Who Sells Cryptocurrency?

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Abstract: Cryptocurrency has become a major force in the financial system in the last decade. However, even as regulators and policymakers across the globe deliberate on how to account for, regulate, tax, and oversee digital assets and cryptocurrency marketplaces, there is little population-level empirical evidence on cryptocurrency users. Providing broad-based evidence on cryptocurrency sellers and activities is critical to policy deliberations because the nature of regulation is often predicated on who is involved in particular activities. Using administrative data, we provide information on the general characteristics of cryptocurrency users who report their sales to the government, focusing on those individuals who own cryptocurrency directly on the blockchain or through cryptocurrency exchanges. Among the insightful patterns we document are ages, incomes, professions, geographic residences, student and marital statuses, and reported income from gambling of cryptocurrency sellers. The average income of cryptocurrency sellers has declined over time, suggesting the base of sellers has expanded in recent years; the average cryptocurrency seller is just under 33 years old—much younger than the average non-crypto investor at 56—-and this gap has grown over time. Moreover, from 2013 to 2020, the population of individuals selling cryptocurrency evolved from small clusters of people largely working in related industries and residing in coastal states (e.g., California and New York) to an expansive population employed in a broad range of industries and spread out across the country. By documenting compelling patterns of increasingly broad-based use of cryptocurrencies, this study contributes timely evidence to the significant regulatory deliberations and towards an innate understanding of these relatively new financial products.

All data work for this project involving administrative tax data was done on IRS computers, by authorized IRS personnel. In addition to being a PhD candidate at the University of Iowa, Tyler Menzer is an IRS employee under a Student Volunteer agreement through the Joint Statistical Research Program (JSRP). We thank John Guyton, Robert Hayden, and Anne Herlache of the IRS for help and guidance with this project and we thank Barry Johnson, Pat Langetieg, Alicia Miller, and Michael Weber for facilitating this project through the JSRP. We appreciate helpful comments from Andrew Belnap, Thomas Omer, Scott Rane(discussant), Brian Williams, and workshop participants at the U.S. Treasury Office of Tax Analysis, the University of Iowa and the 2022 AAA Annual Meeting. The views expressed here are ours alone and do not reflect the views of the Internal Revenue Service.

1. Introduction

On March 9, 2022, U.S. President Joe Biden issued a pivotal Executive Order "outlining the first ever, whole-of-government approach to addressing the risks and harnessing the potential benefits of digital assets and their underlying technology" (White House 2022). This wide-sweeping Order directs or encourages digital-assets-related efforts from major U.S. agencies and regulators, including the Federal Reserve, the U.S. Treasury, the Financial Stability Oversight Council, and the Commerce Department. Notably, the Order also comes amid the recent "explosive growth" in digital assets, which now exceed $3 trillion (White House 2022), and follows recent uncertainty about and disparities within and across various regulatory and policy bodies (e.g., FASB, the U.S. Treasury, the IRS, the SEC) regarding how to account for, tax, regulate, and oversee cryptocurrencies and cryptocurrency market places.[1] In this paper, we examine the population-level attributes of cryptocurrency users who report their sales to the IRS.

Regulation governing financial products and activities often centers on the attributes of the individuals involved. Indeed, U.S. law charges regulatory agencies to "seek the views of those who are likely to be affected, including...those who are potentially subject to such rulemaking" (Exec. Order No. 13563, 2011). Thus, unsurprisingly, the nature of regulation across various financial areas often reflects the attributes of the individuals involved in particular financial activities. For example, U.S. law requires public, but not private, companies to provide audited, U.S. GAAP financial statements and limits the investment vehicles that may be offered to

[1] For example, the IRS issued Notice 2014-21 in 2014 detailing how cryptocurrency would be taxed as property by the IRS. The U.S. Treasury's Financial Crimes Enforcement Network (FinCEN) issued guidance treating cryptocurrencies as currency. Other market participants such as the FASB also have shown interest in updating rules for cryptocurrencies (Maurer 2022). The SEC has pursued regulatory action that presumes cryptocurrencies are securities. The picture for cryptocurrency regulation is even less clear internationally with some countries such as China, Egypt and others banning cryptocurrencies completely (Quiroz-Gutierrez 2022) while others have aimed to be cryptocurrency havens. Portugal, for instance, ruled that cryptocurrency traders are exempt from the country's 28% income tax in 2018 (Hall 2022).

accredited versus non-accredited investors.[2] In line with this intuition, we argue that understanding who uses cryptocurrency, and how trends in cryptocurrency use are changing, is essential to formulating an effective regulatory framework for it.

Protecting "main street" investors is at the heart of U.S. financial regulation. In fact, SEC Chairman Jay Clayton notes that "serving and protecting Main Street investors is my main priority at the SEC" (SEC 2018). Current SEC regulation of products is contingent on demographic attributes of the investors—with some products being allowed for investors perceived as more sophisticated, but not for others (e.g., 17 CFR § 230.144A – Private resales of securities to institutions).[3] Thus, understanding whether "main street investors" or higher income sophisticated investors predominantly use cryptocurrency is central to discussions surrounding cryptocurrency regulation. However, despite cryptocurrencies ostensible entrance into the mainstream and the major regulatory attention that now surrounds it (and other digital assets), little is known about the characteristics of individuals who own cryptocurrencies or how these characteristics have changed over time.

[2] Prior research examines descriptive characteristics of the users of many other financial products, including the use of credit and credit cards, including age (Mathur and Moschis 1994; Limbu et al. 2012), student status (Limbu et al. 2012; Hayhoe et al. 2000), and race (Cohen-Cole 2011); the use of predatory lending services by race (Charron-Chénier 2020), disability (McGarity and Caplan 2019), gender (Nitani et al. 2020), and military status (Graves and Peterson 2005); stock market participation by gender (Almenberg and Dreber 2015), IQ (Grinblatt et al. 2011), geography (Brown et al. 2008), and age (Athreya et al. 2021); health insurance products by race (Monheit and Vistnes 2000; Hargraves and Hadley 2003); fintech products by gender (Chen et al. 2021), age (Singh et al. 2020; Carlin et al. 2017; Li et al. 2020), geography (Friedline and Chen 2021; Li et al. 2020), and race (Friedline and Chen 2021; Haupert 2022).

[3] One important decision for regulators is whether cryptocurrencies should be regulated as property or currency. Current IRS guidance states that cryptocurrency is treated as property (Notice 2014-21). However, some supporters of cryptocurrency argue it should be treated as a currency. Under the Internal Revenue Code (IRC), certain foreign currency transactions can be classified as personal transactions which eliminates gain recognition when the foreign currency gain would be less than $200.[3] This issue has only become more important as businesses have begun to accept cryptocurrency for normal purchases. Our data shows that the median yearly gain for cryptocurrency sellers is only $27, potentially providing initial evidence that the regulatory burden could be significantly reduced for taxpayers who use cryptocurrency for purchases, which may qualify for gain exclusion if cryptocurrency were treated as a currency instead of property.

The inherent opacity surrounding publicly observable cryptocurrency activities accounts for the lack of evidence on who actually transacts in these digital assets.[4] While cryptocurrency publicly records both the individual transactions and the unique identifiers (wallets) of the transacting parties, tying these transactions to individuals and their demographic characteristics has, ironically, proven elusive.[5] We overcome this challenge by using proprietary data from the IRS on reported sales of key cryptocurrency assets to provide the first population-level evidence of the characteristics of U.S. cryptocurrency sellers. We focus our analyses on cryptocurrency sellers who own cryptocurrency through cryptocurrency exchanges or directly on the blockchain rather than those who own cryptocurrency indirectly because cryptocurrency held indirectly, such as through public trusts or investment funds, are regulated the same as traditional securities.

Our primary objective is to contribute evidence on the characteristics of those who report cryptocurrencies sales – the most common places they live, their income, age, marital and student status, and the industries in which they tend to work – and how these characteristics change over time. We find that the average income of cryptocurrency sellers has declined over time, suggesting the base of sellers has expanded in recent years, though the average cryptocurrency seller reports higher income than taxpayers who are not associated with reported investment activity (e.g., who do not report cryptocurrency sales, sales of capital assets, or dividends). The average cryptocurrency seller is just under 33 years old, which is considerably younger than the average non-crypto investor (about 56 years old). This age gap has grown from 2013 to 2020, even while the percentage of U.S. taxpayers reporting cryptocurrency sales has grown. Men, married

[4] Due to the limitations of administrative data and tax reporting rules, we are only able to observe a subset of individuals who both sell cryptocurrency and report those sales in an identifiable way through tax reporting. We discuss the specifics of this limitation in Section 3 and in the Online appendix.

[5] Even Chainalysis, a leader in tracking and identifying blockchain business users, does not provide individual level identification (https://blog.chainalysis.com/reports/service-level-data/).

individuals, college students, individuals with higher wages, individuals with more dividend income, and homeowners have become significantly more likely to sell cryptocurrency over time. We also find some evidence that workers in a broader range of professions own cryptocurrency and that cryptocurrency sellers have become more geographically diverse. Finally, we document a small but important subsection of cryptocurrency users who start with relatively low incomes, but within a short period of time, recognize more than one million dollars in taxable gain. Interestingly in these analyses, cryptocurrency has a resorting effect—the investors who are the lowest income quartile individuals who realize large cryptocurrency gains not only recognize larger gains, on average, than those who started with more income, but after two years, persist in having more taxable income for at least two more years.

Overall, our unique, broad-sample evidence about who sells cryptocurrency and how the attributes of cryptocurrency sellers are evolving over time provides timely, policy-relevant insights that can inform current regulatory efforts and policy deliberations.[6] Further, our evidence contributes to a growing literature regarding many aspects of how cryptocurrencies as an asset class fit into our financial system by providing evidence on the characteristics over time of individuals investing in that asset class (Bourveau, De George, Ellahie and Macciocchi, 2021); .Gan et al (2020); Arnosti and Weinberg (2022); Malik et al (2022); Cheng et al (2019); Makarov and Schoar (2020)). Finally, or analysis informs attempts to enforce taxation of cryptocurrency gains by providing evidence for profiles of the average cryptocurrency seller.

[6] Apart from President Biden's Executive Order issued on March 9, 2022, the U.S. Federal Reserve released a report on a central bank digital currency in January 2022 and asked for comments from stakeholders on the proposal (Federal Reserve 2022), the SEC has filed several lawsuits against cryptocurrency platforms such as Ripple and Blockfi (SEC 2020, SEC 2022), and the U.S. Treasury is planning to issue new preliminary guidance (Versprille 2022).

2. Background

Bitcoin, the first cryptocurrency, is a decentralized, public, pseudo-anonymous payment network.[7] The backbone of Bitcoin is the blockchain, which serves as a public accounting ledger, maintaining the entire transaction history of Bitcoin. While a public ledger would appear to enable the linking of individuals to transactions, various issues cause this not to be the case. Prior studies have attempted to identify cryptocurrency users through different methods. Several papers use heuristics and machine learning to group individual wallet addresses together to identify "users" (Athey et al. (2016); Ron and Shamir (2013); Meiklejohn et al. (2013); Makarov and Schoar (2021)). These analyses are generally limited to single cryptocurrencies (such as Bitcoin) and identify only blockchain-based users, omitting users who buy or sell on certain exchanges. In addition, blockchain analyses make it difficult to distinguish between business users and individuals or to determine the geographic location of users. It also presents challenges when attempting to provide information at the user level—their income, gender, age, marital or student status, reported gambling activities, other investment sales, etc. These inherent limitations in the blockchain setting have led to dramatically different estimates of the number of unique Bitcoin users (Athey et al. (2016), Amiram, Jørgensen, and Rabetti (2021), and Makarov and Shoar (2021)).

Other papers have taken a different approach to identifying cryptocurrency users. Hackethal, Hanspal, Lammer, and Rink (2021) partnered with a German bank and received information on 100,000 investors, 872 of which invest indirectly in cryptocurrency or cryptocurrency-related investment products. They show cryptocurrency investors were younger than non-cryptocurrency investors and had a greater level of wealth and income than non-

[7] See Online Appendix A for additional information on Bitcoin transactions are recorded and processed.

cryptocurrency investors. Their point-in-time estimates find that cryptocurrency investors trade more frequently and hold a higher share of their investments in stocks. Similarly, Hasso, Pelster and Breitmayer (2019), using a sample of 465,926 brokerage accounts from a U.K. brokerage, find that males between 35 and 44 years of age are most likely to trade cryptocurrency, but that females engage in less speculative trading and realize higher returns. In line with the UK brokerage's self-reported claim of being the market leader for contract-for-difference cryptocurrency trading, Hasso et al. note that 90% of active accounts trade cryptocurrency by 2017. They also note that investor trading patterns vary between asset classes, adding to the need for cryptocurrency specific research. While these studies provide some useful insights, it is unclear whether or how the results of these limited and unique samples generalize to larger populations of cryptocurrency users, and how those characteristics have changed over time.

In addition to archival studies, several surveys highlight characteristics of cryptocurrency users. For example, Benneton and Campiani (2020) describe three surveys which provide point-in-time surveys report a wide variety of individual characteristics. The Survey of Consumer Payment Choice (SCPC) reports 1% of users claim cryptocurrency ownership while the ING International Survey on Mobile Banking reports 8% among the subset of respondents who are familiar with cryptocurrency (65%). Another comprehensive survey by the Bank of Canada, the Bitcoin Omnibus Survey, done in 2016 and 2018 suggests that, at the time of the survey, males were more likely to own Bitcoin (64%). These estimates are in line with surveys of U.S. respondents from other surveys such as the 2021 State of Crypto Literacy (64%) and the State of U.S. Crypto Report (74%). Survey evidence also suggests that cryptocurrency investors tend to be younger, consistent with the democratization of finance being a key tenant of the cryptocurrency

space. However, the Bank of Canada survey suggests that both wealthier and more educated individuals own cryptocurrency compared with other individuals, consistent with our findings.

