the different cryptos have various amounts purchases by non-cryptos. A currency can be 100% of the fiat purchases of a cryptocurrency, while representing less than 1% of the total purchases of the cryptocurrency.

Appendix tables B.1, B.2 report the share results by crypto, while B.3 reports the share results for each of the eleven measures. For brevity in the rest of the paper, I will use only the average value of the Fiat share (as results remain qualitatively the same across the remaining seven measures), and average value of the Total share. I will also use the currency's share of Bitcoin purchases, as Bitcoin is still the largest cryptocurrency in the cryptomarket.

4. Distribution of Fiat Currencies Across the Cryptocurrency Market

4.1. Market Power

Table 3 summarizes the 24-hour transaction for the 26 fiat currencies. Fiat purchases of Bitcoin represent approximately two-thirds of all crypto-fiat transactions (63.41%), but are not representative of fiat transactions in the general crypto-market. Some fiats purchase no Bitcoin (CHF, CLP, CNH, CNY, HKD, ILS, NZD, RUR), while others purchase only Bitcoin (MYR). This means that a study that examines only Bitcoin transactions may find difference different answers from one that studies the crypto market as whole.

The largest market share of all crypto-fiat transactions belongs to the USD: it accounts for nearly half of the market at 48.39% of all fiat transactions. This is followed by the KRW at almost one third of the market (29.78%), and then the Japanese Yen (13.55%), and then the Euro (4.26%). This differs from Bitcoin transactions: while the USD also accounts for nearly half of all Bitcoin transactions (54.83%), JPY is second and accounts for nearly one-fifth (20.71%). KRW has merely 15.37%, while the EUR share remains approximately at the same share as the overall market at 4.82%. Across all of the non-Bitcoin crypto markets, KRW dominates with over nearly half of all recorded non-Bitcoin transactions (54.76%), USD about a third (37.22%), the EUR third (3.27%), with JPY (1.14%) and AUD (0.87%) fourth and fifth. This is despite the fact documented in Hileman and Rauchs (2017a) that

Table 3: Daily Crypto-market Transaction Share

		Transactions (Mil. USD)		Market Share (%)		
	Name	Bitcoin	Crypto	BTC	Crypto	Total Share
AUD	Australian Dollar	42.68	81.50	0.55	0.67	0.36
BRL	Brazilian Real	25.86	30.79	0.34	0.25	0.01
CAD	Canadian Dollar	24.12	33.30	0.31	0.27	0.02
CHF	Swiss Franc	-	0.36	-	0.00	0.00
CLP	Chilean Peso	-	0.20	-	0.00	0.00
CNH+CNY	Offshore+Onshore Chinese Yuan	-	7.34	-	0.06	0.02
EUR	Euro	371.46	516.76	4.82	4.26	0.60
GBP	British Pound	54.05	62.07	0.70	0.51	0.02
HKD	Hong Kong Dollar	-	0.46	-	0.00	0.00
IDR	Indonesian Rupiah	16.78	43.68	0.22	0.36	0.23
ILS	Israeli New Shekel	-	0.31	-	0.00	0.00
INR	Indian Rupee	6.13	18.26	0.08	0.15	0.02
JPY	Japanese Yen	1,594.73	1,645.44	20.71	13.55	1.98
KRW	South Korean Won	1,183.43	3,616.19	15.37	29.78	7.05
MXN	Mexican Peso	8.81	12.69	0.11	0.10	0.01
MYR	Malaysian Ringgit	3.80	3.80	0.05	0.03	0.00
NZD	New Zealand Dollar	-	0.02	-	0.00	0.00
PLN	Polish Zloty	38.56	46.59	0.50	0.38	0.11
RUB+RUR	Russian Ruble	27.41	36.01	0.00	0.30	0.05
SGD	Singapore Dollar	3.68	6.38	0.05	0.05	0.01
THB	Thai Baht	12.29	27.82	0.16	0.23	0.07
TRY	Turkish Lira	41.25	52.64	0.54	0.43	0.05
USD	US Dollar	4,221.88	5,875.25	54.83	48.39	19.98
ZAR	South African Rand	22.69	24.11	0.29	0.20	0.01
	Total	7,699.65	12,141.99			

Note: Transaction values are in Millions of USD. The next three columns are the share of all transactions value that the indicated currency represents: for only (fiat-based) Bitcoin transactions (BTC), the fiat crypto market (Crypto), and the total crypto market.

54% of all new DLT ventures (ventures that create new cryptos) originate in North America, with only 19% starting in the Asia-Pacific.

Noticeably, while all currencies within this study engage in the cryptomarket, three—USD, KRW, and JPY—account for over 90% of fiat trades. The number of cryptocurrencies purchased by a fiat currency does not correspond to the the market share of the fiat currency: fiat's used to purchase more cryptocurrencies do not necessarily have a larger market share.

4.2. Market Exposure

Table 1 showed that there were differences in exchange access to cryptos: some crypto's have very few purchases in fiat currencies. Table 2 revealed that there is a large variation

in convertibility between the various medium of exchanges and the top 50 cryptos. Table 3 summarizes the share of currencies within the crypto-market, a measure of their market power.

In this section I will measure the market exposure of the various fiats, using two different measures. One measure considers the diversification of the currency: a currency that invests in only one crypto is potentially more exposed to fluctuations than one that invests in many. The second measure considers the amount invested in the cryptocurrency market relative to a standard, risky market accessible to retail investors: the country's stock market.

Table 4: Transaction Shares in Crypto-market and Stock Markets (%)

| | Power (Share of Spending, %) | | | | Exposure | | | |
	BTC	Fiat-Share	Total-Share	Stocks	# of Crypto	$\frac{\text{Bitcoin}}{\text{Crypto}}$ (%)	HHI	$\frac{\text{Crypto (\$)}}{\text{Stock (\$)}}$ (%)
AUD	0.55	0.67	0.36	0.96	7	52.37	0.32	3.74
BRL	0.34	0.25	0.01	0.68	7	84.00	0.71	2.00
CAD	0.31	0.27	0.02	1.39	4	72.42	0.54	1.05
CHF	-	0.00	0.00	1.01	1	−	1.00	0.02
CLP	-	0.00	0.00	0.03	1	−	1.00	0.31
CNH+CNY	-	0.06	0.02	22.04	6	−	0.80	0.01
EUR	4.82	4.26	0.60	7.46	25	71.88	0.52	3.08
GBP	0.70	0.51	0.02	2.84	10	87.08	0.77	0.96
HKD	-	0.00	0.00	1.63	2	−	0.95	0.01
IDR	0.22	0.36	0.23	0.11	10	38.43	0.19	17.63
ILS	-	0.00	0.00	0.06	2	−	0.86	0.22
INR	0.08	0.15	0.02	0.95	5	33.60	0.29	0.84
JPY	20.71	13.55	1.98	6.30	10	96.92	0.94	11.48
KRW	15.37	29.78	7.05	1.93	19	32.73	0.15	82.45
MXN	0.11	0.10	0.01	0.13	3	69.73	0.52	4.14
MYR	0.05	0.03	0.00	0.12	1	−	1.00	1.41
NZD	-	0.00	0.00	0.01	1	−	1.00	0.08
PLN	0.50	0.38	0.11	0.05	10	82.82	0.69	37.26
RUR+RUB	0.36	0.30	0.05	0.17	14	83.67	0.70	9.42
SGD	0.05	0.05	0.01	0.23	5	57.68	0.47	1.24
THB	0.16	0.23	0.07	0.39	10	44.15	0.27	3.12
TRY	0.54	0.43	0.05	0.34	5	78.37	0.62	6.82
USD	54.83	48.39	19.98	50.68	31	71.86	0.52	5.10
ZAR	0.29	0.20	0.01	0.48	7	94.09	0.88	2.19

