APRIL 20, 2022

STABLECOIN PAYMENTS FEASIBILITY STUDY

ASSESSING THE CONSUMER DEMAND FOR STABLECOINS AS A PAYMENT METHOD

Authors:

- Sarbojeet Saha – Team Leader & Principal Author
- Kaoru Chigahara – Asian Markets Research Specialist
- Evgeniia Podosinnikova – European Markets Research Specialist
- Arjun Sharad – Blockchain Technology Specialist
- Amer Al-Somali – Commercial Applications Specialist

Acknowledgements

We are very grateful to our supervisors, **Patricia Perlman-Dee** and **Martin Berkeley**, for their help, mentorship, and oversight. This project could not have been completed without them.

We would especially like to thank all of our expert interviewees, who provided us with valuable insights and references. Our entire report and project is a direct result of their contributions, and we are extremely grateful to them for their time and help.

Foreword

This report, and the companion presentations, are our contribution back to the cryptocurrency community, our way of saying “thank you” to the experts, academics, traders, and regulators who gave us their valuable time so that we could learn about their industry. It is our hope that these documents will provide a powerful and interesting set of data and analysis to the broader cryptocurrency community, and will help spur discussion, collaboration, and innovation in this field.

We intend for this report that you are now reading to be used as a comprehensive reference document. There are two other PDF slide decks that we have released as companion documents.

The *Stablecoin Payments Public Release Summary* PDF deck provides the outstanding highlights of our work and research, and is intended to spur interest in the subject without delving too deeply into the underlying data. It is ideal for presenting concepts, analyses, and conclusions to key decision makers.

The much larger *Stablecoin Payments Public Release Full* PDF deck provides all of the necessary additional data and analysis. We intend for this to be used to structure and guide more technical and detailed discussions with developers

Finally, this report fills in the remaining details to help readers fit everything together. Each document can be used in isolation, but only with all three will you see a complete picture of our work.

This report and all accompanying documents are FREE TO USE AND DISTRIBUTE, in the public domain, as long as that you provide proper attribution to the authors. Otherwise, there are no limitations on the data contained herein, as all of our sources are also publicly available.

We encourage feedback and welcome readers to follow up with any of us individually, or all of us collectively, by email or via LinkedIn, Facebook, and other relevant social media sites. You can reach us by email by clicking on the hyperlinks embedded in our names in the title page, above.

Thank you for your time and attention, we very much look forward to hearing from you.

- Sarbo, Kaoru, Evgeniia, Amer, and Arjun

Contents

Figures

Tables

Glossary

TERM	MEANING	DESCRIPTION
AMEX	American Express	American-based multinational financial services company that facilitates electronic payments transfers around the world
AML	Anti-Money Laundering	Laws and regulatory frameworks designed to prevent money-laundering
B2B	Business-to-Business	Transactions between commercial enterprises
B2C	Business-to-Consumer	Transactions between customers and businesses
BIS	Bank of International Settlements	Global "central bank to central banks"
BoJ	Bank of Japan	Central bank of Japan
BUSD	Binance USD	USD-pegged fiat-backed stablecoin issued by Binance, the world's largest cryptocurrency exchange
C2B	Consumer-to-Business	Transactions between customers and businesses
CBDC	Central Bank Digital Currency	A special government-issued stablecoin, managed by a nation's relevant central bank infrastructure
CFTC	Commodity Futures Trading Commission	Independent agency of the US government charged with regulating derivatives markets, specifically (as opposed to primary markets)
CTF	Combating Terror Financing	Laws designed to prevent the use of transactions for the purposes of financing terrorist activities
DAI	MakerDAO DAI	USD-pegged Bitcoin-backed overcollateralised stablecoin issued by MakerDAO
dAPP	Decentralised Application	Automated software running on a blockchain as an application layer to assist with a transaction or other purpose
DeFi	Decentralised Finance	Financial instruments offered directly between businesses and consumers without intermediaries, such as banks, exchanges, or brokerages
DLT	Distributed Ledger Technology	A store of digital data contained in database copies housed in different sites, synchronised and updated with new information based on a predefined consensus algorithm
FCA	Financial Conduct Authority	Financial regulatory body of the United Kingdom, operating separately from the UK government, funded by charging fees to firms within the financial services industry
Gas Fee		Variable toll that users must pay in order for transactions to be accepted for processing by nodes on the Ethereum blockchain