We add to the growing literature on owners of bitcoin by providing new evidence on how cryptocurrency users compare not only to other investors (similar to Hasso et al. (2019); Hackenthal et al. (2021)) but also how they compare to the non-investing public. Our unique data allows us to identify financial investment transactions and demographics. We also provide evidence on less identifiable characteristics such as wages and other sources of income, geographic location, home ownership, family size, and employment characteristics. Since most individuals in the U.S. are required to file an annual tax return, our analysis also allows us to examine characteristics across the population of cryptocurrency reporters, especially in populations which may be less likely to answer survey questions, such as the very wealthy. Our large sample size also allows us to determine characteristics of cryptocurrency users when only a small proportion of the population engages with the technology. Finally, and importantly, the nature of our administrative data allows us to provide evidence for how the demographics of cryptocurrency sellers have trended over time.

3. Research Sample and Data

To examine demographic characteristics of those who sell cryptocurrencies, we access confidential taxpayer information from the IRS for tax returns filed between 2013 and 2020. Because tax reporting requirements do not discriminate between the different methods individuals may use to hold cryptocurrency, it should capture reporting of both activity directly on cryptocurrency networks as well as any activity trading cryptocurrency on exchanges. Although IRS reporting would also cover cryptocurrency held indirectly by public firms, trusts, or other registered investment vehicles, those assets would already be subject to third-party reporting. We

therefore do not include those assets in our calculation of cryptocurrency owners, as they do not have control over the actual cryptocurrency. Similarly, consistent with our focus on individual taxpayers, we do not attempt to identify cryptocurrency held by businesses (Forms 1120, 1120S, 1065) or trusts (Form 1041). To the extent that cryptocurrency transactions from flow-through entities affect individual tax returns, we will not identify those transactions.

While our sample is the largest time-series sample of cryptocurrency users to-date, it also has its limitations. In particular, because the U.S. tax system relies upon the realization principle, the tax return reveals the most reliable information about cryptocurrency users only when they sell cryptocurrencies and report those transactions. While knowing everyone who buys and holds cryptocurrency would be useful, IRS data, while potential the best dataset available to answer these questions, it is nonetheless imperfect. Using tax return data to study capital assets is especially a problem in equity markets, where investors must trade off their beliefs about expected returns and the value of tax deferral (Lei et al 2019). However, here, cryptocurrencies are unique in that this problem is partially mitigated by a key feature of the tax system. Investors sell and instantly repurchase cryptocurrencies to take advantage of tax losses (Cong et al 2022). In addition, taxpayers have to check a box on their tax returns for the 2019 and 2020 tax years stating whether or not they engaged in a variety of virtual currency transactions. Consequently, noting who sells should be a much better indicator of who owns cryptocurrencies than it would be for equities, especially given the volatility in the crypto market.

In addition, while there are severe financial penalties for non-compliance with the tax law, some individuals invariably fail to report all their cryptocurrency transactions to the IRS. This problem is prevalent in much of the accounting literature, in which evidence of behavior is only observed contingent on the reporting or detection of such behavior (Cecchini et al, 2010; Hopkins

et al (2014). In some cases, described below, tax law requires third parties to report transaction level tax-related information to the IRS enhancing the quality of the tax data. But to the extent that underreporting varies with the investor characteristics we study, our estimates may not reflect the true population of cryptocurrency users.

We obtain cryptocurrency sales data from two sources. First is IRS Form 8949. Unless certain third-party reporting requirements are met, tax provisions require individuals to report individual stock transactions on Form 8949, including a description of the property, the date of purchase, date of sale, cost of property, sales price, and any adjustments.[8] We use a textual search to identify transactions that are likely to be cryptocurrency.[9] We focus on two types of cryptocurrencies, Bitcoin and Ethereum, which are, by far, the two most valuable, most widely held, and, well-known cryptocurrencies (2021 State of Crypto Report, Yougov 2018).[10] However, our textual analysis likely identifies other cryptocurrencies as well, especially cryptocurrencies with similar names such as Ethereum Classic or Bitcoin Cash.[11] After completing the textual search, we manually inspect a random sample of 3,000 cryptocurrency transactions in each of our sample years (i.e., 24,000 transactions) to assess the possibility of false positives. Overall, we find a false positive rate of 1.2%. This false positive rate is highest in 2013 (3.4%), and drops over time

[8] Taxpayers are allowed to summarize transactions if gains are reported on Form 1099-B, with basis reported, and for which they have no adjustments.

[9] We note that while we use IRS data to perform our analyses, the process we use to identify them was designed and implemented by the authors of this research and does not represent the method the IRS may use to identify cryptocurrency transactions.

[10] The term "Ethereum" can refer to both the cryptocurrency "Ether" and the blockchain platform on which Ether runs. In this paper, we use Ethereum to refer to the cryptocurrency rather than the blockchain network. We use this terminology for several reasons. First, major cryptocurrency platforms such as Coinbase, Kraken, and Binance all refer to the cryptocurrency Ether as Ethereum when listing it on their exchanges. Thus many investors likely think of the term Ethereum as a cryptocurrency. Second, prior literature uses the term Ethereum to refer to the cryptocurrency (see Marakov and Shoar 2020 and Giffin and Shams 2020). Finally, popular news organizations such as Coindesk, use both Ether and Ethereum to refer to the cryptocurrency interchangeably (e.g., https://cointelegraph.com/news/phishing-scammer-monkey-drainer-has-pilfered-as-much-as-1m-in-ethereum).

[11] As of March 21, 2022, Bitcoin is the largest cryptocurrency with a market cap of $889 billion while Ethereum has a market cap of $395 billion. The next largest currency is Tether, which has a market cap of $81 billion (https://coinmarketcap.com/historical/20220327/).

to less than 1% for years after 2015.[12] To supplement our data from Form 8949, we also use the same method to search third-party reported descriptions filed on Form 1099-B.[13] Using form 1099-B filings allows us to identify some transactions that taxpayers may have summarized on their tax returns.

After identifying Bitcoin and Ethereum sales, we merge the Form 8949 data with individual taxpayer data from Form 1040 and its related schedules. We begin with 1,223,732,729 taxpayer-year records who have valid taxpayer identification numbers.[14][15] We restrict our analysis to only electronically filed returns so we can capture all the fields we require for our analysis (reduction of 112,487,851 observations). This process yields a sample of 1,078,688,472 taxpayer-years (202,523,891 unique taxpayers), including 2,620,921 cryptocurrency seller-years. We also merge in IRS data sourced from the Social Security Administration on the birth year and gender of taxpayers as well as additional data from third-party reporting.

4. Results

4.1 Demographic Information on Crypto Sellers

We report general descriptive statistics for our sample in Table 1 and separate our sample into three groups, *NON-INVESTOR* (taxpayers with no capital asset sales, and no dividends), *NON-CRYPTO SELLING INVESTOR* (taxpayers with capital asset sales/dividends but no crypto

[12] We inspect individual transaction descriptions rather than tax returns. If a taxpayer reports multiple cryptocurrency transactions, we could still classify them correctly as a cryptocurrency seller even if one or more of the transactions that we identify are false positives.

[13] To identify cryptocurrency transactions reported on Form 1099-B, we follow the same process we use for Form 8949, with one exception. To avoid classifying cryptocurrency ETFs and related products as transactions related to direct interests in cryptocurrency, we remove transactions for which there is a valid CUSIP reported on the Form 1099-B. Notably, many Form 1099-B transactions report the CUSIP for the security being reported but cryptocurrencies are not regulated securities and thus do not have valid CUSIPs. .

[14] Each year contains between 124,222,137 (2013) and 148,493,792(2019) unique taxpayers.

[15] Because we are interested specifically in the reporting behavior of cryptocurrency owners in the reporting environment of the time, we restrict our sample to the first tax return filed by a taxpayer each year, and we remove tax returns filed more than 1 year after the close of the tax year (32,541,050). We also remove returns for which there are duplicate records filed at the same time (15,356).

sales), and *CRYPTOCURRENCY SELLERS*. As in prior studies, we find that cryptocurrency reporters are younger, with a mean age of 32.8 compared to 41.5 for non-investors and 56.3 for non-cryptocurrency investors. Consistent with the sentiment that cryptocurrency will support the "democratization of finance", we find that sellers have less income than other non-cryptocurrency investors, albeit more income than non-investors. We also find that they have less investment income (e.g., dividends, interest, and capital gains) and wages than non-crypto investors. Both the number of cryptocurrency transactions reported, and the yearly cryptocurrency gain is highly skewed, with the median reporting only one transaction while the average is 9.9.[16] The average reporter has a cryptocurrency gain of $12,484 per year, although the median is only $27. The average yearly cryptocurrency gain for the top 100 *CRYPTOCURRENCY SELLERS* ranges from $559,947 to $18,774,384, indicating that there are some taxpayers realizing and reporting very large cryptocurrency gains. We examine these taxpayers further in Section 4.2. Additionally, the average yearly cryptocurrency losses for the 100 *CRYPTOCURRENCY SELLERS* with the greatest losses ranges between losses of $115,425 and $5,715,828. In both cases, the largest gains and losses generally occur in the latter half of our sample. In addition, the median cryptocurrency seller has no other non-gain investment income (dividends, interest), also consistent with cryptocurrency investors being more like non-investors.

We graph several tax return characteristics in Figure 1. We find that cryptocurrency investors are much more likely to be enrolled in a university or college (*STUDENT)* than both other groups. In line with the lower income of cryptocurrency investors, we also find that they are more likely to claim the Earned Income Tax Credit (*EIC TAX CREDIT)* than other investors, but

[16] We caution interpretation of the number of transactions reported as taxpayers can and do often group transactions together or summarize them. To the extent cryptocurrency transactions are grouped together it should bias the estimate downward.

less likely to claim it compared with non-investors. We also look at taxpayer risk preferences by examining how likely cryptocurrency investors are to have reported gambling income (*GAMBLER)* and find that a similar proportion of cryptocurrency traders have gambling income compared with non-investors or other non-crypto investors (crypto-investors actually have slightly lower gambling income than non-crypto investors). Moreover, we consider the role of financial health and cryptocurrency sales by examining the percentage of cryptocurrency sellers that receive cancellation of debt income (*CANCELLATION OF DEBT)* and find that cryptocurrency investors are similar in that respect compared with non-investors.

We graph the number of cryptocurrency sellers over time in Figure 2, Panel A. The number of cryptocurrency reporters is increasing dramatically over time, with less than 7,000 taxpayers reporting cryptocurrency per year between 2013 and 2016, and over 120,000 sellers in 2017. This large increase coincides with the price increase of Bitcoin in 2017 and the associated hype, broad media coverage, and surge in public interest. While Bitcoin started 2017 around $1,000, it reached a high of nearly $20,000 before falling in 2018 (Higgins 2017). Notably, we also observe a large increase in the number of cryptocurrency sellers in each of the subsequent years. This pattern is consistent with survey evidence, which found that in 2020, 26% of users had acquired their cryptocurrency within the last year, 68% had acquired it within the last two years, and only 4% had acquired their cryptocurrency over five years ago (State of Crypto Report 2021).[17]

We next examine how cryptocurrency sellers have changed over time. In Figure 2, Panel B we directly compare *CRYPTOCURRENCY SELLERS* to *NON-CRYPTO SELLING INVESTORS.*

[17] The increase may also speak to increased compliance with tax laws. Regulatory factors such as the IRS John Doe Summons of a large cryptocurrency exchange and the resulting increase in third party reporting may have resulted in increased regulatory scrutiny and compliance with tax reporting requirements. Consistent with this assumption, we find that the average number of *CRYPTOCURRENCY SELLERS* who receive a Form 1099-B for cryptocurrency increases from 6% in 2016 to 84% in 2020 (untabulated).

The mean (standard deviation) age of cryptocurrency reporters has markedly decreased over time, from 45.2(18.6) in 2013 to 32.4(10.9) in 2020. Over the same time, the average age of non-investors (untabulated) [non-cryptocurrency investors] has remained relatively flat, from 41.1(17.1) to 42.4(17.8) [55.8(19.6) to 55.4(19.6)]. We also note that the average taxable income of cryptocurrency reporters decreases over time, from an average of $299,217 in 2013 to only $76,147 in 2020. This change is particularly interesting because in the early part of our sample period (before 2018), cryptocurrency sellers had more income than non-cryptocurrency investors, and this trend held even at the median. In 2017, the median taxable income for cryptocurrency sellers was over $99,000, while the median non-crypto selling investor had a median income of only $70,000. By 2020, however, the median *NON-CRYPTO SELLING INVESTOR* had median income of $68,000, while the median *CRYPTOCURRENCY SELLER's* taxable income was only $32,000 (untabulated).

Noting the lower income of *CRYPTOCURRENCY SELLERS* over time, we examine the distribution of taxable income for these taxpayers in further detail in Figure 3. We produce a histogram of *TAXABLE INCOME* for *CRYPTOCURRENCY SELLERS* over our sample period, using $10,000 bin widths. For ease of interpretation and due to the extreme skewness in *TAXABLE INCOME*, we limit the upper bound of the histogram to $270,000, which is approximately equal to the 95th percentile for cryptocurrency returns. Consistent with *CRYPTOCURRENCY SELLERS* reporting lower income, we find that 27.4% of these sellers have under $10,000 of taxable income, and over half of sellers report less than $40,000 in taxable income. The low income of these taxpayers is also unlikely due to excessive deductions, as only 13.1% of *CRYPTOCURRENCY SELLERS* file Schedule A for itemized deductions.

