

# An Empirical Study on Bitcoin Payment Usage in e-Commerce

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Based on our work:

# Price Fluctuations and the Use of Bitcoin: An Empirical Inquiry

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# **THE USE OF BITCOIN IN E-COMMERCE**

# The use of Bitcoin in e-commerce: Research methodology

- In the study focused on the use of Bitcoin in e-commerce, we explore the determinants of the Bitcoin-generated sales-fraction among online vendors that have adopted this payment method.
- The study is based on the results of the first-ever global survey of legal on-line vendors that have adopted Bitcoin as a payment mechanism.
  - An English-language questionnaire was distributed to the known population of vendors in April 2013.
  - Of slightly over 600 companies surveyed, 108 responses from 35 countries were collected.
- Our results significantly broaden the knowledge about Bitcoin in that they reveal the determinants of its use in e-commerce, including:
  - the characteristics of the seller,
  - the market environment of the country in which the company has its headquarters,
  - the use of alternative payment methods.



## Table IV. Activity of Bitcoin Network Activity by Country Compared to the Sample Structure

Country (TOP-5 by Nodes)	Percentage of Bitcoin Nodes (September 2014)	Percentage of Respondents (April 2013)
USA	39%	34%
Germany	8%	11%
United Kingdom	7%	7%
France	6%	1%
Canada	5%	3%



Source: Data on 'Percentage of respondents' originates from our survey conducted in April 2013, while the data 'Percentage of Bitcoin Nodes' comes from The Bitcoin Foundation <https://getaddr.bitnodes.io/> (last accessed September 2013). Bitcoin nodes are points on the network that hold the core client together with a copy of the complete blockchain. Most nodes are held by miners who need access to the blockchain in order to create new blocks and who are obliged to store the full history of transactions.

# Table VII. Modeling the Fraction of Sales Conducted via Bitcoin

Panel A. Results of OLS Estimation				
	(1)	(2)	(3)	(4)
<b>Intercept</b>	-15.8611** (7.5235)	13.7449 (10.7200)	154.1301*** (28.9745)	1.8429 (11.4494)
<b>Size</b>	-0.0461* (0.0258)			
<b>Start-Up</b>	30.9588*** (6.5274)	22.4614*** (6.3029)	20.1376*** (6.0898)	19.5028*** (6.3316)
<b>Physical_Location</b>	-5.7005 (6.6917)			
<b>Bitcoin_Knowledge</b>	14.1837*** (3.4209)	12.0883*** (2.6929)	13.8861*** (2.4916)	12.7528*** (2.4782)
<b>Payment_Card</b>		-14.1959** (5.9802)	-14.4356** (5.9930)	-15.1790** (6.0155)
<b>PayPal</b>		-25.4845*** (5.9797)	-23.9468*** (5.7469)	-25.3335*** (5.6758)
<b>Pay_by_Link</b>		23.3874** (9.2047)	23.3628** (11.1243)	23.4049* (12.2232)
<b>Cash (on delivery)</b>		-17.4715** (6.9065)	-15.9047** (6.3367)	-15.0971** (6.9229)
<b>Bank_Transfer</b>		3.9960 (6.6462)	-1.1811 (6.0943)	-2.1165 (6.6552)
<b>InGDP</b>			-13.6480*** (2.8853)	
<b>Shadow_Economy</b>				0.8220*** (0.2272)
<b>R-squared</b>	0.4257	0.5866	0.6499	0.6443
<b>Adj. R-squared</b>	0.3992	0.5540	0.6165	0.6096
<b>F-statistic</b>	16.1190	18.0375	19.4895	18.5637
<b>Prob (F-statistic)</b>	0.0000	0.0000	0.0000	0.0000

Note. This table presents regressions linking the percentage of sales conducted via Bitcoin to a range of explanatory variables. Panel A reports OLS results, while Panel B provides estimates of a Tobit model left censored at 0 and right censored at 90. Variable definitions are given in Table IV. Standard errors of parameter estimates are given in parentheses and those reported in Panel A were estimated using White (1980) heteroskedasticity-consistent method. \*, \*\* and \*\*\* represent statistical significance at 10%, 5% and 1%, respectively.