Note: Stock market data for EUR and GBP is 2014. # of Crypto is the number of cryptos the indicated fiat currency purchases directly. $\frac{\text{Bitcoin}}{\text{Crypto}}$ calculated the indicated ratio: it is the share of the currency's purchases in the cypto-market that are used to purchase Bitcoin. This varies from 0% (or 32.73% if some Bitcoins are purchased) to 100%. The Normalized Herfindahl Index ranges from 0 (unconcentrated) to 1 (concentrated) and is calculated using direct fiat purchases. $\frac{\text{Crypto (\$)}}{\text{Stock (\$)}}$ compares the daily value of crypto transactions to the daily value of transactions in the stock market of the indicated currency's country.

4.2.1. Diversification

Table 4 shows that among fiat currencies, the US dollar (USD) has the highest convertibility: it is used for direct fiat purchases of 31 of the 50 cryptos, the Euro (EUR) 25 cryptos, and third is the South Korean Won (KRW) at 19 cryptos.

The importance of Bitcoin within each countries portfolio differs widely: Among fiat currencies that purchase both Bitcoin and other cryptos, the relative importance of Bitcoin varies from 32.73% (KRW) to 96.92% (JPY). Some currencies are primarily being used to buy only Bitcoin.

To better measure diversification across the basket of cryptocurrency options, I calculate the normalized Herfindahl Index (HHI). The Herfindahl Index can therefore be thought of as combining the information regarding the number of cryptocurrencies purchased, and the relative transaction value of the cryptocurrencies purchased. The HHI ranges from 0 (unconcentrated) to 1 (completely concentrated in 1 cryptocurrency) and is calculated as

$$HHI^f = \frac{\sum_{c=1}^{N} s_c^{f2} - \frac{1}{N}}{1 - \frac{1}{N}} \tag{5}$$

where s_c^f is the share of the cryptocurrency is the fiat currency transactions, $s_c^f = \frac{V_c^f}{\sum_c V_c^f}$, and $N = 50$. Most fiats are highly concentrated ($HHI > 0.25$). The exceptions are the moderately concentrated IDR (0.19) and KRW (0.15). This result is partially driven by both countries that having a relatively low share of transactions in Bitcoin (38.43% and 32.73% respectively) though a low share of Bitcoin expenditures is not sufficient: both also buy several other cryptos. For example, INR has a similar share of transactions in Bitcoin (38.43%), but buys only 4 other cryptocurrencies and therefore has an HHI of 0.29.

All three exposure measures show that most countries are relatively undiversified with the cryptomarket, with the possible exceptions of Korea (KRW), Indonesia (IDR), USA (USD), and Europe (EUR) depending on the measure used.

4.2.2. Relative to stock market

I compare stock market transactions in the country of each fiat currency in Table 4. Specifically, I use the USD-equivalent value of 2016 stocks transactions.[8] A country's stock market represents a standard risky financial instrument; if individuals are purchasing cryptos as a high-risk, high-reward investment strategy the relative sizes of countries stock market should be correlated with the crypto market. Additionally, the stock market can be accessed by both domestic and foreign individuals so, to the extent that a country's crypto shares may be inflated due to external agents, the stock market share should be also increased.

For most countries, their share of the stock market is larger than their share of crypto market, with only six exceptions: IDR, JPY, KRW, PLN, RUR+RUB and TRY.[9] I examine the ratio of daily cryptocurrency spending to that of daily stock market transactions. For many countries this value of small: crypto transactions are equal to only 5% of the US stock market transactions. There are, however, exceptions. Of the exceptions, Korea is one of the most obvious as its cryptocurrency transactions are equal to over 82% of its daily stock market transactions. This represents a large share of financial flows into a poorly regulated and understood market, relative to the formal (or officially counted) financial flows.

5. Crypto-Market Power and Exposure

Figure 3 contrasts three measures of market power (Bitcoin market share, fiat market share, and total market share) and three measures of market exposure (the share of bitcoin in the crypto transactions, the Herfindahl index, and the size of the crypto market relative to the stock market). The USD, KRW, JPY and EUR removed from analysis as section 4 has already shown that they are outliers.

Countries that have a lot of power in the Bitcoin market (as measured by market share) have a weakly positive correlation with Bitcoin exposure (a correlation coefficient of 0.54

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[8]Stock trade valued is obtained from the World Bank, current USD value. Code: CM.MKT.TRAD.CD
[9]Some have suggested that Chinese individuals are using Korean markets to access cryptos, while others suggest that Korea is in a crypto-craze.