4.2 Cryptocurrency Millionaires

One area of interest related to cryptocurrencies is their ability to produce immense wealth as a result of the exponential growth in asset prices. This growth has created a rag to riches story for many early investors (Schlott 2022). To examine this phenomenon further, we look specifically at individual taxpayers who report large cryptocurrency gains—the cryptocurrency millionaires. To begin, we partition taxpayers into five categories. Here, we first sum both *CAPITAL GAIN/LOSS*es and *CRYPTOCURRENCY GAIN*s by taxpayer for all years in our sample period. We label taxpayers who have a total *CRYPTOCURRENCY GAIN* greater than $1 million as *CRYPTOCURRENCY MILLIONAIRES*. Then, to calculate a taxpayer's total gain from traditional equities, we subtract a taxpayer's total cryptocurrency gain from the total capital gain reported on their tax return. We identify taxpayers who reported over $1 million of non-cryptocurrency capital gains as *EQUITY MILLIONAIRES*. We restrict *EQUITY MILLIONAIRES* to the group of individuals who report non-cryptocurrency *CAPITAL GAIN/LOSS* above $1 million, but *CRYPTOCURRENCY GAIN* less than $1 million. If a taxpayer's *CAPITAL GAIN/LOSS* and *CRYPTOCURRENCY GAIN* each exceed $1 million, we include them among the *CRYPTOCURRENCY MILLIONAIRES*. Finally, we treat all other taxpayers who do not fall into those two categories as we do in Table 1 (e.g., *NON-INVESTOR*, *NON-CRYPTO INVESTOR*, *CRYPTOCURRENCY SELLER*), except that these categories now exclude observations relating to *CRYPTOCURRENCY MILLIONAIRES* and *EQUITY MILLIONAIRES*.

We report descriptive statistics for these groups of taxpayer-years in Table 2. When we compare *CRYPTOCURRENCY MILLIONAIRES* to *EQUITY MILLIONAIRES*, we note that both groups have higher incomes than the other groups, consistent with these groups being associated with higher wealth (income) than non-millionaire groups. *CRYPTOCURRENCY MILLIONAIRES* also report higher income, on average, than *EQUITY MILLIONAIRES*. Rather than the image of

rags to riches, this pattern suggests that these individuals were already wealthy individuals. For example, the average wage income of *CRYPTOCURRENCY MILLIONAIRES* is $366,092 while the average wage income for *NON-CRYPTOCURRENCY INVESTORS* is only $86,215. In addition, it appears that *CRYPTOCURRENCY MILLIONAIRES* also report more cryptocurrency transactions than *NON-MILLIONAIRE CRYPTOCURRENCY SELLERS* (54.57 and 9.57 respectively). Taxpayers with at least a $1 million of cryptocurrency gain are also less likely to receive a cryptocurrency Form 1099-B, which may indicate that these transactions were on-chain or private cryptocurrency transactions.

However, while cryptocurrency millionaires are on average wealthy to begin with, this masks large heterogeneity in initial incomes. To further examine the effects of large cryptocurrency gains, we examine a different set of taxpayers. In particular, we identify taxpayers who had a single tax year with a cryptocurrency gain of $1 million or more. Then, we determine the first year in which each of these taxpayers reported a cryptocurrency gain of at least $1 million and graph the taxable income of these investors in event time, with period $year_t$ being the first year the taxpayer had $1 million or more in cryptocurrency gains. We then divide taxpayers into quartiles based on their total taxable income in $year_{t-2}$, allowing us to see the trend in income, conditioning on prior income, thus allowing us to explore whether these were, indeed, rags to riches stories, on average.

We report the average taxable income of each quartile over time in Figure 4. We can see that the large cryptocurrency gain is a large shock to income for all quartiles. The highest income quartile's taxable income appears to return to pre-cryptocurrency gain levels within two years, by $year_{t+2}$, with average income going from $7.19 million in $year_{t-2}$ to $6.69 million in $year_{t+2}$. However, for each of the bottom three quartiles of income, taxpayers in all three groups appear to

report considerably higher income in $year_{t+2}$ than in $year_{t-2}$. The lowest quartile of income (as of event year t-2) exhibits the largest difference, with average taxable income starting at only $1,666 in $year_{t-2}$ and ending at $2,189,009 by in $year_{t+2}$. Although relatively few individuals have cryptocurrency gains over $1 million in any single year, the results of this analysis provides evidence that at least some low-income taxpayers appear to experience potentially life-changing levels of income via cryptocurrency investments. Further, we note that individuals in the lowest quartile of income in t-2 actually end up with the second highest income in t+2, suggesting that cryptocurrency gains do have, at least for a small section of the population, the ability to reorder income strata in meaningful ways.

4.3 Geographic Location of Cryptocurrency users

We next turn our focus to the geographic location of cryptocurrency users. In Figure 5, we map the ratio of cryptocurrency seller tax returns to total number of tax returns by county for the continental United States for even numbered years. In the early sample years (2014 and 2016), we see very few counties have cryptocurrency investors, with many counties having no cryptocurrency investors at all.[18] In 2018, we observe a much broader adoption across the U.S., suggesting that cryptocurrency was becoming more geographically wide-spread. Notably, some states appear to still have low cryptocurrency reporting rates even in 2020. West Virginia, which was rated 5th on a list of the "worst" states for cryptocurrency investors in 2022 (Newberry, 2022) and had the lowest search interest in Bitcoin in 2020 out of all 50 states (Google Trends analysis, untabulated) appears to have a relatively low incidence of cryptocurrency sellers. New Hampshire also appears to have low cryptocurrency reporting, and also has below average google trends search volume (rank 41) for 2020. However, somewhat puzzling is the relatively low

[18] Due to restrictions on IRS data and bias in small counties, we set any county with less than 10 cryptocurrency reporters or less than 1,000 tax returns to 0.

cryptocurrency taxpayer reporting rates in Nevada, which had the highest Google Trend for Bitcoin out of all 50 states in 2020.

We next move to more granular data on location to examine cryptocurrency reporting at the city level. In Table 3, we report the top 10 cities with the highest cryptocurrency reporter ratio as well as the 10 cities with the highest raw numbers of cryptocurrency reporters. Overall, we see that California has some of the highest ratios of cryptocurrency reporters throughout our sample period, with five out of 10 of the top cities in California in 2014 and eight out of ten in 2020. This seems to indicate that these cryptocurrency "capitals" have maintained their positions throughout our sample period, and the west coast continues to be the area with the highest concentrations of *CRYPTOCURRENCY SELLERS.* Examining the raw number of cryptocurrency reporters without regard to population size is also insightful. We continue to find that more cryptocurrency reporters live on either the west or east coast, with only four non-coastal cities in 2014 and only three non-coastal cities in 2020. Although there might be concern that population drives these results, we note that several of the top 10 largest cities in the U.S. such as Philadelphia, Phoenix, and San Antonio do not appear on the list. We conclude that although cryptocurrency has achieved a much wider adoption over the eight-year period of our sample, there is still significant geographic clustering of cryptocurrency users.

4.4 Cryptocurrency and Occupation

We next examine the occupations (industries of employment) of cryptocurrency sellers using wages and Form W-2 information. We obtain the population of W-2 data for our sample years, which reports wage income and use the W-2 with the highest reported income each year.[19]

[19] For this test, if a tax return is filed as "Married Filing Joint" we identify the highest paid job for both the taxpayer and spouse for each year. If a "Married Filing Joint" tax return is a cryptocurrency seller, we assume both spouses are cryptocurrency reporters.

Next, we identify the three-digit NAICS code based on the business tax return that filed the Form W-2. Similar to our geographic analysis, Table 4 reports the top 10 industry codes for 2014 and 2020 for both the ratio of sellers to total taxpayers and raw number of sellers.

In Panel A, we report the ratio of taxpayers who are *CRYPTOCURRENCY SELLERS* to the total number of taxpayers whose highest paid W-2 is in the given industry. We find that the highest ratios of cryptocurrency reporters generally fall into more technology- or finance- related industries. Publishing and news related industries also make up a large portion of the top industries. We also see that even among the highest ratio industries, the ratio has increased over the sample period. For example, Other Information Services has increased from 0.04% taxpayers in the industry reporting cryptocurrency in 2014 to 3.29% report sales in 2020. We also see that even the 10th highest ratio (Information, 1.65%) in 2020 is higher than all other industries in 2014, highlighting the growth in cryptocurrency adoption. We observe some changes in cryptocurrency seller industry ranks over the sample period, with more retail industries (NAICS3 454, 443) in 2020 than in 2014, and two industries in the top 10 in 2014, Museums, Historical Sites, and Similar Institutions and Motion Picture and Sound Recording Industries, dropping off the list by 2020. We also present the information graphically in Figure 6, Panel A, which also includes data for the years 2016 and 2018. We observe that the general shift in the top industries happens between 2016 and 2018, which coincides with the large increase in the overall number of cryptocurrency sellers.

When we analyze the raw number of cryptocurrency reporters per industry in Panel B, we see more of a shift through time. In 2014, half of the top ten highest ratio and highest raw counts are the same, such as Professional, Scientific and Technical Services, Other Information Services, Publishing Industries, and Computer and Electronic Manufacturing. However, toward the end of the sample period, we see the top industries with the most cryptocurrency reporters are industries

in which we would expect a large number of cryptocurrency sellers simply because they are some of the largest industries (e.g., Food Services and Drinking Places, Educational Services, or Food and Beverage Stores). In fact, none of the industries with the largest ratios are included in the top 10 list by number of sellers by 2020. This change over time lends evidence to the broader adoption of cryptocurrency from a more niche investment to an asset with a much broader appeal and wider reach. Similar to the percentage rank, we also find that the majority of the change in the top industries happens between 2016 and 2018 as can be seen in Figure 6, Panel B.

4.5 Regression Analysis

We conclude our analysis with a model of the determinants of cryptocurrency users. To assess the determinants of being a *CRYPTOCURRENCY SELLERS* we estimate Eq. (1) on a tax return year basis as follows:

$$\begin{aligned} CRYPTOCURRENCY\ SELLERS_{it} = {} & \alpha + \beta_1 AGE(Under\ 24)_{it} + \beta_2 AGE(25\text{-}44)_{it} + \\ & \beta_3 AGE(45\text{-}64)_{it} + \beta_4 LN\ WAGES_{it} + \beta_5 LN\ DIVIDENDS_{it} + \beta_6 MARRIED_{it} + \\ & \beta_7 SINGLE\ MALE_{it} + \beta_8 HOMEOWNER_{it} + \beta_9 DEPENDENTS_{it} + \beta_{10} STUDENT_{it} + \\ & \delta_k + \varepsilon_{it} \end{aligned} \quad (1)$$

We include three indicator variables for various age groups, with individuals greater than 65 being the base group. We include both the natural log of *WAGES* and natural log of *DIVIDENDS* to capture potentially different effects of labor income versus capital income.[20] We include the indicator variables *MARRIED* and *SINGLE MALE* to capture the effects of gender and tax reporting status. Because our observations are primarily at the tax return level, and not the taxpayer level, we do not attempt to allocate income or expenses between spouses, which is why

[20] We specifically avoid using *TAXABLE INCOME* due to the fact that cryptocurrency gains are a part of *TAXABLE INCOME* and we avoid *CAPITAL GAIN/LOSS* for the same reason. We note that if we were to try to remove cryptocurrency gains from income mechanically by subtracting them out, the variable would lose interpretability if there were other losses included on the return, as IRS rules do not allow *TAXABLE INCOME* to go below 0 or *CAPITAL GAIN/LOSS* to go below -3,000.

for married couples we do not indicate a gender. We include *HOMEOWNER* to capture potentially differing asset or net worth values. We include *DEPENDENTS* to capture whether taxpayers with children have different investments. We include *STUDENT* to capture potentially differing socio-economic status and education level. Finally, δ reflects our year fixed effects to help control for the significant time trends in cryptocurrency reporting.

Due to the size of our data set (starting with well over a billion observations), we are unable to run a regression analysis on our full sample. To address this issue, we begin by taking a random sample of 10 million tax returns from the population of tax returns that have data available for the regressions.[21] We repeat each random sampling process 10 times and average the coefficients, standard errors, and adjusted R-squared from the models to report in Table 5. We also report the number of coefficients (out of 10) that are significant at the 1% level. Column 1 reports the results of Eq. (1). As mentioned earlier, the overall probability of being a *CRYPTOCURRENCY SELLERS* is low, only a fraction of a percent. To aid in the interpretation of coefficient magnitude, we also report the overall probability of selling cryptocurrency for the full sample from which each random regression sample is chosen. Our objective with Model (1) and later models is to examine whether certain types of people are more likely to use cryptocurrency than other types of people, rather than attempt to develop a prediction model of cryptocurrency use. The explanatory power of our models is very low (with an R-squared generally below 1%). This pattern suggests that other factors not reflected in our tax return data, such as personal connections, investment advisors, technological aptitude, illegal behavior, or risk preferences, could better explain the variation in cryptocurrency use.

[21] In untabulated analysis described in the online appendix, we find that the random sampling process does a good job of maintaining the attributes of the full sample in the random sample.

In line with prior survey evidence, we find that a significant predictor of cryptocurrency use is age, with *AGE(UNDER 24) (AGE(25-45))* tax returns having a probability 58.0% (82.3%)[22] above the percentage of cryptocurrency owners in the entire population. In fact, all age groups under age 65+ are associated positively with selling cryptocurrency. We also find that a *SINGLE MALE* tax return has a 49% probability above the baseline. Being *MARRIED* is also positively associated with selling. While these associations are consistent with the univariate statistics discussed earlier, observing them in a regression framework allows us to understand these associations conditional on the other variables in the model.

Both measures of income are positively associated with owning cryptocurrency, but that the effect for capital income is larger, with a 1% increase in *TAXABLE DIVIDENDS* being 5.8 times the effect of a 1% increase in *WAGES*. We find that *HOMEOWNER* is positively associated with the probability of reporting cryptocurrency sales and the association holds even when conditioning on income and marital status, while the coefficient on the number of *DEPENDENTS* is negative, indicating that as taxpayers have more children, they are less likely to sell cryptocurrency. We also find that being enrolled in higher education (*STUDENT*) is also highly positively associated with being a cryptocurrency seller with a probability 56.4% above the baseline, even after controlling for age.