ICBDC	Intermediate CBDC	Intermediate government-backed stablecoin issued by banks and other systemically important financial institutions for the purpose of facilitating payments and transfers between retail customers and merchants
KYC	Know Your Client	Rules and procedures designed to verify the identity and location of a busienss or customer in a transaction
MA	MasterCard	Global multinational financial services company based in Purchase, NY, that facilitates electronic payments transfers
MAS	Monetary Authority of Singapore	Central bank of Singapore
PoC	Proof-of-Concept	Prototype or model to test a concept or application on a small scale
PoS	Proof of Stake	Consensus algorithm based around specific authenticators, who have the most to lose in terms of financial stake in case of an incorrectly validated block, to add new data into the blockchain
PoW	Proof of Work	Consensus algorithm based around miners solving complex cryptographic hashing problems in order to add new data blocks to a blockchain
PRA	Prudential Regulatory Authority	Subsidiary of the Bank of England, charged with the prudential regulation of banks, building societies, credit unions, insurers, and investment firms
Quango	Quasi Non-Governmental Organisation	Private organisation that is partly financed or owned by the UK government, but operates independently of it
RCBDC	Retail CBDC	Retail central bank-backed stablecoin intended for general purpose transactions by both customers and merchants of all types
SaaPM	Stablecoin as a Payment Method	Acronym for stablecoin payments in general
SEC	Securities & Exchange Commission	National government body in charge of administering and regulating domestically traded securities and assets in markets and exchanges
Seignorage		Traditionally defined as the difference between the face value of money, and the cost of producing the actual money itself. In the context of cryptocurrency, this refers to the triggering mechanism of the algorithm used by some stablecoins to create or destroy tokens - if the seigniorage of a coin deviates from 0, then the algorithm automatically corrects this
Smart Contract		A program that triggers payments to specified recipients using cryptocurrency when specific terms and conditions are met, residing and executed on a blockchain

SNB	Swiss National Bank	Central bank of Switzerland
TPS	Transactions Per Second	Number of total completed, verifiable transactions on a payment network executed per second
USDC	USD Coin	USD-pegged fiat-backed stablecoin issued by Circle, historically the second most important stablecoin by market capitalisation
USDT	Tether USD	USD-pegged fiat-backed stablecoin issued by Tether Corp., historically the market leader in stablecoins by market capitalisation
UST	Terra USD	USD-pegged algorithmic ("seignorage") stablecoin issued by Terra
VISA		American-based multinational financial services company that facilitates electronic payments transfers around the world
WCBDC	Wholesale CBDC	Wholesale central bank-backed stablecoin restricted primarily for financial settlements, interbank operations, and cross-border financial transactions

1 Executive Summary

1.1 Background and Business Situation

Our project team received a brief to map out and quantify the current and future use cases of a specialised form of cryptoasset known as *stablecoins*, to understand whether consumer demand exists to drive the adoption of stablecoins as a payment method (SaaPM).

We therefore specify here the dominant current and potential future use cases for stablecoins, opportunities to use stablecoins in the B2C and B2B arenas, and current and future challenges in bringing forth stablecoins as a viable payment method.

1.2 Research Methodology

We approached this situation in two phases to define and quantify the market for SaaPM.

1.2.1 Defining the Stablecoin Market

We first set out to understand what stablecoins are, establish their current regulatory environment, and investigate barriers preventing their adoption. We interviewed **33** subject matter experts across a variety of disciplines, located in **13** countries around the world (Table 1).

We combined the insights gained from these interviews using **thematic analysis** to understand areas of consensus and divergence between our experts. We also unpacked **8** use cases of stablecoins that show the relevance and potential of stablecoins in consumer payments (Section 4.12).

1.2.2 Quantifying the Market Opportunity

We surveyed a total of **804** respondents using Qualtrics and then Survey Monkey, to understand their interest in using stablecoins for payments (Section 3.4.2). We reached out to Qualtrics users primarily through social media, but applied no specific criteria for Survey Monkey respondents, in order to ensure random sampling. Given a total of almost 750 responses from 6 countries via Survey Monkey, which exceeds our original goal of 100 per country, we believe this is a large enough sample size to assess customer appetite for SaaPM. We combined interview and survey data into an estimate of the potential market size of stablecoin-based payments (Section 5.1.3).