Figure 3: Market Power and Market Exposure
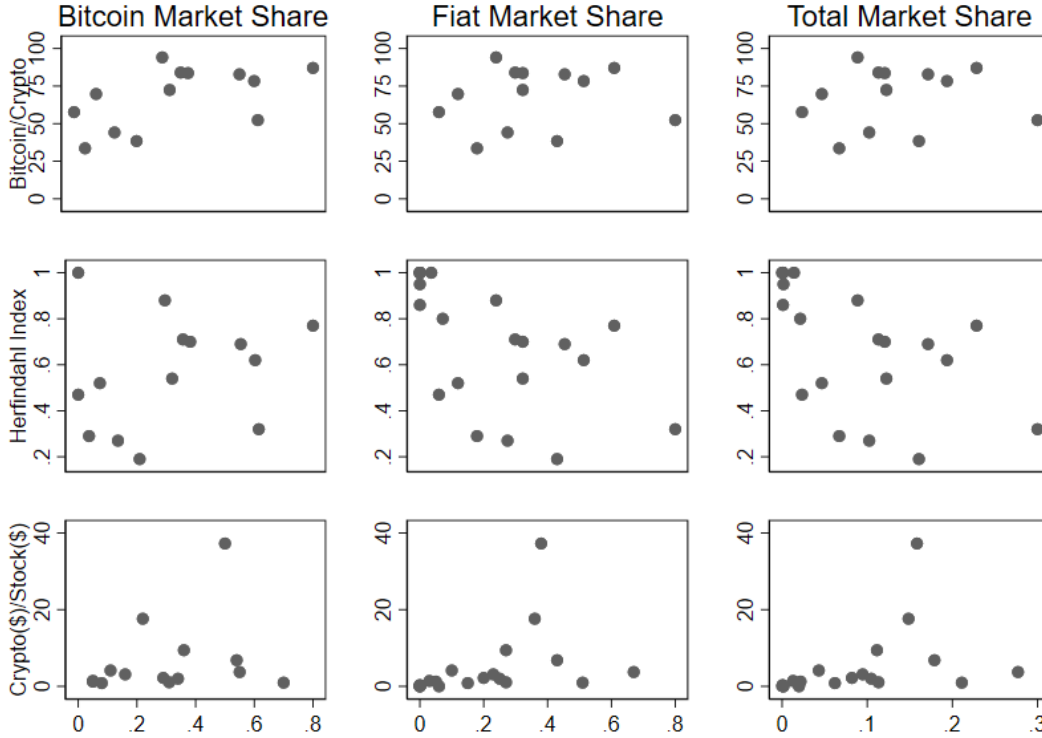
Note: N=20, removed the outliers of USA, KRW, JPY, and EUR. Visualization of Power (Market Share) and Exposure (size of crypto transactions relative to stock market transactions) in Table 4.

with a significance level of 0.06). Otherwise, Bitcoin market share does not correlate with any measure of market exposure. This implies that policy makers cannot use the Bitcoin market to determine whether their country is vulnerable to the cryptocurrency market.

Countries that have a high fiat (or total) market share tend to be more diversified, as measured by the Herfindahl index (a correlation coefficient of -0.54 with a significance level of 0.01) implying that they are more robust to swings in cryptocurrency markets. However, they are also weakly more likely to have higher exposure when comparing crypto transaction volume to stocks (a correlation coefficient of 0.45 with a significance level of 0.05), which implies that a larger share of financial wealth is engaged in the cryptocurrency market.[10]

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[10]It should be noted that these correlation coefficients are all sampled from a small sample size of only 20 countries.

Therefore, countries that have invested heavily in the crypto-market relative to their domestic stock market (high exposure) may feel volatility from the crypto-market more keenly than those who are less invested, but they are also more diversely invested which provides some protection from a cryptocurrency-specific downswing. On one hand, cryptos represent a diversification asset (Bouri et al. (2017)), so this represents a reduction in home-biased investment. On the other, the crypto market is dominated by only three economies so that an economic crisis in one can generate contagion in the crypto-market which could then spread to the exposed economies.

6. Determinants of Cryptocurrency market share

I consider economic size (GDP), average income (GDP per capita), and two measures of global integration: Trade Openness ($\frac{Exports+Imports}{GDP}$) and the Chinn and Ito (2006) Index of Financial Openness.[11] The Chinn-Ito index ranges from 0 (financially closed) to 1 (financially open). I also use the E-friction scores of Zwillenberg et al. (2014) to capture ease of internet access. The E-friction score incorporates information on a country's infrastructure, industry development, individual frictions (such as payment systems or data security) and information frictions (language support, a country's commitment to internet access, etc.), with a lower score indicates lower internet frictions (easier, free-er internet access). As internet access is a key component of crypto markets, it is possible that a high frictions would reduce crypto transactions. The data is presented in Figure 4, using both market shares and the market deviation from the stock market, defined as the ratio of the crypto share and the stock market share. The USD, KRW, JPY and EUR are again removed from analysis.

There are no correlations between any measures of crypto-market share or deviations from stock market share, and economic size, income, or the two measures of economic openness, or internet access.[12]

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[11]All data comes from the World Bank. GDP: NY.GDP.MKTP.CD. GDP per capita: NY.GDP.PCAP.CD. Exports: NE.EXP.GNFS.CD. Imports: NE.IMP.GNFS.CD.

[12]There is a weak positive correlation GDP per capita and HHI, implying that higher income economies

Figure 4: Market Share And Economic Measures
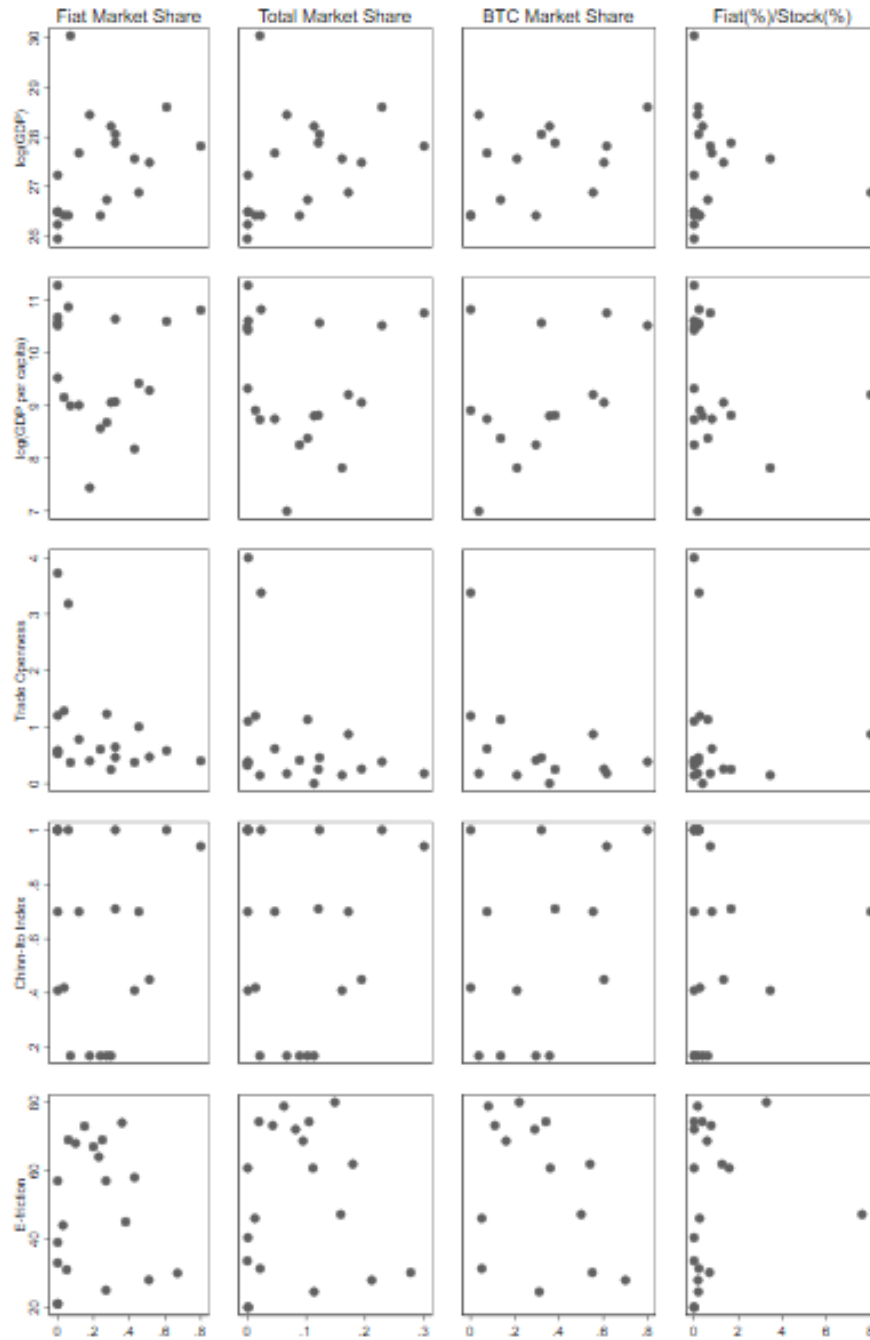
Note: N=20. Comparison of market share and five economic properties, removing the outliers of USA, KRW, JPY, CNH+CNY and EUR.