We next examine how the associations between particular attributes and cryptocurrency sales have changed over time. To facilitate this comparison, we construct a trend variable, which equals 0 starting in 2013, 1 in 2014, and so forth (*TREND*). We then interact *TREND* with all of our variables from Eq. (1). Specifically, we estimate the following model:

[22] Calculated as (0.00384-0.00243)/0.00243 = .5804

$$CRYPTOCURRENCY\ SELLER_{it} = \alpha + \beta_1 AGE(Under\ 24)_{it} + \beta_2 AGE(25\text{-}44)_{it} + \beta_3 AGE(45\text{-}64)_{it} + \beta_4 LN\ WAGES_{it} + \beta_5 LN\ DIVIDENDS_{it} + \beta_6 MARRIED_{it} + \beta_7 SINGLE\ MALE_{it} + \beta_8 HOMEOWNER_{it} + \beta_9 DEPENDENTS_{it} + \beta_{10} STUDENT_{it} + \beta_{11} TREND + \beta_{12} AGE(Under\ 24)_{it} * TREND + \beta_{13} GE(25\text{-}44)_{it} * TREND + \beta_{14} AGE(45\text{-}64)_{it} * TREND + \beta_{15} LN\ WAGES_{it} * TREND + \beta_{14} LN\ DIVIDENDS_{it} * TREND + \beta_{16} MARRIED_{it} * TREND + \beta_{17} SINGLE\ MALE_{it} * TREND + \beta_{18} HOMEOWNERit * TREND + \beta_{19} DEPENDENTS_{it} * TREND + \beta_{20} STUDENT_{it} * TREND + \varepsilon_{it} \quad 2$$

Table 5, Column 2 reports the result of this analysis. We find that the main effect for most variables is of the opposite sign as in column (1). We note that the coefficients on the interaction terms for both *AGE(UNDER 24)*TREND* and *AGE(25-44)*TREND* are positive, suggesting that *CRYPTOCURRENCY SELLERS* are indeed getting younger over time. The trend for both *SINGLE MALE* and *MARRIED* are also positive. Finally, we find that owning a home (having more dependents) is positively (negatively) associated with the probability of reporting a cryptocurrency sale over time. We also find a positive and large coefficient for *STUDENT*TREND.* Overall, we interpret the evidence to suggest that although the number of *CRYPTOCURRENCY SELLERS* has increased dramatically in recent years, such sellers continue to be different from the general population of taxpayers.[23]

We estimate our regressions on a sampling basis. Here, we describe some tests we performed to validate the sampling methodology we use in our regressions that are necessary because of the constraints in research computing power. In the full sample, 0.243% of the sample tax returns are *CRYPTOCURRENCY SELLERS,* while testing our random sample selection process results in between 0.242-0.246% (average 0.243%) of *CRYPTOCURRENCY SELLERS.* We find similar results when looking at the proportion of our sample that are *NON-INVESTORS,* 78.34% on average in our random samples, 78.35% in the full sample, and *NON-CRYPTO SELLING INVESTORS,* which make up 21.41% on average in our random samples and 21.41% in our full

[23] In analysis described and tabulated in the online appendix, we estimate this regression during different parts of our sample period. While the direction of the results are similar to those reported here, some magnitudes do change.

sample. On average each random sample contains approximately 21,900 *CRYPTOCURRENCY SELLERS*. These cryptocurrency sellers also appear to be similar to the full population. For example, the average (Median) wages reported by *CRYPTOCURRENCY SELLERS* in our random samples is $77,039 ($46,036) while in our full sample the same statistics are $77,049 ($46,010). We note that the standard deviation of our random samples is typically smaller than the full population. For example, the standard deviation for *WAGE INCOME* for the full population is $355,060, while the average standard deviation for our random samples is only $209,624, with only one out of the 10 random samples having a standard deviation larger than the full sample. This pattern is likely due to the fact that the extreme observations on the right tail of the distribution have a very low probability of being selected for a given random sample. Thus, our models may not model the extreme end of the distributions very well. In untabulated robustness checks, we find that keeping the full sample of *CRYPTOCURRENCY SELLERS* observations and selecting a random control sample results in generally consistent inferences, although coefficient size does vary with the proportion of *CRYPTOCURRENCY SELLERS* to control observations.

4.6 Additional Analysis

We conduct two cross-sectional splits to further examine the attributes of *CRYPTOCURRENCY SELLERS*. First, we separately examine the two subsamples of our sample period based on tax year. Given the extreme discontinuous jump in *CRYPTOCURRENCY SELLERS* in 2017, when the number of reporters went from under 7,000 in 2016 to over 120,000 in 2017, we split our sample in half at this point. We report the results of these tests in Table 6, columns (1) and (2), where we partition our sample of 10 million tax returns into two subsamples, one for the 2013 – 2016 period and the other for the 2017 – 2020 period. Although the signs of the

coefficients are consistent across all model variables in both regressions, there are several notable differences in magnitudes.

The coefficient on *AGE(25-44)* in column (1) is approximately the same magnitude as column (2) when scaled by the baseline probability (1.86 vs. 1.79). However, the youngest group of tax payers (*AGE(UNDER 24)*) are more likely to sell cryptocurrency in the later period (baseline adjusted of 1.06 to 1.57). The results suggest that this trend is reversed for *AGE(44-64)* cryptocurrency sellers, who are more likely to sell cryptocurrency in the early period (0.80 to 0.39). We also find that investment income (*LN DIVIDENDS)* has a larger effect in the early period (0.53 to 0.13), while the coefficients on wage income (*LN WAGE)*, *HOMEOWNER*, and *STUDENT* are generally not significantly different from zero in the early period. The coefficients on the indicator variables for gender and marital status exhibit a stronger relation in the late period but are large in both periods when scaled by the baseline percent. The effect for *DEPENDENTS* appears to weaken from the early to late period (-0.27 versus -0.12), suggesting that more taxpayers claiming dependents own cryptocurrency in later years.

We next examine how cryptocurrency taxpayers are different from *NON-INVESTORS* as opposed to *NON-CRYPTO SELLING INVESTORS*. We view this analysis as an important distinction of our study over prior work. Whereas prior studies compare cryptocurrency holders to other investors when using investment data (e.g., Hackethal et al., 2021; Hasso et al., 2019), we are able to compare cryptocurrency investors to a non-investing baseline separate from other investors. We present the results of these tests in Online Appendix Table 1, columns (3) and (4). When comparing *CRYPTOCURRENCY SELLERS* to other tax returns with investments, we find the largest predictors are *AGE(UNDER 24)* (8.49 times the baseline), *STUDENT* (8.45 times the baseline), *AGE(25-44)* (6.30 times the baseline), and *SINGLE MALE* (6.09 times the baseline). We

also observe that *CRYPTOCURRENCY SELLERS* tend to have less dividend income than other investors and are less likely to own their home than other investors. We also examine *CRYPTOCURRENCY SELLERS* compared with the general *NON-INVESTOR* tax returns. While closer in age to non-investors, we find that cryptocurrency sellers are still younger on average, more likely to be married, more likely to be male, and more likely to be a student. The large coefficient on *LN DIVIDENDS* is consistent with *NON-INVESTORS* having no other investment income, by definition. These results provide initial evidence that while *CRYPTOCURRENCY SELLERS* tend to be wealthier and have more income than the general population, some of that difference may actually reverse, depending on the comparison group. In addition, the fact that *CRYPTOCURRENCY SELLERS* report higher wage income than both comparison groups suggest they may be more sophisticated or wealthier, on average.

5. Conclusion

We offer the first broad-sample descriptive evidence on U.S. taxpayers selling cryptocurrency. As the number of cryptocurrency users increases and cryptocurrencies become a larger part of the financial ecosystem, it is imperative that regulators and rule-makers understand who sells cryptocurrencies. The results of our analyses suggest that despite increasingly widespread cryptocurrency selling, users are distinct from other U.S. investors and from non-investing taxpayers (e.g., certain geographic areas of the U.S. continue to be top cryptocurrency areas). Consistent with cryptocurrency gaining more mainstream appeal, we find that the number of counties in the U.S. with significant cryptocurrency reporting has increased dramatically. We also find evidence that the industries where cryptocurrency users work are becoming more diverse, moving from technology and finance related fields to areas such as restaurant workers. The association between certain personal attributes (e.g., gender, income, age, marital and student

status) and cryptocurrency sellers are also changing over time, reinforcing the need for timely, broad-based evidence on cryptocurrency sellers. Our study contributes to the growing literature on cryptocurrency and its users. We also provide timely evidence that can inform lawmakers and regulators as they seek to better target and construct legislation and rules.

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Appendix A. Variable Descriptions

VARIABLE	DESCRIPTION
Variables of Interest	
CRYPTOCURRENCY SELLERS	1 if either the description of a Form 8949 transaction is identified as cryptocurrency or a description from Form 1099-B is identified as cryptocurrency for tax return$_i$ in year$_t$. 0 otherwise. See online appendix A for a description of the textual analysis which identifies transactions as cryptocurrency.
NON-CRYPTO SELLING INVESTOR	1 if tax return in year$_t$ reports either a non-zero amount for dividends or a non-zero amount for capital gain on Form 1040, and is not identified as a CRYPTOCURRENCY SELLERS in year$_t$. 0 otherwise.
NON-INVESTOR	1 if a tax return is neither a CRYPTOCURRENCY SELLERS nor a NON-CRYPTO SELLING INVESTOR, 0 otherwise.
CRYPTOCURRENCY GAIN*	Sum of the total gain or loss reported on form 8949 for transactions identified as cryptocurrency for tax return$_i$ in year$_t$
NUM OF CRYPTO TRANSACTIONS*	Number of separate lines which are identified as cryptocurrency transactions on Form 8949 for tax return$_i$ in year$_t$
CRYPTOCURRENCY 1099B	An indicator equal to 1 if the primary or secondary taxpayer received any Form 1099-B which includes a transaction identified as cryptocurrency. See Online Appendix A. 0 Otherwise.
TREND	A year trend variable which takes the value of 0 in 2013 and increases in increments of 1.
CRYPTOCURRENCY MILLIONAIRE	1 for taxpayer$_i$ if $\sum_{t=2013}^{2020}(CRYPTOCURRENCY\ GAIN_t) \geq$ \$1,000,000
EQUITY MILLIONAIRE	1 for taxpayer$_i$ if $\sum_{t=2013}^{2020}(CAPITAL\ GAIN_t - CRYPTOCURRENCY\ GAIN_t) \geq$ \$1,000,000 and *CRYPTOCURRENCY MILLIONAIRE* = 0
Continuous/Discrete Variables	
AGE	The year in which tax return$_{it}$ was filed less the birth year for the primary taxpayer on tax return$_i$
WAGES	Wages as reported on Form 1040 for tax return$_i$ in year$_t$.
TAXABLE INTEREST	Taxable Interest as reported on Form 1040 for tax return$_i$ in year$_t$.
TAXABLE DIVIDENDS	Taxable Dividends as reported on Form 1040 for tax return$_i$ in year$_t$.
CAPITAL GAIN/LOSS†	Capital Gain/Loss as reported in Form 1040 for tax return$_i$ in year$_t$.
TAXABLE INCOME	Taxable income after all deductions reported on Form 1040 for tax return$_i$ in year$_t$.

DEPENDENTS	Number of dependents reported on a taxpayer's return for $year_t$. This variable ranges from 0 to 4 dependents due to restrictions in IRS data.