1.3 Key Findings

The dominant use cases for stablecoins, beyond trading and hedging of cryptocurrency transactions, are in **cross-border remittances, online gaming, and online retail**. Real-world use cases, as outlined in Section 4.12, show that stablecoins can be used for online retail payments and other applications.

Both businesses and consumers are interested in using stablecoins to **decrease settlement times and availability of funds**, since stablecoins offer near-instantaneous settlement and rapid conversion into fiat, relative to credit and debit cards. Stablecoins provide a natural fit for cross-currency settlements and internal cashflow management due to their relatively low costs.

Consumer interest in stablecoins remains a niche area, but our surveys point to strong interest among users in that niche in SaaPM due to low costs, anonymity, security, and privacy. We find that consumers in Singapore are the most likely to adopt SaaPM.

Serious regulatory and especially technological barriers to adoption of SaaPM exist, across every part of the world where we were able to procure data and expert insight. Even so, we find that most of these barriers, especially technological, are already being overcome.

Central Bank Digital Currencies (CBDCs) can and probably will coexist alongside stablecoins, except in China, based on our available data and the opinions of our experts. Moreover, the presence of hybrid or synthetic CBDCs may well serve as a driver for stablecoin adoption for consumer payments, as long as governments permit private stablecoins to coexist with CBDCs themselves.

Despite these encouraging signs, we find that ***stablecoins are not currently viable as a large-scale method of payments for most industries***. We estimate that no more than 10% of all consumers would be interested in using SaaPM, and that **stablecoins will make up a fraction of 1% of total global payments volume in the next 12 months, with a maximum market size of perhaps US$4.45B** (Section 5.1.3). Within specific subsectors of online payments, such as the markets for *non-fungible tokens* (NFTs), and online retail, SaaPM shows potential for adoption for B2B and B2C use cases.

We find that there are some very interesting opportunities for a variety of financial services companies to get involved in stablecoins beyond consumer payments. These include using stablecoins to facilitate internal cashflow optimisation, and providing liquidity services to institutional investors who require a stable and well-regulated hedging instrument for volatile cryptocurrencies.

1.4 Core Recommendations

There is no market of significant scale at present for SaaPM, but the market is developing very rapidly, and we recommend attempting test cases to assess consumer uptake for stablecoin payments **in Singapore only**, as the Thai government has recently banned cryptoasset payments. For companies interested in getting involved with stablecoin-based payment methods, we recommend focusing on providing consumer incentives, such as reward points through merchant partnerships, for stablecoin-based transactions related to NFTs and online gaming. Since broad-based SaaPM is unlikely to be viable for at least 24 months, we recommend that financial services providers, consultancies, and other relevant firms partner with exchanges, merchants, and acquirers to offer services and products to these parties that will help prepare the way for mass adoption of stablecoins, such as AML/KYC/CFT and authentication services. We recommend avoiding the US and Canada for SaaPM, due to regulatory and compliance issues. Finally, we recommend any decisions or conclusions made within 6 months of the release of this report, as the market is changing and moving so quickly that much of our research is likely to be outdated within that timeframe.

1.5 Future Opportunities

Payment processors, such as PayPal, international banks, such as JPMorgan, and retailers such as Amazon and Walmart, are all actively exploring the use of stablecoins to improve their internal and external cash management capabilities. We argue that large banks could benefit from using a similar model to facilitate internal optimisation of cashflows and settlements across borders. **We recommend that international banks and financial services companies at least consider creating their own internal stablecoin**, as the benefits may outweigh the capital and regulatory costs of doing so.

2 Introduction

This report was commissioned to answer the core business question:

"*Does consumer demand exist to drive the adoption of accepting stablecoins as a method of payment?*"

All of the data and analysis that follow are intended to answer this specific question.