are more likely to diversify. Small sample warning applies.

7. Conclusion

Much like the internet that came before it, cryptos promise an increased linkage between economies. This paper has established that the fiat purchases of Bitcoin are not a good representation crypto market share, and introduced three different measures to accommodate the increasingly fragmented nature of the market when gauging market share: Direct, Purchase, and Implicit. The different measures affect the ranking for mid-rank fiats that have have concentrated purchasing in a few cryptos, and can increase or decrease the market share of each fiat.

All three measures reveal that while these digital financial instruments have the potential to link economies and increase financial flows, just three currencies—the KRW, USD, and JPY—account for over 90% of crypto transactions, with the top four—KRW, USD, JPY, and EUR—accounting for over nearly 95%. The size of these transactions do not follow the relative sizes of the stock markets associated with these fiats, nor can this concentration be explained by by the relative economic size, income, or openness of the economy. Some currencies with large exposures to the crypto-market which may lead to an benefit from this new digital economy by reducing home-bias and increasing diversification, or it may lead a detrimental effect due to a new avenue of financial contagion that is much harder to shut down using standard economic policy tools.

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Appendix A. Example

Table A.5 represents an fictional, illustrative example of trades and how they would be reported in the data collected on CoinMarketCap. F1 and F2 represent two state-issued fiat currencies (for example, US Dollar and Euro), while C1, C2, and C3 represent 3 cryptos (BTC, ETH, and XRP). In the underlying data, $100 of F1 is used to purchase C1, while $250 of C1 is sold for F1. This level of distinction is not available in the reported data, which only reveals that $350 (=$100+$250) has moved between F1 and C1. Notice that the total value of transactions in the economy is $1140.

Table A.5: Example of the relationship between underlying market and reported CoinMarketCap data

Underlying Data	Reported Data
F1 → C1: $100	
C1 → F1: $250	F1 ↔ C1: $350
F2 → C1: $150	
C1 → F2: $190	F2 ↔ C1: $340
F1 → C2: $210	
C2 → F1: $50	F1 ↔ C2: $260
C1 → C2: $70	
C2 → C1: $30	C1 ↔ C2: $100
C2 → C3: $30	
C3 → C2: $60	C2 ↔ C3: $90

An example of the underlying trades contrasted with the transaction data reported by coinmarketcap. F1 and F2 represent two state-issued fiat currencies (for example, US Dollar and Euro), while C1, C2, and C3 represent 3 cryptos (for example, BTC, ETH, and XRP). The reported data does not allow for distinction between a transfer in or out of a fiat.

The values of the data in Table A.5 is summarized in Table A.6. Notice that the summed value of all the rows or columns in the table is $1330: greater than the true value of transactions in the economy ($1140). This is because crypto-to-crypto transactions are counted twice: for example, the $100 transaction between C1 and C2 is listed for both C1 and C2.

Table A.7 calculates the direct and implicit market shares: the two shares in which only fiat currency purchases are in the denominator. F1 accounts for $350 transactions for C1, F2 accounts for $340, accordingly, F1 has a 51% state-issued fiat market share in C1 ($350/($350+$260)), while F2 has a 49% market share. Whether the Direct or Purchase

Table A.6: Market Distribution

	F1	F2	C1	C2	C3	Total
C1	$350	$340	-	$100	$0	$790
C2	$260	$0	$100	-	$90	$450
C3	$0	$0	$0	$90	-	$90
Total	$610	$340	$100	$190	$90	$1330

Market Share approach is used makes no difference for the market share calculated for an individual crypto, but it does matter when trying to measure crypto market share overall. When calculating the F2's direct market share in the aggregate market, the Direct definition yields $340/$950=36%. However, calculating this market share using the Purchase definition yields $340/$690=49%. For F1, there is no difference in the two methods as it purchases all the cryptos that are also bought with fiat.

Table A.7: Direct and Purchase Market Shares (%)

	F1	F2	Herfindahl
C1	50.7	49.3	0.500
C2	100	0.00	1.000
C3	-	-	0.000
Total			
Direct	64.2	35.8	
Purchase	64.2	49.3	
Herfindahl	1.26	0.24	

Table A.8 repeats the exercise of Table A.7 using total market value, instead of only fiat transactions. Unsurprisingly, each market share is lower when also allowing crypto-crypto transaction values than when solely considering fiat-crypto transactions. The values for the Herfindahl index also fall for the same reason.