# Empirical results

## Alternative payment methods

Substitutes

- Strong negative impact of **PayPal** and **payment cards**. Facing the choice between Bitcoin and PayPal or cards, many customers will choose the familiar and established technology:
  - better knowledge + lower risk for the customer (chargeback protection in PayPal and payment cards).
- **Cash-on-delivery** is often used by (unbanked) individuals distrustful or ignorant of new technologies.
  - This segment of customers will be less interested in using Bitcoin.
- Positive association between Bitcoin and Pay-By-Link (online mechanism based on bank transfers).
  - Similar features: speed, low costs (cheaper to cards or PayPal), non-reversible payment (no chargeback).
  - Different segments (not a true substitute):
    - Pay-By-Link are dedicated to domestic transactions of bank account holders;
    - Bitcoin suits the global market and poses only ICT requirements.



# MANAGERIAL IMPLICATIONS

# Managerial Implications (1/2)

Our study provides practical recommendations for e-commerce managers who are considering accepting Bitcoin payments:

**Scenario 1.** – If vendors want low transaction costs and no chargeback,

- they should avoid payment cards, PayPal and cash on delivery (where the client may refuse the shipment).
- Pay-By-Link and Bitcoin are both cheap with non-reversible transactions, but of the two, only Bitcoin suits cross-border payments.

**Scenario 2.** – If a company is willing to accept higher costs and risks to improve customer convenience,

- they should accept payment cards and PayPal, which customers in developed countries prefer.
- In such cases, Bitcoin provides only limited benefits but, if the vendor is looking to sell in developing countries with larger shadow economies, then accepting the cryptocurrency is a sensible option.

# Managerial Implications (2/2)

- Bitcoin has its own unit of value with very high volatility, therefore vendors will need to choose between the following ways of accepting payments:

## **Option 1.**

Keeping their own Bitcoin wallet and accept payments directly,

- They do not bear any additional charges.
- They become investors and take the associated exchange rate risk.
- It may be associated with legal and/or tax risks specific of a given country.

## **Option 2.**

Using the Payment Service Provider and paying its commission.

- Payment Service Providers play an important role in the development of the Bitcoin acceptance.
- They process transactions and assume the risk of exchange rate.
- The cost for merchant is usually less than 1% of value.



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# APPENDIX

# Table V. Definitions of Variables Constructed from the Survey

Variable	Definition
<b><u>Company-Specific Variables</u></b>	
<b>Bitcoin_Sales</b>	This variable records responses to the following questionnaire item: 'What is the fraction of sales value conducted via Bitcoin?' This question was multiple choice and specified 7 intervals ranging from 0% to 81-100%. For the purposes of our calculations we have taken the midpoint of the interval selected and expressed the data in percentage points.
<b>Size</b>	Number of employees working for the company. Records represent midpoints of 5 different intervals.
<b>Start-Up</b>	Dummy variable indicating companies established less than 3 years ago.
<b>Bitcoin_Knowledge</b>	Variable recording responses to the following question: 'How would you rate the knowledge of your customers regarding Bitcoin?' on a 4-point scale ranging from 1) Very poor to 4) Very good.
<b>Physical_Location</b>	Dummy variable indicating whether the company is conducting sales in a physical location (e.g. shop, office, service outlet).
<b>Payment_Card</b>	Dummy variable for the acceptance of payment cards (debit, credit) by the company.
<b>PayPal</b>	Dummy variable for the acceptance of PayPal payments.
<b>Pay_by_Link</b>	Dummy variable for the acceptance of payments via Pay-By-Link.
<b>Cash</b>	Dummy variable for companies accepting the 'cash-on-delivery' payment method.
<b>Bank_Transfer</b>	Dummy variable for companies accepting bank transfers from their customers.
<b><u>Country-Specific Variables</u></b>	
<b>InGDP</b>	Natural logarithm of GDP per capita expressed in current US dollars for the country in which the company is headquartered. The data was taken from World Economic Outlook Database compiled by IMF.
<b>Shadow_Economy</b>	Size of the shadow economy (in % of official GDP) estimated for the country in which the company is headquartered. This data has been sourced from the Appendix of Schneider (2012).