2.1 Project Scope

In terms of scope, this report seeks to specify answers to the following ancillary questions, which derive naturally from the main question:

- What are the dominant stablecoin use cases at the moment?
- What products and services can be paid for with stablecoins?
- What are the incentives for people to use stablecoins?
- What are consumer perceptions of SaaPM if available for day-to-day purchases?
- What is the opportunity for stablecoins to be used for B2B payments?
- What are the main challenges for SaaPM to address?

2.2 Objectives

This report aims to help readers understand the primary use cases of stablecoins for payment purposes. We aim to provide a clear picture of the current regulatory and technological landscape for stablecoins, and showcase potential use cases of SaaPM. We account for the likely impact of *Central Bank Digital Currencies* (CBDCs) in the stablecoin market. Finally, we provide future recommendations for innovation and growth in SaaPM for readers to consider.

2.3 Deliverables

In this report, we aim to deliver:

1. Thematic analysis of FinTech, academic, payment processing, and regulatory experts;
2. Financial estimate of SaaPM market size based on data gathered from secondary research, interviews, and customer surveys;
3. Strategic analysis of the likely future development of the SaaPM landscape;

2.4 Reliance on External Sources

We emphasise that, throughout this project, we have relied upon a mixture of expert interviews, secondary research, consumer survey data, and paid research reports made accessible to us through the Alliance Manchester Business School digital library. We have thoroughly cited and attributed these sources wherever necessary. We provide a full bibliography (Section 7) where readers can peruse all relevant references, which we have cited here using the Harvard referencing style.

3 Methodology and Data

Figure 1 encapsulates the overall methodology that guided this project:

Figure 1 Project Methodology Flow

3.1 Business Objectives

Throughout this project, our goal was to seek out an answer to the question:

"Does consumer demand exist to drive the adoption of accepting stablecoins as a method of payment?"

In addition, we sought to answer a series of corollary questions concerning the size and shape of the market opportunity of SaaPM. We divided the project into two phases. In the first phase, we sought to lay out the market landscape in order to specify where the opportunities lie. In the second, we quantified the current and potential size and scale of those opportunities.

3.2 Defining Scope and Variables

There are many different stablecoins in the market at present (see Section 4.1). We confined the scope of our research primarily to use cases for, and adoption of, **single-currency fiat-backed stablecoins**. This is because other types of stablecoins, such as algorithmic (aka *seigniorage* – see Glossary),

commodity-backed, or cryptocurrency-backed, are unlikely to be acceptable for use under the rules and regulations that govern most potential market participants, in our considered judgement.

Given this definition, we then sought to understand the nature of the stablecoin market by looking at available relevant research reports in databases, such as *Mintel*, *Frost & Sullivan*, and *Euromonitor* (e.g., (Tuttle 2021)), and publicly accessible research papers via *Academia.edu*. We also read through industry whitepapers to understand some of the technical details behind cryptocurrencies in general, and stablecoins in particular (e.g., (Crypto Gurukul 2020; Tether Corp. 2017; Nakamoto 2008)).

In addition, we examined recent papers and regulatory releases concerning stablecoin regulation (FDIC et al. 2021; Sokolov 2021), and academic papers concerning general cryptocurrency governance (Zachariadis et al. 2019; Reijers et al. 2018; Werbach 2018; Tiwana et al. 2010).

We were also particularly interested in understanding the opportunities and threats posed by CBDCs, which are essentially government-issued stablecoins. In theory, **the existence of CBDCs would eliminate the need for stablecoins**, and we wanted to test this.

This background literature gave us a set of clear hypotheses to test against available market data. In the interests of time, we decided to restrict our research to 5 primary regions:

- **United States of America**, due to size of the market (over 330 million people) and presence of FinTech and cryptocurrency development talent;
- **United Kingdom**, due to accessibility of experts, as 60% of our team was based in the UK, and specifically near the University of Manchester, for the duration of our project;
- **Asia – Japan, Singapore, Thailand**, due to the advanced nature of the payments market and the ability of our multilingual team to get access to Japanese regulatory documents and experts;
- **Europe – Germany, Netherlands, France, Belgium**, due to the close links between universities in those regions and the University of Manchester, thereby providing significant ease of access to market and regulatory experts, particularly within the UoM system;

3.3 Initial Hypotheses

Our background reading allowed us to form the following 4 primary hypotheses:

1. **The regulatory environment for SaaPM is *most favourable* in the USA;**
2. **Adoption of SaaPM is *most likely* in East and Southeast Asian markets;**
3. **The implementation of CBDCs will pose a significant existential threat to SaaPM;**
4. **Stablecoins can be easily adapted into an actual payment method within the next 12-36 months;**

We understood that we needed to divide the project into two clear phases. First, we needed to establish the terrain and contours of the market. Second, we needed to find the actual core market opportunities for SaaPM.