Finally, Table A.9 constructs the implied market share of each fiat currency: In this case the transactions between C1 and C2, and the transactions between C2 and C3. For Crypto C3, 100% of all transactions are with C2. One unit of C2 is 58% F1, 0% F2, 22% C1, and

Table A.8: Share of Total Market (%)

	F1	F2	Herfindahl
C1	44.3	43.0	0.381
C2	57.8	0.00	0.334
C3	-	-	0.000
Total			
Direct	42.4	23.6	
Purchase	42.4	43.0	
Herfindahl	0.530	0.185	

20% C3. Using this within the definition of C3 yields

$$C3 = 0F1 + 0F2 + 0C1 + 1C2 + 0C3 \tag{A.1}$$

$$C3 = 0F1 + 0F2 + 0C1 + 1(0.58F1 + 0F2 + 0.22C1 + 0.20C3) \tag{A.2}$$

$$C3 = 0.58F1 + 0F2 + 0.22C1 + 0.20C3 \tag{A.3}$$

$$C3 = 0.725F1 + 0.275C1 \tag{A.4}$$

This therefore reduces C3 to a function of F1 and C1. This can in turn be substituted into the definition of C2 to find that

$$C2 = 0.58F1 + 0.22C1 + 0.20C3 \tag{A.5}$$

$$C2 = 0.58F1 + 0.22C1 + 0.20(0.725F1 + 0.275C1) \tag{A.6}$$

$$C2 = 0.58F1 + 0.22C1 + 0.145F1 + 0.055C1 \tag{A.7}$$

$$C2 = 0.725F1 + 0.275C1 \tag{A.8}$$

Unsurprisingly—given that C3 is only purchased by C2—C2 and c3 has the same composi-

tion. Finally, solving C1 yields

$$C1 = 0.44F1 + 0.43F2 + 0C1 + 0.13C2 + 0C3 \qquad (A.9)$$

$$C1 = 0.44F1 + 0.43F2 + 0.13(0.725F1 + 0.275C1) \qquad (A.10)$$

$$C1 = 0.44F1 + 0.43F2 + 0.09F1 + 0.04C1 \qquad (A.11)$$

$$C1 = 0.55F1 + 0.45F2 \qquad (A.12)$$

Substituting this back into C2 yields that

$$C2 = 0.725F1 + 0.275(0.55F1 + 0.45F2) \qquad (A.13)$$

$$C2 = 0.88F1 + 0.12F2 \qquad (A.14)$$

With the same expression for C3. This can now be used on the values in Table A.6 to find the Implied Market Distribution in Levels (show in Table A.9)

Table A.9: Implied Market Distribution

	F1	F2	Total
C1	$436	$353	$790
C2	$394	$55	$450
C3	$79	$11	$90
Total	$909	$420	$1330

This can in turn be used to calculate the Implied Market Share, shown in Table A.10.

Table A.10: Implied Share of Total Market (%)

	F1	F2	Herfindahl
C1	55.2	44.8	0.505
C2	87.7	12.3	0.784
C3	87.7	12.3	0.784
Total			
Share	68.4	24.0	
Herfindahl	1.842	0.231	

Appendix B. Tables And Figures

Table B.1: Fiat Market Share Within Each Crypto (% of total transactions)

	Fiat %	AUD	BRL	CAD	CHF	CLP	CNH	CNY	EUR	GBP	HKD	IDR	ILS	INR	JPY	KRW	MXN	MYR	NZD	PLN	RUB	RUR	SGD	THB	TRY	USD	ZAR
ADA	1.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.08	-	-	-	-	-	-	-	-	-	-	-
ARDR	0.06	-	-	-	-	-	-	-	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ARK	0.07	-	-	-	-	-	-	-	0.07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BCC	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-
BCH	31.27	0.13	0.11	0.13	-	-	-	-	0.87	0.03	-	0.14	0.00	0.07	0.18	18.54	-	-	0.00	0.16	0.04	0.01	0.23	0.12	-	10.50	0.01
BCN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BNB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BTC	49.23	0.27	0.17	0.15	-	-	-	-	2.38	0.35	-	0.11	-	0.04	10.2	7.57	0.06	0.02	-	0.25	0.18	-	0.02	0.08	0.26	26.99	0.15
BTG	57.85	-	0.01	-	-	-	-	-	0.15	0.00	-	0.72	-	-	-	49.62	-	-	-	0.04	-	0.02	-	0.04	-	7.26	-
BTS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DASH	23.07	-	0.00	-	-	-	0.41	-	1.20	0.00	-	-	-	-	-	9.02	-	-	-	0.10	0.32	0.30	-	0.07	0.10	11.51	0.02
DCR	0.05	-	-	-	-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DOGE	2.31	-	-	-	-	-	-	-	0.24	0.00	-	-	-	-	-	-	-	-	-	-	0.00	0.08	-	-	1.76	0.23	-
EMC2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EOS	60.27	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	42.44	-	-	-	-	-	0.00	-	-	-	17.82	-
ETC	55.61	0.29	-	-	-	-	-	-	0.65	0.00	-	0.41	-	-	-	47.16	-	-	-	-	-	0.01	-	-	-	7.10	-
ETH	30.28	0.27	-	0.18	0.02	0.01	0.03	-	2.12	-	0.02	0.08	-	0.09	0.15	9.25	0.09	-	-	0.06	0.05	0.05	0.01	0.12	0.25	17.43	0.01
GBYTE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GNT	1.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.23	-
HSR	16.15	16.04	-	-	-	-	-	-	-	-	-	-	-	-	0.11	-	-	-	-	-	-	-	-	-	-	0.00	-
KMD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LSK	4.95	-	-	-	-	-	-	-	0.03	-	-	-	-	-	-	-	-	-	-	4.46	-	-	-	-	-	0.46	-
LTC	47.3	0.28	0.28	0.32	-	-	0.02	0.00	3.27	0.59	0.00	0.08	0.02	0.15	0.02	7.53	-	-	-	0.21	0.04	0.08	-	0.05	0.28	34.05	0.03
MIOTA	51.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.76	-	-	-	-	-	-	-	-	-	38.73	-
MONA	62.69	-	-	-	-	-	-	-	-	-	-	-	-	-	62.69	-	-	-	-	-	-	-	-	-	-	-	-
NEO	12.23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.37	-	-	-	-	-	-	0.00	0.00	-	11.85	-
NXT	2.37	-	-	-	-	-	-	-	0.02	-	-	2.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OMG	28.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.31	-	-	-	-	-	-	-	2.37	-	26.02	-
PIVX	0.60	-	-	-	-	-	-	-	0.55	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-	-	-	0.00	-
PPT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QASH	55.66	-	-	-	-	-	-	-	0.00	-	-	-	-	-	3.33	-	-	-	-	-	-	-	0.03	-	-	52.3	-
QTUM	60.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	57.80	-	-	-	-	-	-	-	-	-	2.25	-
REP	12.58	-	-	-	-	-	-	-	11.32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.63	0.63	-
SALT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SNT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STEEM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
STRAT	0.36	-	-	-	-	-	-	-	0.25	0.00	-	-	-	-	-	0.08	-	-	-	-	-	-	-	-	-	0.02	-
TRON	28.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28.62	-	-	-	-	-	-	-	-	-	-	-
USDT	2.16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	-	2.16	-
VERI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VTC	0.46	-	-	-	-	-	-	-	0.44	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WAVES	4.07	-	-	-	-	-	-	-	0.09	-	-	3.37	-	-	-	0.00	-	-	-	-	0.37	0.1	-	-	-	0.14	-
XEM	21.96	-	-	-	-	-	-	-	0.07	-	-	-	-	-	21.44	-	-	-	-	-	-	0.13	-	-	-	0.31	-
XLM	4.41	-	-	-	-	-	-	0.28	0.00	-	-	4.04	-	-	0.07	-	-	-	-	-	-	-	-	-	-	0.03	-
XMR	32.95	-	0.01	-	-	-	-	-	2.01	-	-	-	-	-	-	15.50	-	-	-	0.01	-	-	-	-	-	15.43	-
XRB	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	-
XRP	51.22	0.58	0.01	-	-	-	-	0.38	2.18	0.00	-	0.33	-	0.55	0.75	32.04	0.14	-	-	-	0.15	-	-	0.23	-	13.85	0.04
XVG	0.70	-	-	-	-	-	-	-	0.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-
ZEC	27.57	-	-	-	-	-	-	-	1.17	-	-	-	-	-	-	12.83	-	-	-	0.03	0.19	0.07	-	-	-	13.19	0.1
Direct Share		0.28	0.10	0.00	0.00	0.00	0.01	0.02	1.76	0.21	0.00	0.15	0.00	0.06	5.60	12.30	0.04	0.01	0.00	0.16	0.11	0.01	0.02	0.09	0.18	19.98	0.08
Purchase Share		0.36	0.16	0.17	0.02	0.01	0.04	0.17	2.13	0.30	0.01	0.19	0.01	0.08	7.50	13.74	0.07	0.02	0.00	0.22	0.14	0.05	0.03	0.12	0.27	20.93	0.11