Indicator Variables

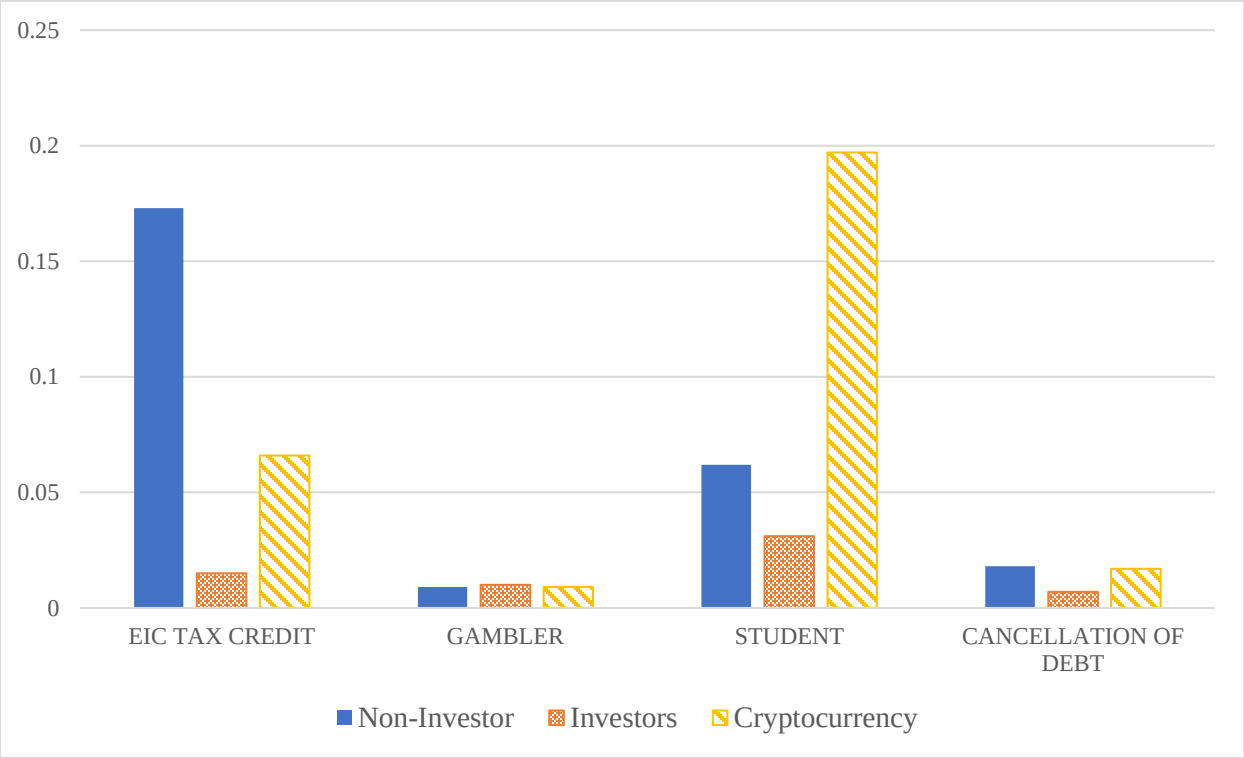
MARRIED	1 if tax $return_i$ in $year_t$ reports both a primary taxpayer and a spouse, 0 otherwise.
SINGLE MALE	1 if tax $return_i$ in $year_t$ does not report a spouse and census data lists the primary taxpayer as male. 0 if census data lists the primary taxpayer as female. Missing otherwise.
SCH A‡	1 if tax $return_i$ in $year_t$ had Schedule A for Itemized deductions attached. 0 otherwise.
EIC TAX CREDIT‡	1 if tax $return_i$ in $year_t$ included Schedule EIC for the Earned Income Tax Credit. 0 otherwise.
HOMEOWNER‡	1 if tax $return_i$ in $year_t$ receives a Form 1098 for mortgage interest.
GAMBLER‡	1 if tax $return_i$ in $year_t$ receives a W-2G for gambling winnings with reported amounts in Box 1 or Box 7
STUDENT‡	1 if tax $return_i$ in $year_t$ receives a 1098-T for tuition and has reported amounts in Box 1 for Tuition and Fees in Box 1
CANCELLATION OF DEBT‡	1 if tax $return_i$ in $year_t$ receives a 1099-C for the cancellation of debt and reports an amount in Box 2

***** *CRYPTOCURRENCY GAIN and NUM CRYPTO TRANSACTIONS* are only non-zero for tax returns for which we identify cryptocurrency transactions. It is possible that some cryptocurrency transactions are summarized on these lines or are summarized on the Schedule D of Form 1040. Thus, they should be interpreted as lower bounds rather than absolute values.

† *CAPTITAL GAIN/LOSS* is reported on Form 1040 after the capital loss limitation. The minimum value for this variable is -3,000. Losses in excess of -3,000 are carried forward and included in the next year's *CAPITAL GAIN/LOSS* amount.

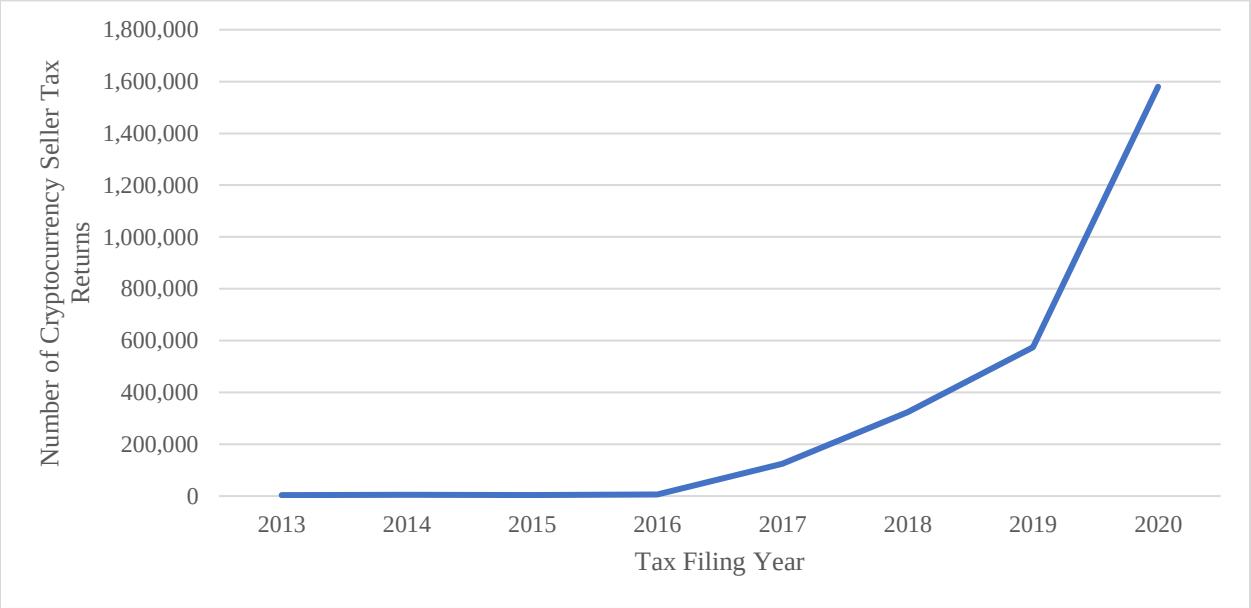
‡The indicator variables for SCH A and EIC TAX CREDIT are indicators for the presence of their respective forms, Schedule A and Schedule EIC. Filing these forms is at the discretion of the taxpayer and does not mean that they claimed the credit or reduced the taxes due of the taxpayer. HOMEOWNER is an indicator variable for the presence of third party reported information on mortgage interest. It therefore captures taxpayers who may or may not report the item on their individual tax returns, but it may not capture taxpayers who fall under the reporting thresholds. Such as taxpayers who pay less than $600 in Mortgage, interest.

Figure 1. Characteristics by Taxpayer Type

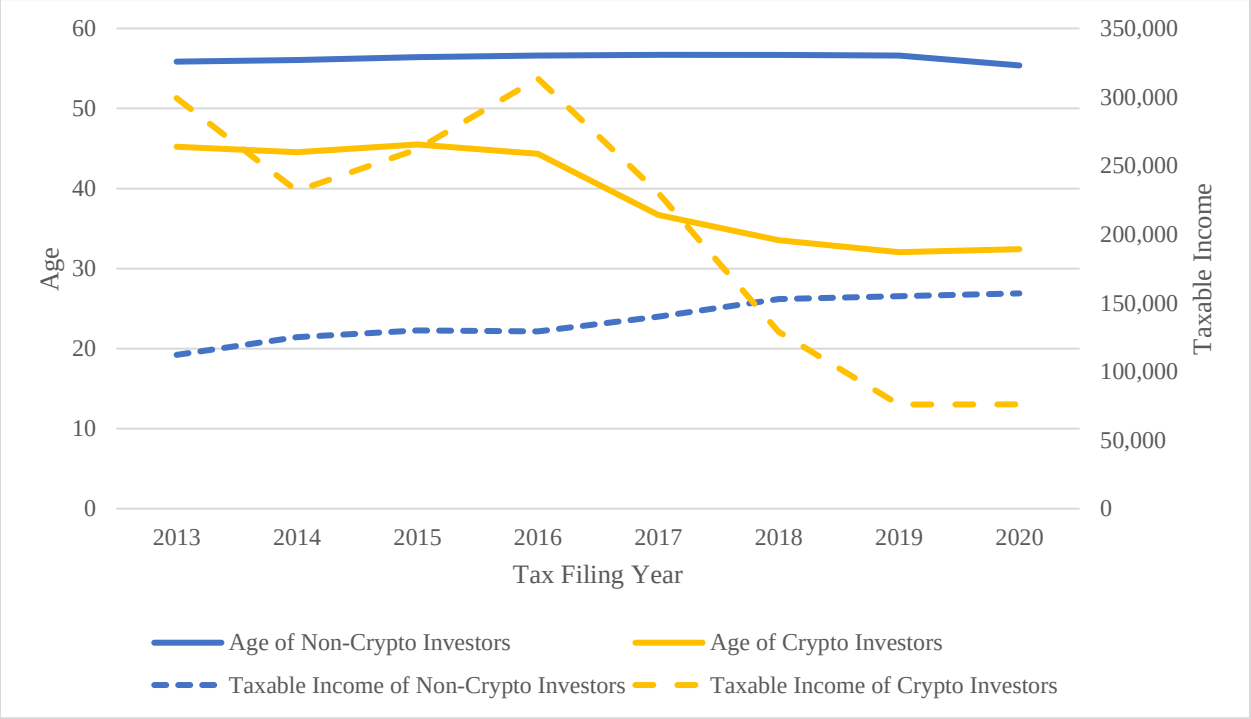


Note: Figure 1 shows the percentage of tax returns, split by taxpayer type, for various statistics. EIC is the percentage of tax returns which include the Earned Income Tax Credit, GAMBLER is the percentage of returns which receive a Form W-2G for gambling income, STUDENT is the percentage of returns which receive a Form 1098-T for tuition expense, and CANCELLATION OF DEBT is the percentage of returns which receive a Form 1099-C for cancellation of debt income.

Figure 2. Time Trends in Cryptocurrency
Panel A. Number of Cryptocurrency Sellers over time

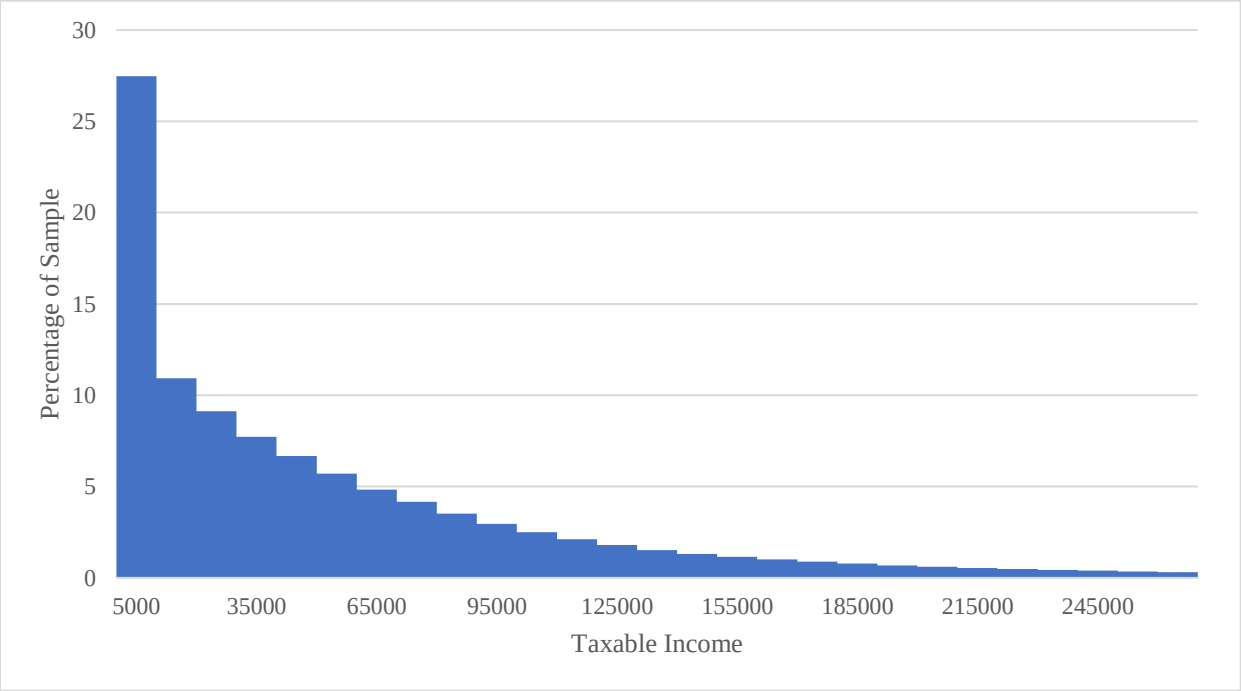


Panel B. Cryptocurrency Seller Age and Income over Time



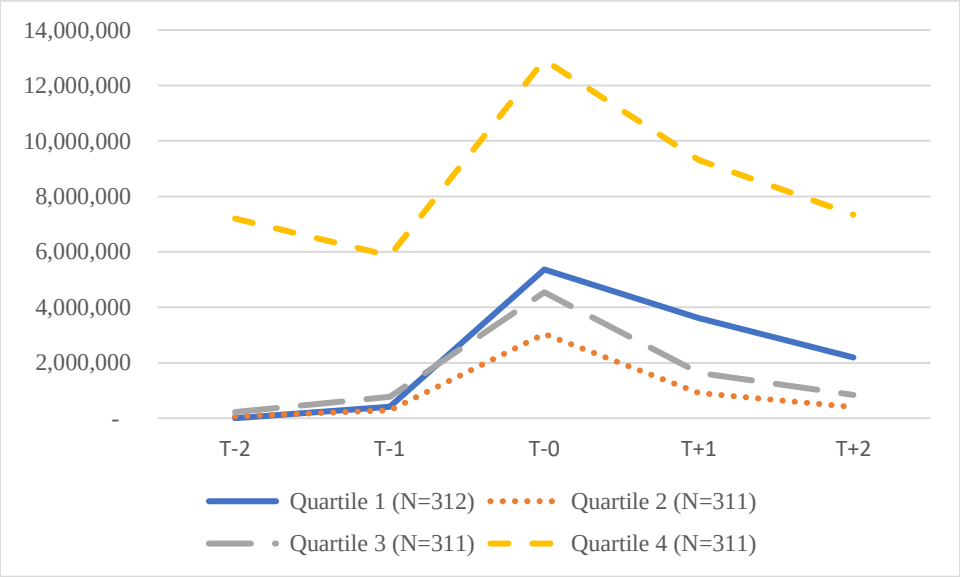
Note: Panel A reports the number of taxpayers who report cryptocurrency each year over our sample period. The number of reporters in trends upward from 4,344 (2013) to over 1.5 million (2020). Panel B splits the population into cryptocurrency sellers or non-cryptocurrency sellers and shows both the age (left-hand Y axis) and Taxable Income (right-hand Y axis) for both groups.