## Table VI. Summary Statistics for the Survey Variables

Variable	Number of Observations	Mean	Standard Deviation	25 <sup>th</sup> Percentile	Median	75 <sup>th</sup> Percentile
<b>Company-Specific Variables</b>						
Bitcoin_Sales	101	30.6931	37.1351	5.0000	5.0000	90.0000
Size	100	8.2000	34.9973	1.0000	6.0000	6.0000
Start-Up	108	0.4907	0.5022	0.0000	0.0000	1.0000
Physical_Location	108	0.2315	0.4237	0.0000	0.0000	0.0000
Bitcoin_Knowledge	101	2.3366	1.0225	1.0000	3.0000	3.0000
Payment_Card	108	0.3889	0.4898	0.0000	0.0000	1.0000
PayPal	108	0.6389	0.4826	0.0000	1.0000	1.0000
Pay_by_Link	108	0.0278	0.1651	0.0000	0.0000	0.0000
Cash	108	0.1944	0.3976	0.0000	0.0000	0.0000
Bank_Transfer	108	0.4352	0.4981	0.0000	0.0000	1.0000
<b>Country-Specific Variables</b>						
InGDP	101	10.5220	0.6584	10.5808	10.8004	10.8781
Shadow_Economy	99	14.9667	8.7401	8.6000	12.5000	16.0000

# Table VII. Modeling the Fraction of Sales Conducted via Bitcoin

Panel B. Results of Tobit Estimation				
	(1)	(2)	(3)	(4)
<b>Intercept</b>	-47.1749*** (15.2608)	1.0252 (14.5427)	250.9073*** (67.6949)	-16.8294 (15.7426)
<b>Size</b>	-0.0383 (0.1296)			
<b>Start-Up</b>	49.5839*** (10.1324)	34.8684*** (8.3885)	30.6624*** (8.0697)	29.6082*** (8.0095)
<b>Physical_Location</b>	-4.1224 (12.2988)			
<b>Bitcoin_Knowledge</b>	24.1768*** (5.3218)	19.9666*** (4.1189)	23.3836*** (4.0981)	20.9831*** (3.9384)
<b>Payment_Card</b>		-16.5761** (8.0730)	-16.6151** (7.7814)	-17.1115** (7.7229)
<b>PayPal</b>		-40.2662*** (8.4360)	-39.2853*** (8.0740)	-39.9375*** (7.9508)
<b>Pay_by_Link</b>		35.3557 (23.2584)	30.1452 (20.9575)	28.6266 (20.8604)
<b>Cash (on delivery)</b>		-24.1125** (10.8759)	-22.8749** (10.6846)	-21.9174** (10.5038)
<b>Bank_Transfer</b>		7.0298 (8.9304)	-3.8868 (8.9462)	-3.7186 (8.7575)
<b>lnGDP</b>			-24.0992*** (6.3971)	
<b>Shadow_Economy</b>				1.3259*** (0.4807)
<b>Log likelihood</b>	-309.1620	-314.5538	-287.0383	-286.9478
<b>Left censored obs [%]</b>	14.1304	14.4330	15.0538	15.3846
<b>Right censored obs [%]</b>	27.1739	25.7732	26.8817	25.2747

Note. This table presents regressions linking the percentage of sales conducted via Bitcoin to a range of explanatory variables. Panel A reports OLS results, while Panel B provides estimates of a Tobit model left censored at 0 and right censored at 90. Variable definitions are given in Table IV. Standard errors of parameter estimates are given in parentheses and those reported in Panel A were estimated using White (1980) heteroskedasticity-consistent method. \*, \*\* and \*\*\* represent statistical significance at 10%, 5% and 1%, respectively.