Note: Each number represents the share the fiat currency (column heading) represents of all purchases of the crypto (row heading). A "-" indicates no transactions were recorded. For example, the value of 0.06 for the ARDR-EUR pair indicates that 0.06% of ARDR purchases were conducted using the Euro (EUR). The "% Fiat" column indicates the share of total transactions that were conducted using Fiat currencies. Direct share is the share of all crypto transactions the indicated fiat is used in, while average share is the Purchase share is the share of all the purchased cryptos.

Table B.2: Implicit Fiat Share Within Each Crypto

	Total %	AUD	BRL	CAD	CHF	CLP	CNH	CNY	EUR	GBP	HKD	IDR	ILS	INR	JPY	KRW	MXN	MYR	NZD	PLN	RUB	RUR	SGD	THB	TRY	USD	ZAR
ADA	83.90	0.59	0.24	0.25	0.00	0.00	0.01	0.03	3.87	0.50	0.00	0.28	0.00	0.11	13.69	19.13	0.09	0.03	0.00	0.37	0.26	0.02	0.04	0.18	0.41	43.60	0.20
ARDR	83.90	0.59	0.24	0.25	0.00	0.00	0.01	0.03	3.87	0.50	0.00	0.28	0.00	0.11	13.69	19.13	0.09	0.03	0.00	0.37	0.26	0.02	0.04	0.18	0.41	43.60	0.20
ARK	83.90	0.59	0.24	0.25	0.00	0.00	0.01	0.03	3.87	0.50	0.00	0.28	0.00	0.11	13.69	19.13	0.09	0.03	0.00	0.37	0.26	0.02	0.04	0.18	0.41	43.60	0.20
BCC	83.90	0.59	0.24	0.25	0.00	0.00	0.01	0.03	3.87	0.50	0.00	0.28	0.00	0.11	13.69	19.13	0.09	0.03	0.00	0.37	0.26	0.02	0.04	0.18	0.41	43.60	0.20
BCH	83.90	0.59	0.24	0.25	0.00	0.00	0.01	0.03	3.87	0.50	0.00	0.28	0.00	0.11	13.69	19.13	0.09	0.03	0.00	0.37	0.26	0.02	0.04	0.18	0.41	43.60	0.20
BCN	83.90	0.59	0.24	0.25	0.00	0.00	0.01	0.03	3.87	0.50	0.00	0.28	0.00	0.11	13.69	19.13	0.09	0.03	0.00	0.37	0.26	0.02	0.04	0.18	0.41	43.60	0.20
BNB	59.43	0.42	0.16	0.18	0.00	0.00	0.01	0.02	2.77	0.34	0.00	0.21	0.00	0.08	9.04	13.64	0.07	0.02	0.00	0.25	0.18	0.02	0.03	0.13	0.30	31.43	0.13
BTC	84.30	0.56	0.25	0.25	0.00	0.00	0.01	0.02	3.92	0.51	0.00	0.28	0.00	0.10	14.27	18.51	0.09	0.03	0.00	0.38	0.27	0.02	0.04	0.18	0.42	43.97	0.21
BTG	93.19	0.25	0.11	0.11	0.00	0.00	0.00	0.01	1.78	0.21	0.00	0.84	0.00	0.05	5.74	57.69	0.04	0.01	0.00	0.19	0.11	0.02	0.02	0.12	0.18	25.63	0.08
BTS	70.31	0.51	0.20	0.21	0.00	0.00	0.01	0.02	3.25	0.40	0.00	0.24	0.00	0.09	11.06	16.48	0.08	0.03	0.00	0.30	0.21	0.02	0.03	0.16	0.35	36.49	0.16
DASH	87.54	0.45	0.18	0.20	0.00	0.00	0.42	0.03	4.20	0.38	0.00	0.22	0.00	0.08	10.38	23.73	0.07	0.02	0.00	0.38	0.52	0.32	0.03	0.21	0.43	45.11	0.17
DCR	84.31	0.56	0.25	0.25	0.00	0.00	0.01	0.02	3.97	0.51	0.00	0.28	0.00	0.10	14.26	18.50	0.09	0.03	0.00	0.38	0.27	0.02	0.04	0.18	0.42	43.95	0.21
DOGE	80.69	0.53	0.23	0.24	0.00	0.00	0.01	0.02	3.88	0.48	0.00	0.26	0.00	0.10	13.10	17.37	0.09	0.03	0.00	0.35	0.25	0.09	0.04	0.17	2.15	41.11	0.19
EMC2	84.31	0.56	0.25	0.25	0.00	0.00	0.01	0.02	3.92	0.51	0.00	0.28	0.00	0.10	14.26	18.51	0.09	0.03	0.00	0.38	0.27	0.02	0.04	0.18	0.42	43.98	0.21
EOS	93.25	0.24	0.09	0.10	0.00	0.00	0.01	0.01	1.55	0.18	0.00	0.11	0.00	0.05	5.00	50.29	0.04	0.01	0.00	0.14	0.10	0.01	0.02	0.08	0.17	34.99	0.07
ETC	92.64	0.56	0.10	0.11	0.00	0.00	0.00	0.01	2.35	0.21	0.00	0.54	0.00	0.05	5.81	55.88	0.04	0.01	0.00	0.16	0.11	0.02	0.02	0.08	0.18	26.29	0.08
ETH	79.85	0.66	0.13	0.32	0.02	0.01	0.03	0.02	4.30	0.27	0.02	0.26	0.00	0.15	7.65	21.71	0.14	0.02	0.00	0.26	0.19	0.06	0.04	0.24	0.48	42.73	0.12
GBYTE	84.30	0.56	0.25	0.25	0.00	0.00	0.01	0.02	3.92	0.51	0.00	0.28	0.00	0.10	14.27	18.51	0.09	0.03	0.00	0.38	0.27	0.02	0.04	0.18	0.42	43.97	0.21
GNT	83.83	0.57	0.23	0.26	0.00	0.00	0.01	0.02	3.91	0.47	0.00	0.28	0.00	0.11	13.10	18.85	0.10	0.03	0.00	0.36	0.25	0.02	0.04	0.19	0.42	44.41	0.19
HSR	85.62	16.59	0.19	0.21	0.00	0.00	0.01	0.02	3.18	0.38	0.00	0.23	0.00	0.10	10.35	17.18	0.08	0.02	0.00	0.28	0.20	0.02	0.03	0.16	0.34	35.87	0.15
KMD	84.25	0.56	0.25	0.25	0.00	0.00	0.01	0.02	3.92	0.51	0.00	0.28	0.00	0.10	14.18	18.55	0.10	0.03	0.00	0.38	0.27	0.02	0.04	0.18	0.42	43.96	0.20
LSK	85.02	0.53	0.23	0.24	0.00	0.00	0.01	0.02	3.75	0.48	0.00	0.27	0.00	0.10	13.49	17.63	0.09	0.03	0.00	4.82	0.25	0.02	0.04	0.17	0.40	42.24	0.19
LTC	91.04	0.60	0.41	0.45	0.00	0.00	0.02	0.01	5.28	0.85	0.00	0.23	0.02	0.21	6.92	17.82	0.05	0.02	0.00	0.40	0.17	0.09	0.02	0.15	0.50	56.70	0.13