Figure 3. Histogram of Taxable Income for *CRYPTOCURRENCY SELLERS*



Note: Figure 2 shows the Histogram for Taxable Income for *CRYPTOCURRENCY SELLERS* across the sample period. We limit the Y axis to $270,000 of taxable income, which relates approximately to the 95th percentile. Bin width is $10,000, with midpoints listed on the x-axis. Tax returns which would have less than $0 of income due to losses or deductions are limited to $0 due to tax reporting rules.

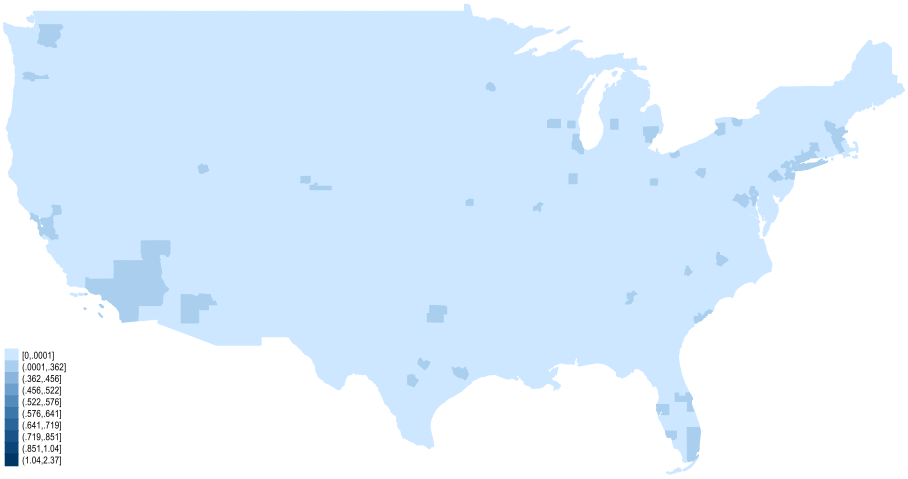
Figure 4. Mean Taxable Income of Taxpayers with >$1 Million Cryptocurrency Gains



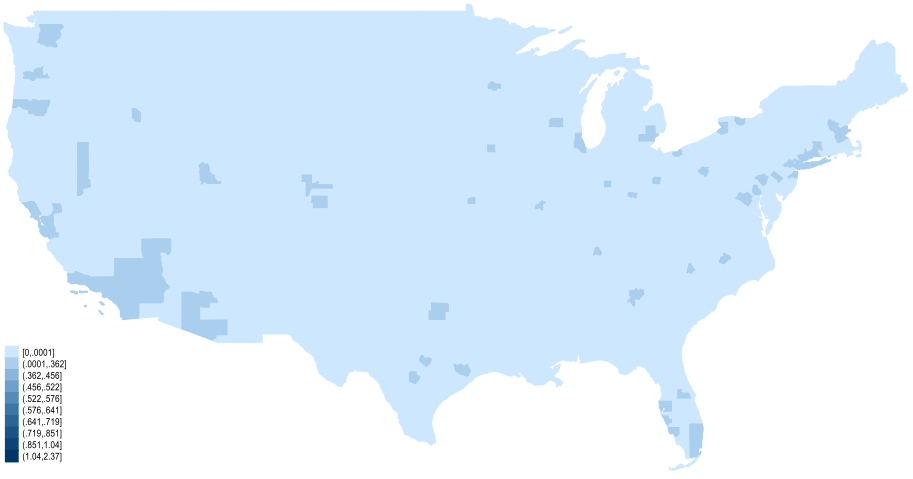
Note: Figure 4 graphs average taxable income over time of taxpayers who reported a Cryptocurrency capital gain of at least $1 million. Taxpayers are divided into quartiles based on their taxable income in T-2. If a taxpayer does not file a return in T-2, we assume that their taxable income is 0. In order to have data to complete quartiles, we only include gains beginning in 2015. The first cryptocurrency gain of at least $1 million is set as T-0.

Figure 5. Heat Map of Cryptocurrency Sellers over time

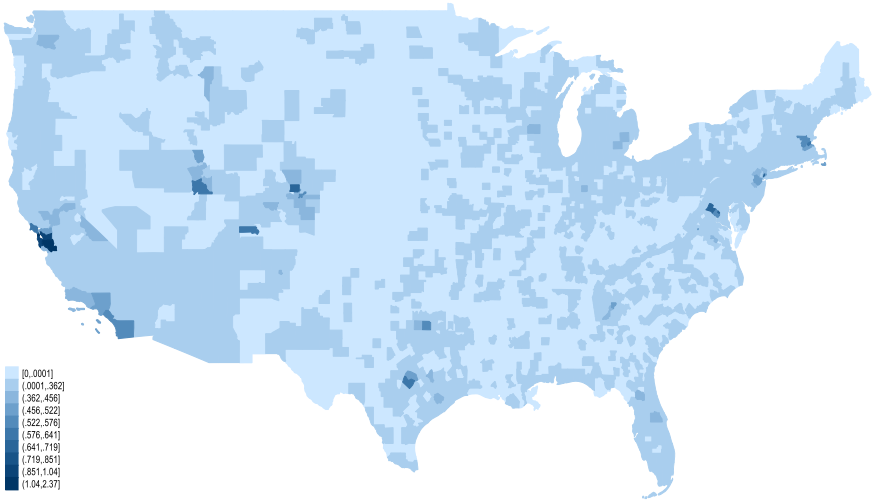
Panel A. 2014



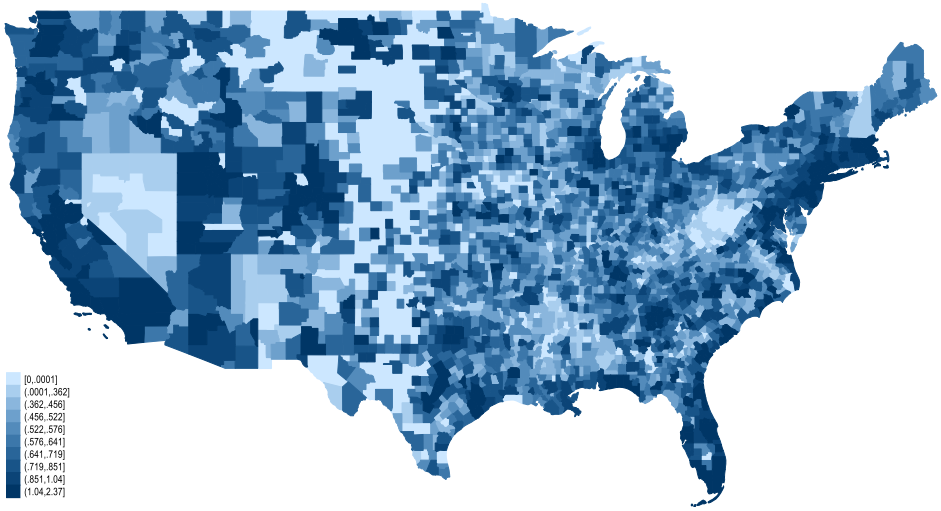
Panel B. 2016



Panel C. 2018



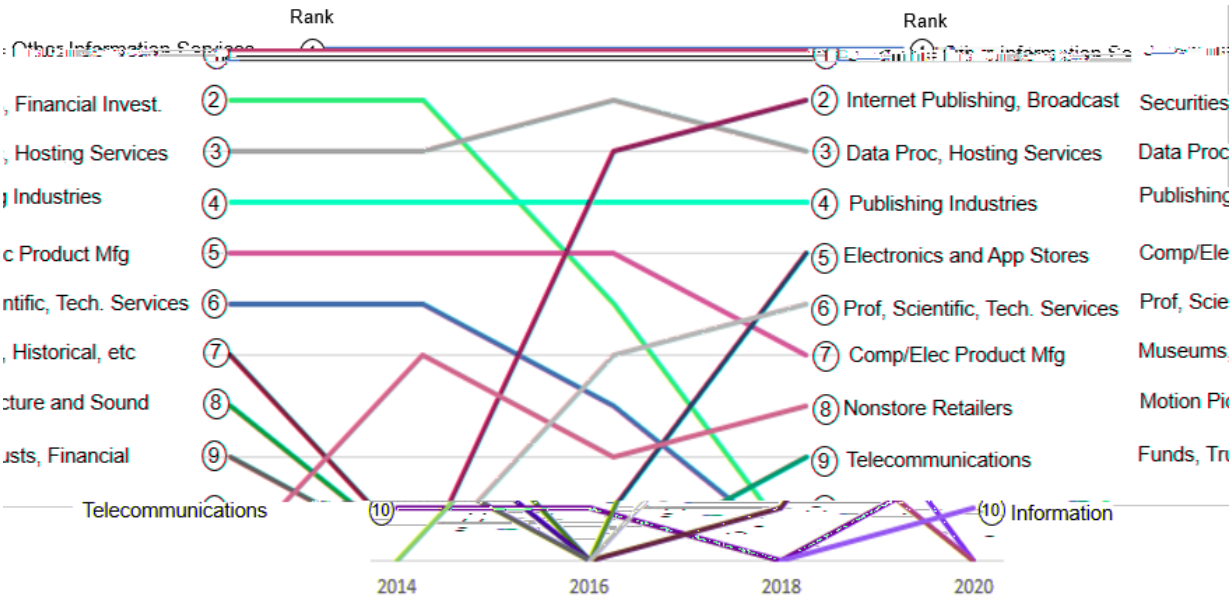
Panel D. 2020



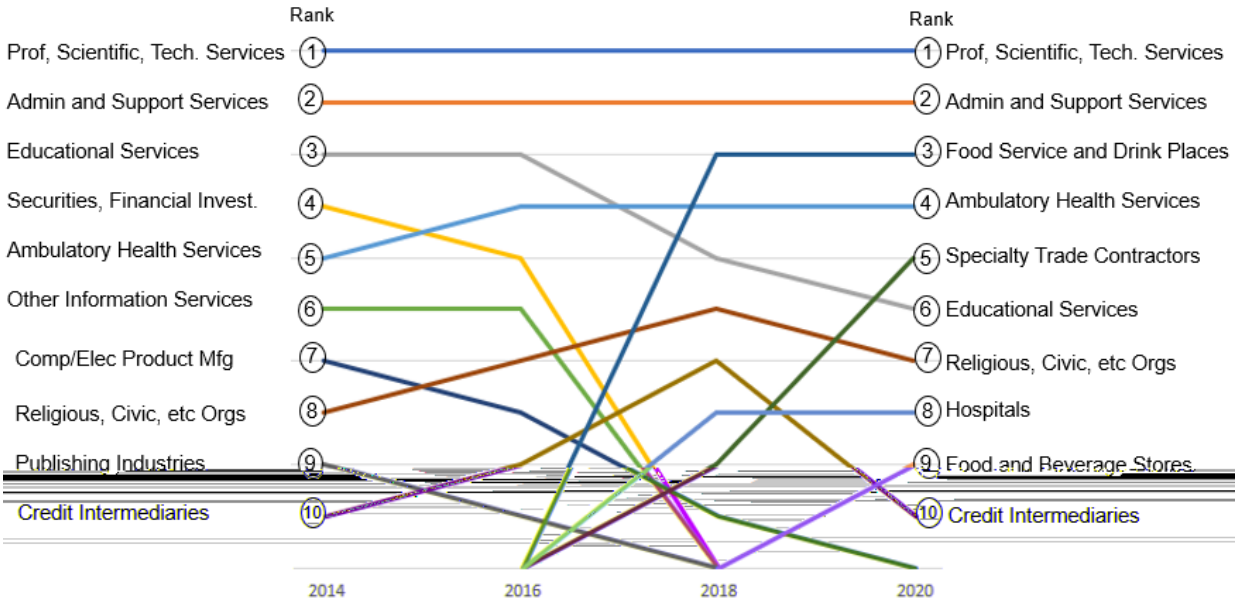
Note: Figure 2 displays a heat map of the percentage of cryptocurrency sellers in each county in the continental United States. Breakpoints between colors are based off of the decile rankings for 2020 to make colors comparable between graphs (Breakpoints: 0, >0 to 0.362, 0.362 to 0.456, 0.456 to 0.522, 0.522 to 0.576, 0.576 to 0.641, 0.641 to 0.719, 0.719 to 0.851, 0.851 to 1.04, and 1.04 to 2.37).

Figure 6. Industry of Cryptocurrency Sellers over time

Panel A: Top Cryptocurrency Seller Job Industries Over Time by Percentage



Panel B: Top Cryptocurrency Seller Job Industries Over Time by Number



Note: Figure 5, Panel A presents the ratio of Cryptocurrency Sellers in a particular business industry by year compared to all taxpayers in the given industry, Panel B presents the top business industries over time ranked by the number of CRYPTOCURRENCY SELLERS. To identify industry of a taxpayer, we obtain the population of W-2 data for our sample years, which reports wage income and use the W-2 with the highest reported income each year. Next, we identify the three-digit NAICS code based on the business tax return that filed the Form W-2. Since *CRYPTOCURRENCY SELLER* is calculated at the tax return level, if a joint tax return is filed, we assume both spouses are/are not holders of cryptocurrency. The denominator is the total taxpayers whose highest paid W-2 is in the given industry. Each taxpayer is assigned only a single industry. Data points are for each even numbered year between 2014 and 2020. A point at the bottom of each chart means that the specified industry was not in the top 10.