3.4 Project Phases

3.4.1 Phase 1: Mapping the Market Landscape

Having defined which kinds of stablecoins we would look at, and in which countries, we sought to answer the following questions:

- What are the dominant *present* stablecoin use cases, and what is their monetary value in USD?
- What will be the most likely *future* stablecoin use cases, and likely revenue of these in USD?
- What products and services can be paid for with stablecoins?
- What is the opportunity for stablecoins to be used in the B2B payment?
- What are the technological and regulatory challenges and barriers against SaaPM?

To accomplish this, we sought to interview *at least **30*** experts to understand the nature and structure of the market, across a range of fields:

1. **Regulatory experts**, defined as *contacts working directly for or with regulatory authorities, such as the UK FCA or global central banks,* to understand the views of governments and market overseers from around the world, and the direction of current and future regulation;
2. **Academics**, defined as *contacts whose academic research at the PhD or higher level concerns cryptocurrency technology, practice, and regulation*, to understand what consumer and market problems these digital assets seek to solve, and what prevents or drives their widespread adoption;
3. **FinTech/Crypto SMEs**, defined as *contacts working for cryptocurrency exchanges, FinTech companies involved with cryptocurrencies, or stablecoin issuers*, to explain where the SaaPM market is heading and what is driving or preventing the adoption of SaaPM;
4. **Payment processing SMEs**, defined as *contacts with current or past experience working for payment processors, such as VISA, MA, AMEX, PayPal, and similar companies,* to help us see how stablecoins can fit into the overall business and strategy of the payments industry;

The last was particularly important. Stablecoins, like all cryptocurrencies, are essentially a P2P payments system, which, by definition, removes the need for any intermediary financial services company or payment processor. In theory, therefore, SaaPM is a direct challenge to the core business model of payment processors and networks. As part of this project, we sought to understand whether stablecoin payments can also be a potential opportunity for such companies.

Table 1 summarises the total number of completed interviews, and shows the range of countries from which we were able to gather information. See Section 8.2 for an ***anonymised*** list of experts interviewed for this project.

Type and Country	Completed Interviews
Academic Expert	***10***
Belgium	1
Canada	3
Germany	1

UK	2
USA	3
FinTech/Crypto Expert	***11***
Canada	1
Denmark	1
India	1
Japan	1
Singapore	1
South Africa	1
UAE	1
UK	3
USA	1
Payment Processing Expert	***4***
Singapore	1
UK	1
US	1
USA	1
Regulatory Expert	***8***
Japan	1
Thailand	1
UK	5
USA	1
TOTAL	**33**

Table 1 Summary of Expert Interviews Conducted

These 33 interviews provided us with insights into the current B2B and B2C stablecoin use cases, regulatory barriers of SaaPM adoption, major technological blockers and drivers of stablecoin payments, and potential future developments in the industry.

We note that academic and regulatory experts make up the substantial majority of our expert interviewee body, and such experts were relatively more willing to be interviewed than payment processing experts. We speculate this is because stablecoins are currently a major topic of interest and discussion within the payments processing industry, and companies may not want to share their current activities and plans in this area.

Our interviews with FinTech/Crypto SMEs helped to compensate somewhat for this by adding details around the payments industry's potential uses for stablecoins. Our secondary research tells us that a number of payment processing companies are already involved in SaaPM, or plan to be in the near future (The Paypers 2022; Secular Growth Stories 2021; Bellusci 2021).

We collated our interview data into a *thematic analysis* to pull out common themes and areas of substantial agreement. A summary of the most salient themes can be found in Section 4.2. The complete thematic analysis can be found in Section 8.1.