MIOTA	91.91	0.28	0.11	0.13	0.00	0.00	0.01	0.01	1.93	0.23	0.00	0.14	0.00	0.05	6.29	22.04	0.05	0.02	0.00	0.17	0.12	0.01	0.02	0.09	0.21	59.90	0.09
MONA	92.69	0.20	0.09	0.09	0.00	0.00	0.00	0.01	1.39	0.18	0.00	0.10	0.00	0.04	67.77	6.59	0.03	0.01	0.00	0.14	0.09	0.01	0.02	0.06	0.15	15.64	0.07
NEO	85.12	0.52	0.20	0.22	0.00	0.00	0.01	0.02	3.40	0.42	0.00	0.25	0.00	0.10	11.61	17.15	0.08	0.03	0.00	0.32	0.22	0.02	0.04	0.16	0.37	49.82	0.17
NXT	84.43	0.56	0.24	0.25	0.00	0.00	0.01	0.02	3.82	0.49	0.00	2.63	0.00	0.10	13.62	18.35	0.09	0.03	0.00	0.36	0.26	0.02	0.04	0.18	0.41	42.74	0.20
OMG	88.21	0.43	0.17	0.18	0.00	0.00	0.01	0.02	2.77	0.34	0.00	0.20	0.00	0.08	9.33	14.19	0.07	0.02	0.00	0.25	0.18	0.02	0.03	2.51	0.30	56.98	0.14
PIVX	84.40	0.55	0.25	0.25	0.00	0.00	0.01	0.02	4.45	0.51	0.00	0.28	0.00	0.00	14.18	18.40	0.09	0.03	0.00	0.42	0.26	0.02	0.04	0.18	0.42	43.72	0.20
PPT	81.78	0.62	0.18	0.29	0.01	0.01	0.02	0.02	4.14	0.38	0.01	0.27	0.00	0.13	10.51	20.33	0.12	0.02	0.00	0.31	0.23	0.04	0.04	0.22	0.46	43.26	0.16
QASH	92.26	0.27	0.09	0.12	0.00	0.00	0.01	0.01	1.77	0.19	0.00	0.12	0.00	0.05	8.52	8.88	0.05	0.01	0.00	0.15	0.11	0.01	0.04	0.09	0.19	71.49	0.08
QTUM	87.16	0.20	0.08	0.08	0.00	0.00	0.00	0.01	1.25	0.16	0.00	0.09	0.00	0.04	4.24	64.18	0.03	0.01	0.00	0.12	0.08	0.01	0.01	0.06	0.13	16.32	0.06
REP	85.43	0.54	0.20	0.22	0.00	0.00	0.01	0.02	14.71	0.41	0.00	0.25	0.00	0.10	11.20	17.29	0.09	0.03	0.00	0.31	0.22	0.02	0.04	0.80	0.36	38.45	0.16
SALT	83.48	0.58	0.23	0.26	0.00	0.00	0.01	0.02	3.98	0.47	0.01	0.28	0.00	0.11	13.05	19.13	0.10	0.03	0.00	0.36	0.25	0.02	0.04	0.19	0.43	43.71	0.19
SC	84.19	0.56	0.25	0.25	0.00	0.00	0.01	0.02	3.93	0.50	0.00	0.28	0.00	0.10	14.10	18.59	0.10	0.03	0.00	0.38	0.26	0.02	0.04	0.18	0.42	43.94	0.20
SNT	83.49	0.57	0.23	0.26	0.00	0.00	0.01	0.02	3.95	0.48	0.00	0.28	0.00	0.11	13.32	18.98	0.10	0.03	0.00	0.36	0.26	0.02	0.04	0.19	0.43	43.65	0.19
STEEM	84.02	0.56	0.25	0.25	0.00	0.00	0.01	0.02	3.91	0.51	0.00	0.28	0.00	0.10	14.16	18.49	0.09	0.03	0.00	0.38	0.27	0.02	0.04	0.18	0.42	43.83	0.20
STRAT	84.24	0.56	0.24	0.25	0.00	0.00	0.01	0.02	4.16	0.51	0.00	0.28	0.00	0.11	13.98	18.71	0.10	0.03	0.00	0.37	0.26	0.02	0.04	0.18	0.42	43.77	0.20
TRON	88.09	0.42	0.16	0.19	0.00	0.00	0.01	0.02	2.86	0.33	0.00	0.20	0.00	0.08	9.10	42.39	0.08	0.02	0.00	0.25	0.18	0.02	0.03	0.14	0.31	31.18	0.13
USDT	81.15	0.82	0.20	0.23	0.00	0.00	0.01	0.04	3.48	0.41	0.00	0.27	0.00	0.12	9.93	23.27	0.08	0.02	0.00	0.29	0.21	0.03	0.03	0.21	0.35	40.95	0.15
VERI	80.61	0.65	0.15	0.30	0.02	0.01	0.03	0.02	4.24	0.31	0.02	0.27	0.00	0.14	8.74	21.23	0.13	0.02	0.00	0.28	0.21	0.05	0.04	0.23	0.47	42.92	0.13
VTC	84.43	0.55	0.25	0.25	0.00	0.00	0.01	0.02	4.35	0.52	0.00	0.28	0.00	0.10	14.21	18.44	0.09	0.03	0.00	0.38	0.27	0.02	0.04	0.18	0.42	43.79	0.20
WAVES	83.51	0.53	0.23	0.24	0.00	0.00	0.01	0.02	3.79	0.48	0.00	3.64	0.00	0.10	13.29	17.57	0.09	0.03	0.00	0.36	0.62	0.12	0.04	0.17	0.40	41.58	0.19
XEM	87.69	0.44	0.19	0.20	0.00	0.00	0.01	0.02	3.14	0.39	0.00	0.22	0.00	0.08	32.42	14.54	0.07	0.03	0.00	0.29	0.21	0.15	0.03	0.14	0.33	34.61	0.16
XLM	84.70	0.55	0.23	0.24	0.00	0.00	0.01	0.30	3.73	0.47	0.00	4.31	0.00	0.10	13.19	18.19	0.09	0.03	0.00	0.35	0.25	0.02	0.04	0.18	0.40	41.81	0.19
XMR	89.26	0.39	0.17	0.17	0.00	0.00	0.01	0.02	4.63	0.34	0.00	0.19	0.00	0.07	9.20	28.20	0.06	0.02	0.00	0.26	0.17	0.01	0.03	0.12	0.28	44.79	0.13
XRB	78.00	0.56	0.24	0.24	0.00	0.00	0.01	0.00	3.61	0.49	0.00	0.27	0.00	0.07	13.60	15.98	0.09	0.04	0.00	0.36	0.25	0.02	0.04	0.16	0.41	41.35	0.20
XRP	91.56	0.86	0.12	0.12	0.00	0.00	0.00	0.39	4.03	0.24	0.00	0.47	0.00	0.60	7.25	41.30	0.20	0.03	0.00	0.18	0.28	0.01	0.02	0.32	0.20	34.82	0.13
XVG	84.43	0.56	0.24	0.25	0.00	0.00	0.01	0.02	4.61	0.50	0.00	0.28	0.00	0.10	13.97	18.51	0.10	0.03	0.00	0.37	0.26	0.02	0.04	0.18	0.42	43.72	0.20
ZEC	88.43	0.43	0.17	0.18	0.00	0.00	0.01	0.02	3.99	0.36	0.00	0.21	0.00	0.08	9.92	26.68	0.07	0.02	0.00	0.29	0.38	0.08	0.03	0.13	0.30	44.82	0.24
Implicit Share		0.74	0.26	0.28	0.00	0.00	0.02	0.05	4.40	0.53	0.00	0.39	0.00	0.15	13.85	28.01	0.11	0.03	0.00	0.39	0.28	0.03	0.04	0.24	0.40	49.53	0.20