Table 1. Descriptive Statistics

	NON-INVESTOR (N=845,102,236)			NON-CRYPTOCURRENCY INVESTOR (N=230,965,310)			CRYPTOCURRENCY SELLERS (N=2,620,926)		
Variables of Interest	**Mean**	**Std. Dev.**	**Median**	**Mean**	**Std. Dev.**	**Median**	**Mean**	**Std. Dev.**	**Median**
AGE	41.47	16.72	39	56.26	18.52	58	32.78	10.75	30
WAGES	39,506	257,012	26,604	86,318	392,742	37,413	77,049	355,060	46,010
TAXABLE INTEREST	98	49,955	0	2,757	152,022	47	1,733	1,263,304	0
TAXABLE DIVIDENDS	0	0	0	7,882	267,688	469	1,649	81,328	0
SCH A	0.168	0.374	0	0.442	0.497	0	0.131	0.338	0
MARRIED	0.316	0.465	0	0.584	0.493	0	0.378	0.485	0
MALE	0.314	0.464	0	0.182	0.385	0	0.541	0.498	0
STUDENT	0.062	0.242	0	0.031	0.174	0	0.197	0.398	0
LN WAGES	8.877	3.611	10.19	7.491	5.263	10.53	9.724	3.309	10.74
LN DIVIDENDS	-	0.000	0	5.663	3.194	6.15	1.686	2.690	0
Descriptive Variables									
*CAPITAL GAIN/LOSS**	0	0	0	22,512	856,090	24	18,765	1,167,616	0
TAXABLE INCOME	34,346	88,971	19,747	138,353	1,079,166	67,115	91,421	1,086,150	36,372
CRYPTOCURRENCY GAIN	-			-			12,484	824,804	27
NUM OF CRYPTO TRANSACTIONS	-			-			9.90	100.40	1
EIC TAX CREDIT	0.173	0.378	0	0.015	0.123	0	0.066	0.249	0
GAMBLER	0.009	0.096	0	0.010	0.099	0	0.009	0.094	0
CANCELLATION OF DEBT	0.018	0.134	0	0.007	0.085	0	0.017	0.129	0
CRYPTOCURRENCY 1099B	-			-			0.784	0.412	1

Note: Table 1 reports descriptive statistics for the full sample of taxpayers (2013-2020) split out between Non-Investors, Non-Cryptocurrency Selling Investors, and Cryptocurrency Sellers. Cryptocurrency Sellers are taxpayers who we identify as selling cryptocurrency for year t through textual analysis of Form 8949 Capital Gain descriptions, or who receive a Form 1099-B which we identify as relating to cryptocurrency through textual analysis of the description. Non-Cryptocurrency Selling Investors are taxpayers who are not identified as selling cryptocurrency but do report either Dividends or a Capital Gain or loss on their Form 1040 in year t. Non-Investor Taxpayers are all other taxpayers. *CAPITAL GAIN/LOSS* is limited to the 3,000 capital loss limitation, however, *CRYPTOCURRENCY GAIN* is calculated on a transaction level basis and is not calculated with regard to the overall capital gain limitation. *CRYPTOCURRENCY GAIN* and *NUM OF CRYPTO TRANSACTIONS* are calculated only using information from Form 8949 and thus have limited non-missing observations (863,340 and 894,177 respectively). Some transactions reported on Form 1099-B may be summarized by taxpayers on their Form 1040 or Schedule D, and thus we would not be able to identify reported amounts for those transactions from the tax return. We avoid calculating reported amounts from Form 1099-B in order to avoid double counting transactions which are reported on both Form 8949 and Form 1099-B. *SINGLE MALE* and *MARRIED* are part of a categorical variable where the baseline is taxpayers who do not file a joint return and are female. Medians are calculated as the mean of the observations around the median observation per IRS disclosure guidelines. Due to missing values for gender and age in the Social Security Administration database, a small number of values for those amounts are missing. In order to comply with IRS data disclosure requirements, medians are calculated as a local average around the true median.

Table 2. Cryptocurrency millionaire descriptive statistics

	NON-MILLIONAIRE									
	NON-INVESTOR (N=845,096,538)		NON-CRYPTO INVESTOR		CRYPTOCURRENCY SELLER (N=2,601,317)		EQUITY MILLIONAIRE (N=75,488)		CRYPTOCURRENCY MILLIONAIRE	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
AGE	41.47	16.72	56.26	18.52	32.69	10.67	46.76	13.37	40.53	11.49
WAGES	39,505	257,012	86,215	389,079	74,387	182,305	457,407	2,688,332	366,092	5,790,899
TAXABLE INTEREST	98	49,955	2,739	151,735	1,173	1,266,663	63,392	523,876	96,070	949,502
TAXABLE DIVIDENDS	-	-	7,853	267,254	797	24,845	102,780	513,208	165,186	2,225,614
SCH A	0.17	0.37	0.44	0.50	0.13	0.33	0.81	0.40	0.57	0.50
MARRIED	0.32	0.46	0.58	0.49	0.38	0.48	0.75	0.43	0.56	0.50
SINGLE MALE	0.31	0.46	0.18	0.39	0.54	0.50	0.22	0.42	0.41	0.49
STUDENT	0.06	0.24	0.03	0.17	0.20	0.40	0.02	0.13	0.03	0.16
*CAPITAL GAIN/LOSS**	0	0	22,207	839,433	5,682	536,312	1,065,872	8,058,907	2,397,415	20,173,968
TAXABLE INCOME	34,345	88,960	137,908	1,068,095	74,386	355,173	1,699,424	8,233,654	2,833,299	16,598,034
CRYPTOCURRENCY GAIN	0	0	0	0	3,402	33,204	-33,068	3,801,461	1,753,248	8,722,526
NUM OF CRYPTO TRANSAC	0.00	0.00	0.00	0.00	9.57	92.93	15.23	214.31	54.57	404.87
EIC TAX CREDIT	0.17	0.38	0.02	0.12	0.07	0.25	0.00	0.05	0.01	0.08
GAMBLER	0.01	0.10	0.01	0.10	0.01	0.09	0.01	0.11	0.02	0.12
CANCELLATION OF DEBT	0.02	0.13	0.01	0.09	0.02	0.13	0.00	0.07	0.01	0.08
CRYPTOCURRENCY 1099B	0.00	0.00	0.00	0.00	0.79	0.41	0.03	0.16	0.02	0.15

Note: Table 2 reports descriptive statistics for the full sample of taxpayers (2013-2020) split out between Non-Investors, Non-Cryptocurrency Selling Investors, Cryptocurrency Sellers. Equity Millionaires, and Cryptocurrency Millionaires. Cryptocurrency Millionaire is a time invariant indicator for taxpayers who recognize over $1 million of gain as a result of cryptocurrency transactions over the sample period. Equity Millionaire is a time invariant indicator for taxpayers who recognize over $1 million of equity capital gain and do not recognize over $1 million of cryptocurrency gain. *CAPITAL GAIN/LOSS* is limited to the 3,000 capital loss limitation, however, *CRYPTOCURRENCY GAIN* is calculated on a transaction level basis and is not calculated with regard to the overall capital gain limitation. *CRYPTOCURRENCY GAIN* and *NUM OF CRYPTO TRANSACTIONS* are calculated only using information from Form 8949 and thus have limited non-missing observations (863,340 and 894,177 respectively). Some transactions reported on Form 1099-B may be summarized by taxpayers on their Form 1040 or Schedule D, and thus we would not be able to identify reported amounts for those transactions from the tax return. We avoid calculating reported amounts from Form 1099-B in order to avoid double counting transactions which are reported on both Form 8949 and Form 1099-B. *SINGLE MALE* and *MARRIED* are part of a categorical variable where the baseline is taxpayers who do not file a joint return and are female. Medians are calculated as the mean of the observations around the median observation per IRS disclosure guidelines. Due to missing values for gender and age in the Social Security Administration database, a small number of values for those amounts are missing.

Table 3. Top 10 Cryptocurrency Cities for 2014 and 2020

Panel A. Top Cryptocurrency Cities for 2014 and 2020 by Percentage of Taxpayer Returns

2014			2020		
Rank	City	Percentage of Sellers	Rank	City	Percentage of Sellers
1	Menlo Park, CA	0.0637%	1	Sunnyvale, CA	1.5402%
2	Mountain View, CA	0.0522%	2	Mountain View, CA	1.5245%
3	San Francisco, CA	0.0410%	3	Ross, CA	1.4648%
4	Palo Alto, CA	0.0384%	4	Milpitas, CA	1.4638%
5	Redmond, WA	0.0369%	5	Cupertino, CA	1.4595%
6	Cambridge, MA	0.0304%	6	Santa Clara, CA	1.4430%
7	New York, NY	0.0202%	7	Redmond, WA	1.4292%
8	Fremont, CA	0.0187%	8	Fremont, CA	1.4005%
9	Seattle, WA	0.0147%	9	Dublin, CA	1.3889%
10	Plano, TX	0.0137%	10	Secaucus, NJ	1.3819%

Panel B. Top Cryptocurrency Cities for 2014 and 2020 by Number of Taxpayers

2014			2020		
Rank	City	Number of Sellers	Rank	City	Number of Sellers
1	San Francisco, CA	162	1	Brooklyn, NY	5,425
2	New York, NY	158	2	New York, NY	5,358
3	Seattle, WA	60	3	Los Angeles, CA	4,775
4	Brooklyn, NY	59	4	Chicago, IL	4,683
5	Austin, TX	47	5	San Francisco, CA	4,450
6	Los Angeles, CA	42	6	Houston, TX	3,912
7	Houston, TX	42	7	Austin, TX	3,880
8	Chicago, IL	41	8	Seattle, WA	3,643
9	San Jose, CA	30	9	San Jose, CA	3,593
10	Minneapolis, MN	30	10	San Diego, CA	3,546

Note: Panel A shows the top ten cities based on the percentage of Cryptocurrency Seller tax returns filed in the given city over all tax returns filed in the given city. The percentage is not calculating the number of taxpayers as one tax return may relate to either one or two taxpayers given the filing status. Panel B shows the top ten cities based on the total number of Cryptocurrency Seller tax returns filed in the given city. For both panels we require any given city to have at least 1,000 tax returns filed in the year, and at least 10 Cryptocurrency Seller returns filed in the year to reduce extreme percentages and due to IRS data restrictions. Taxpayer city is defined using taxpayer provided information on the Form 1040.

Table 4. Top Cryptocurrency Seller Job Industries for 2014 and 2020

Panel A. Top Cryptocurrency Seller Job Industries for 2014 and 2020 by Percentage

	2014			2020		
Rank	Industry	NAICS3	Percent	Industry	NAICS3	Percent
1	Other Information Services	519	0.04%	Other Information Services	519	3.2919%
2	Securities, Commodity Contracts, and Other Financial Investments and Related Activities	523	0.02%	Internet Publishing and Broadcasting	516	2.7027%
3	Data Processing, Hosting, and Related Services	518	0.02%	Data Processing, Hosting, and Related Services	518	2.6124%
4	Publishing Industries (except Internet)	511	0.01%	Publishing Industries (except Internet)	511	2.1485%
5	Computer and Electronic Product Manufacturing	334	0.01%	Electronics and Appliance Stores	443	2.0355%
6	Professional, Scientific, and Technical Services	541	0.01%	Professional, Scientific, and Technical Services	540	1.9145%
7	Museums, Historical Sites, and Similar Institutions	712	0.01%	Computer and Electronic Product Manufacturing	334	1.7639%
8	Motion Picture and Sound Recording Industries	512	0.01%	Nonstore Retailers	454	1.7260%
9	Funds, Trusts, and Other Financial Vehicles	525	0.01%	Telecommunications	517	1.7169%
10	Telecommunications	517	0.00%	Information	510	1.6546%

Panel B: Top Cryptocurrency Seller Job Industries for 2014 and 2020 by Number

	2014			2020		
Rank	Industry	NAICS3	Number	Industry	NAICS3	Number
1	Professional, Scientific, and Technical Services	541	943	Professional, Scientific, and Technical Services	541	227,586
2	Administrative and Support Services	561	301	Administrative and Support Services	561	141,207
3	Educational Services	611	248	Food Services and Drinking Places	722	98,763
4	Securities, Commodity Contracts, and Other Financial Investments and Related Activities	523	212	Ambulatory Health Care Services	621	71,381
5	Ambulatory Health Care Services	621	191	Specialty Trade Contractors	238	56,926
6	Other Information Services	519	143	Educational Services	611	55,423
7	Computer and Electronic Product Manufacturing	334	124	Religious, Grantmaking, Civic, Professional, and Similar Organizations	813	41,559
8	Religious, Grantmaking, Civic, Professional, and Similar Organizations	813	121	Hospitals	622	39,738
9	Publishing Industries (except Internet)	511	108	Food and Beverage Stores	445	39,737
10	Credit Intermediation and Related Activities	522	107	Credit Intermediation and Related Activities	522	33,102

Note: Table 4, Panel A presents the ratio of Cryptocurrency Sellers in a particular business industry by year compared to all taxpayers in the given industry. To identify industry of a taxpayer, we obtain the population of W-2 data for our sample years, which reports wage income and use the W-2 with the highest reported income each year. Next, we identify the three-digit NAICS code based on the business tax return that filed the Form W-2.. Since *CRYPTOCURRENCY SELLER* is calculated at the tax return level, if a joint tax return is filed, we assume both spouses are/are not holders of cryptocurrency. The denominator is the total taxpayers whose highest paid W-2 is in the given industry. Each taxpayer is assigned only a single industry. Panel B presents the same information except that instead of the ratio of cryptocurrency sellers total, industries are ranked by the raw number of cryptocurrency sellers.