Note: Each number represents the implicit share of the fiat currency (column heading) based all purchases of the crypto (row heading). For example, the value of 0.59 for the ADA-AUD pair indicates that 0.59% of ADA could be traced back to AUD. The "Total %" column indicates the share of transactions that could be accounted for within the crypto. Implicit share is the fiat share of crypto transactions.

Table B.3: Eleven Measures of Crypto-Market Share

	Number	BTC	Purchase	Fiat Market (%)			Total Market (%)		Implicit Share (%)		
				Mean	Median	Agg.	Mean	Median	Mean	Median	Agg.
AUD	7	0.55	0.77	2.07	0.00	0.67	0.36	0.00	0.84	0.56	0.74
BRL	7	0.34	0.32	0.03	0.00	0.25	0.01	0.00	0.20	0.23	0.26
CAD	4	0.31	0.36	0.04	0.00	0.27	0.02	0.00	0.22	0.24	0.28
CHF	1	-	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CLP	1	-	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CNH	3	-	0.12	0.04	0.00	0.01	0.01	0.00	0.02	0.01	0.02
CNY	4	-	0.35	0.14	0.00	0.05	0.01	0.00	0.03	0.02	0.06
EUR	25	4.82	4.74	16.11	0.00	4.26	0.60	0.00	3.78	3.87	4.40
GBP	10	0.70	0.61	0.13	0.00	0.51	0.02	0.00	0.42	0.47	0.53
HKD	2	-	0.04	0.00	0.00	0.00	0.00	0.0	0.00	0.00	0.00
IDR	10	0.22	0.41	5.54	0.00	0.36	0.23	0.00	0.00	0.00	0.30
ILS	2	-	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INR	5	0.08	0.18	0.04	0.00	0.15	0.02	0.00	0.11	0.10	0.15
JPY	10	20.71	16.34	4.58	0.00	13.55	1.98	0.00	12.91	13.41	13.85
KRW	19	15.37	30.10	18.10	0.00	29.78	7.05	0.00	22.46	18.57	28.01
MXN	3	0.11	0.14	0.01	0.00	0.10	0.01	0.00	0.09	0.09	0.11
MYR	1	0.05	0.05	0.00	0.00	0.03	0.00	0.00	0.03	0.03	0.03
NZD	1	-	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PLN	10	0.50	0.49	1.99	0.00	0.38	0.11	0.00	0.40	0.36	0.39
RUB	10	0.36	0.32	0.25	0.00	0.27	0.03	0.00	0.24	0.25	0.28
RUR	11	-	0.12	0.17	0.00	0.03	0.02	0.00	0.03	0.02	0.03
SGD	5	0.05	0.07	0.02	0.00	0.05	0.01	0.00	0.04	0.04	0.04
THB	10	0.16	0.27	0.30	0.00	0.23	0.07	0.00	0.23	0.18	0.24
TRY	5	0.54	0.59	1.57	0.00	0.43	0.05	0.00	0.40	0.41	0.40
USD	31	54.83	48.94	24.84	2.45	48.39	6.23	0.04	41.76	43.60	49.53
ZAR	7	0.29	0.24	0.02	0.00	0.20	0.01	0.00	0.17	0.19	0.20

Note: Share information from Table ?? and Table B.2. Rank indicates the largest (1) to smallest (26) market share by each transaction share.