Table 5. Determinants of Cryptocurrency Sellers

	(1)		(2)	
Dependent Variable: *CRYPTOCURRENCY SELLERS*				
Independent Variables				
		†		†
AGE (UNDER 24)	0.00458	10	-0.00395	10
	(0.000062)		(0.000068)	
AGE (25-44)	0.00466	10	-0.00372	10
	(0.000054)		(0.000058)	
AGE (45-64)	0.00113	10	-0.00073	10
	(0.000036)		(0.000039)	
LN WAGES	0.00006	10	-0.00004	10
	(0.000004)		(0.000005)	
LN DIVIDENDS	0.00035	10	-0.00021	10
	(0.000007)		(0.000007)	
MARRIED	0.00247	10	-0.00333	10
	(0.000035)		(0.000057)	
SINGLE MALE	0.00353	10	-0.00482	10
	(0.000041)		(0.000066)	
HOMEOWNER	0.00029	10	-0.00012	6
	(0.000036)		(0.00004)	
DEPENDENTS	-0.00031	10	0.00032	10
	(0.000017)		(0.000019)	
STUDENT	0.00380	10	-0.00487	10
	(0.000126)		(0.00016)	
TREND			-0.00140	10
			(0.000018)	
*AGE (UNDER 24) * TREND*			0.00232	10
			(0.000034)	
*AGE (25-44) * TREND*			0.00227	10
			(0.000028)	
*AGE (45-64) * TREND*			0.00048	10
			(0.000018)	
*LN WAGES * TREND*			0.00002	10
			(0.000002)	
*LN DIVIDENDS * TREND*			0.00015	10
			(0.000003)	
*MARRIED * TREND*			0.00125	10
			(0.000019)	
*SINGLE MALE * TREND*			0.00179	10
			(0.000022)	

*HOMEOWNER * TREND*			0.00011	[10]
			(0.00002)	
*DEPENDENTS * TREND*			-0.00018	[10]
			(0.00001)	
*STUDENT * TREND*			0.00163	[10]
			(0.000053)	
Intercept	-0.00031	[10]	0.00032	[10]
	(0.000017)		(0.000019)	
Observations	10,000,000		10,000,000	
Year Fixed Effects	YES		NO	
Baseline Full Sample Probability of Crypto Seller	0.00243		0.00243	
Average Adj R-Squared	0.002		0.002	

†: Superscript numbers next to coefficients are the number of significant coefficients (out of 10) at the 1% level across the 10 random samples.

Note: Reported coefficient estimates, standard errors, and adjusted R^2 are average numbers over 10 iterations of random sampling. For each random sample, 10 million tax returns were selected at random from the full sample of tax returns (approx. 1.078 billion, from which the baseline full sample probability was computed). Numbers to the right of the coefficient are the number of coefficients that were significant at the 1% level over all iterations. Column (1) reports the results of model 1 on a random sample of all tax returns. Column (2) reports the results of model 2 on a random sample of all tax returns. Variables are defined in Online Appendix A. Robust Standard errors are reported in parentheses. To aid in the interpretation of coefficient magnitude, the baseline full sample probability of being a *CRYPTOCURRENCY SELLERS* is reported at the bottom of each column.

Table 6. Cross sectional samples of cryptocurrency determinants

	(1)		(2)		(3)		(4)	
Sample	Early Sample 2013-2016		Late Sample 2017-2020		Only Crypto Sellers and Investors		Only Crypto Sellers and non-Investors	
Dependent Variable: *CRYPTOCURRENCY SELLERS*								
Independent Variables								
		†		†		†		†
AGE (UNDER 24)	0.00004	8	0.00850	10	0.03255	10	0.00380	10
	(0.000012)		(0.000117)		(0.000574)		(0.000063)	
AGE (25-44)	0.00007	10	0.00856	10	0.02076	10	0.00348	10
	(0.000013)		(0.000098)		(0.000272)		(0.000053)	
AGE (45-64)	0.00004	7	0.00189	10	0.00090	10	0.00064	10
	(0.000012)		(0.000064)		(0.000135)		(0.000039)	
LN WAGES	0.00000	1	0.00010	10	0.00011	10	0.00004	10
	(0.000001)		(0.000008)		(0.000015)		(0.000005)	
LN DIVIDENDS	0.00002	10	0.00062	10	-0.00342	10	0.16578	10
	(0.000002)		(0.000012)		(0.000029)		(0.00085)	
MARRIED	0.00003	10	0.00469	10	0.00694	10	0.00256	10
	(0.000006)		(0.000067)		(0.000137)		(0.00004)	
SINGLE MALE	0.00004	10	0.00661	10	0.01865	10	0.00327	10
	(0.000006)		(0.000076)		(0.000257)		(0.000041)	
HOMEOWNER	0.00001	2	0.00051	10	-0.00788	10	0.00029	10
	(0.000007)		(0.000069)		(0.000155)		(0.000041)	
DEPENDENTS	0.00000	2	-0.00058	10	0.00006	10	-0.00030	10
	(0.000003)		(0.000033)		(0.000096)		(0.000017)	
STUDENT	0.00000	0	0.00413	10	0.02613	10	0.00363	10
	(0.000016)		(0.000163)		(0.000912)		(0.000126)	
Intercept	0.00000	2	-0.00058	10	0.00006	10	-0.00030	10
	(0.000003)		(0.000033)		(0.000096)		(0.000017)	
Observations	10,000,000				10,000,000			
Year Fixed Effects	YES		YES		YES		YES	
Baseline Full Sample Probability of Crypto Seller	0.00004		0.00459		0.00309		0.01122	
Average Adj R-Squared	0.000		0.005		0.011		0.003	

†: Superscript numbers next to coefficients are the number of significant coefficients (out of 10) at the 1% level across the 10 random samples.

Note: Reported coefficient estimates, standard errors, and adjusted R^2 are average numbers over 10 iterations of random sampling. For each random sample, 10 million tax returns were selected at random from the full sample of tax returns (approx. 1.078 billion, from which the baseline full sample probability was computed). Numbers to the right of the coefficient are the number of coefficients that were significant at the 1% level over all iterations. Column (1) and (2) report the results of model 1 run on the same random samples split by early sample period (2013-2016) and late sample period (2017-2020). Each column is therefore only a portion of the full 9 million tax return random sample. Column (3) and (4) report the results of model 1 where the control sample consists of only NON-CRYPTO SELLING *INVESTORS* (3) or *NON-INVESTORS* (4). Each column is therefore only a portion of the full 10 million tax return random sample. Variables are defined in Online Appendix A. Robust standard errors are reported in parenthesis. To aid in the interpretation of coefficient magnitude, the baseline full sample probability of being a *CRYPTOCURRENCY SELLERS* is reported at the bottom of each column. The number of observations in each random sample varies based on the cross-sectional split and random sample.

Online Appendix- Not for print publication

Overview of the Bitcoin Network and Transactions

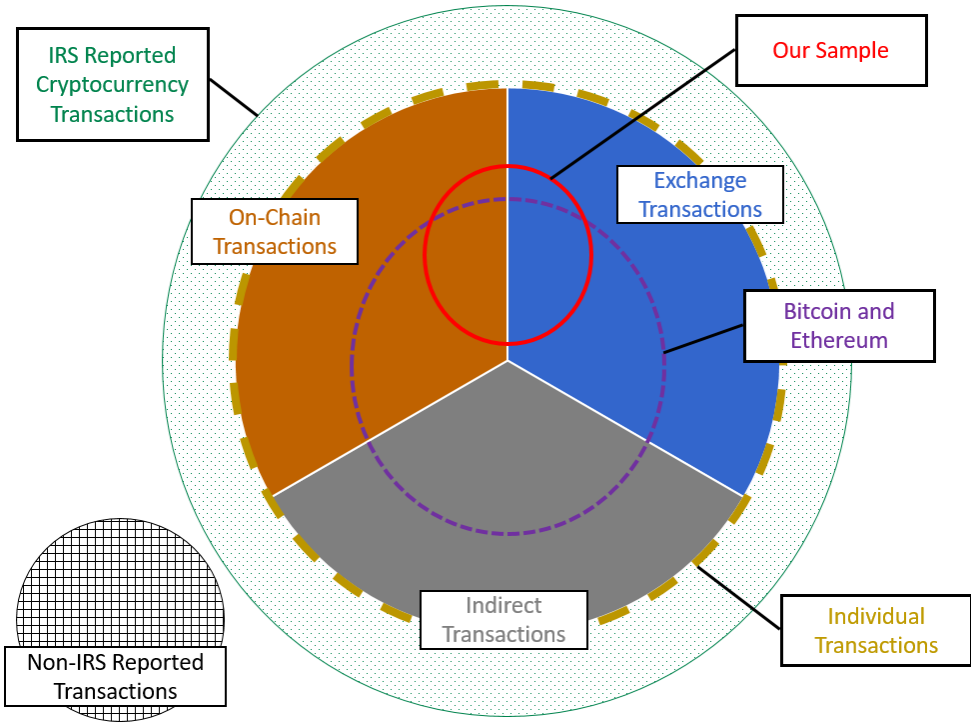
Bitcoin can refer both to the unit of account as well as the ledger which records transactions denominated in Bitcoin. Although we will discuss Bitcoin specifically, the general information applies to many other similar cryptocurrencies and we attempt to note important differences. Bitcoin is a decentralized public ledger and can be thought of as serving a similar function to a bank. The Bitcoin ledger, commonly referred to as "the Blockchain", contains and updates a list of transactions which can be used to identify how much Bitcoin is associated with each account. We next go over the key features of Bitcoin and similar cryptocurrencies.

Unlike a traditional bank, Bitcoin is decentralized. This means there is no central authority approving or processing transactions. Instead, when an individual wants to send Bitcoin, they broadcast the transaction to the entire Bitcoin network. Then, individuals or groups known as "Miners" observe those transactions and compete with each other for the right to confirm those transactions are legitimate and post them to the Blockchain. This competition helps to ensure that no single entity has control over which transactions are or are not posted to the ledger. As a reward for the effort, miners are rewarded with both Bitcoin transaction fees paid by users as well as a set Bitcoin reward which is created for each new batch of transactions that is confirmed. For Bitcoin, the competition for the right to post transactions is based on computing power, where miners with more computing power are more likely to win. Other cryptocurrencies use other mechanisms to determine which transactions are recorded on the blockchain.

Although the blockchain is a form an accounting ledger, there are several differences which make it unique from other systems. First, the Blockchain does not record running totals like a bank account. Instead, each account (also called a wallet) is the sum of all transactions that have taken place relating to that wallet. Therefore, in order to know the current balance of a wallet, one must examine the entire history of the blockchain, not simply the most recent transactions. The second difference is that Bitcoin accounts cannot be split. If a user has 100 Bitcoin in a wallet and want to spend 10 Bitcoin, then they must send 90 Bitcoin to another wallet owned by themselves and 10 Bitcoin to the external recipient. Wallets are reusable and can receive unlimited deposits. The third detail about Bitcoin is that it is a sender-based system. In order to send Bitcoin, all a sender needs is a Bitcoin account address, and Bitcoin can be sent without any action or even knowledge of the receiver. Taken together, this makes Bitcoin pseudonymous. The entire transaction history of each individual Bitcoin account can be observed, however, a single user can have an infinite number of accounts. In addition, because there is no central processing party, the identity of the owner of individual Bitcoin accounts is difficult to determine without additional information outside of the Blockchain.

Several factors have led to innovation and changes within the cryptocurrency space. First, long transaction approval times (greater than 10 minutes for many Bitcoin transactions) and high transaction fees have led users to both transact with centralized Bitcoin market makers and develop competing cryptocurrencies with the aim of reducing the inefficiencies in Bitcoin. Second, although Bitcoin is pseudonymous, newer cryptocurrencies have been designed to increase privacy and security. Finally, new blockchains have been developed which allow users to increase the complexity of transactions. For example, a user could set up a transaction to send some value of cryptocurrency only if a specific set of identifiable outcomes is realized. Ultimately, the Bitcoin and cryptocurrency ecosystem continues to rapidly evolve and change over time, offering new opportunities but also challenges for investors, regulators, and researchers.

Online Appendix Figure 2. Cryptocurrency Transaction Types (*Not drawn to scale*)



Notes: This figure is a representation of the various types of cryptocurrency transactions that taxpayers may engage in, and how those definitions relate to our sample of identified cryptocurrency transactions. The figure is not intended to be definitive, but provided to help understand the relationship between the universe of transactions and those which we identify. We provide additional definitions below:

Non-IRS reported Transactions: These are cryptocurrency transactions which are not reported to the IRS on an individual tax return on Form 8949 nor are reported to the IRS by third parties on Form 1099-B.

IRS Reported Cryptocurrency Transactions: These are transactions which are reported to the IRS. This could be through reporting on tax returns (Individual, Business, and Trust), or through reported to the IRS through various third party reporting (e.g. Form 1099-B, Form 1099-MISC).

Individual Transactions: These transactions include only those transactions that are reported directly on Form 1040 for an individual taxpayer or are reported on Form 1099-B where the taxpayer has a Social Security number. Individual transactions does not include transactions which are reported by businesses even if those transactions may eventually flow through to an individual return on Schedule K-1 and Schedule E.

On-Chain Transactions: On-Chain transactions refer to cryptocurrency transactions which are recorded permanently on a public blockchain. These transactions include sending or receiving cryptocurrency directly to individual wallets as well as sales of cryptocurrency made directly on the blockchain. The details of these transactions is generally publically available but pseudo-anonymous. It is thus difficult to link the public blockchain data directly to taxpayers. On-Chain Transactions also are not generally subject to third party reporting unless there is a centralized intermediary facilitating the transaction.

Exchange Transactions: Exchange transactions refer to cryptocurrency transactions done through a centralized third-party outside of the blockchain. These transactions are generally recorded on internal accounts or ledgers of the centralized party. Thus, individual transactions may not appear, or may only appear in aggregate on the blockchain.

Online Appendix Figure 3. Google Trends Index for "bitcoin"