We conducted all interviews virtually via Zoom or MS Teams, with at least 2 team members present, one to ask and direct the interview, and another to take notes. We sent all interviewees a Participant

Information Sheet and Consent Form, in line with UK GDPR guidelines concerning informed consent, and specifically asked for permission before recording any interviews.

3.4.2 Phase 2: Understanding Consumer Sentiment

During the second phase of the project, we sought to answer two specific questions from the consumer's point of view:

- What incentives do ordinary consumers have to use stablecoins?
- What is consumers' perception of stablecoin as a method of payment if available for day-to-day purchases?

We decided to do this via customer surveys, designed and distributed via University-approved platforms, starting with Qualtrics. Our survey incorporated *branching logic*, which resulted in sharply varying sample sizes for some questions as opposed to others. The full set of survey questions can be found in Section 8.4, and a flowchart explaining the logic can be found in Section 4.9.

We initially aimed to receive 50 responses. After reviewing this sample size, we decided to increase this to at least 100 survey responses, with a randomised lottery to give rewards to up to 100 respondents. We distributed our survey via LinkedIn, Reddit forums, blogs, online cryptocurrency forums, academic and personal contacts, and email, and expected a response-to-view rate of roughly 40%. We did not target any specific demographic or group, but expected that the results would skew toward the younger demographic, mostly male, and in business or financial services by profession. The Qualtrics survey results bear out these initial expectations (Section 4.9.2).

By March 11, 2022, we had received **57** complete responses. This was an insufficient sample set, particularly in terms of assessing consumer sentiment with respect to SaaPM viability. Therefore, we decided to increase the sample size by using Survey Monkey's paid responses functionality to buy at least **600** additional responses. Again, we did not seek to target any specific demographic. **Since we have no control over Survey Monkey's methods in reaching respondents, we can make no comment as to the quality of the responses**, but we have tried to comment on sample sizes wherever appropriate when presenting the results (Section 4.9.3).

Due to our findings from Phase 1, we concentrated on responses from the USA, UK, Singapore, Thailand, Sweden, and Japan. We have received a total of **804** responses, when combining Qualtrics and Survey Monkey results.

In addition, to understand B2B use cases more thoroughly, we sought to interview at least **20** payment processing, finance, business development, or settlements experts at merchants that our desk data indicated as being willing to accept cryptocurrencies in general, and possibly stablecoins in particular. We searched for references in our Phase 1 research to companies that accepted cryptocurrencies of any kind for payments, and found that a wide variety of merchants do so. These include, but are not limited to:

- BitRefill, a provider of crypto-prepaid vouchers redeemable at various other businesses (BitRefill 2022);
- airBaltic, a regional airline based in Latvia that accepts payments for bookings in multiple cryptocurrencies (airBaltic 2021);

- Newegg, an online retailer of IT equipment, computing goods, and consumer electronics, which accepts payments via BitPay's platform in cryptocurrencies, including multiple USD stablecoins (Newegg 2021);

In all, we assembled a list of 26 merchants that currently, or may in the next 6-12 months, accept cryptocurrencies for payment purposes, and reached out to over 40 individuals via LinkedIn and email to request interviews. We reached out to online retailers, airlines, and payment providers in particular, as our Phase 1 data pointed to these as the most likely industries to adopt cryptocurrency payments in general, therefore stablecoin payments in particular.

We secured one interview with a merchant in Japan, which yielded some useful insights into the Japanese market for stablecoins, but were unable to secure further merchant data of any kind through interviews. Because we cannot corroborate the findings from that interview with others from the same country or elsewhere, we have deliberately excluded any specific results from that one merchant interview in our findings and conclusions.

3.5 Limitations and Mitigations

We encountered several limitations and issues during this project, especially with respect to conclusions gleaned from surveys and interviews.

3.5.1 Risks

With every expert interview, we ran the risk of personal bias distorting the findings. For instance, our FinTech/Crypto SMEs have a vested business and personal interest in the success of stablecoins and cryptocurrencies in general as a method of payments, which may colour their comments. By contrast, our academic experts were generally much more sceptical of stablecoin payments, but this may well be due to conflicts of interest caused by past work for central banks and legacy financial institutions, which tend to be hostile to blockchain technology.

We mitigated these biases by seeking a wide range of opinions from many different sources, in both the public and private sectors, and from across the globe. We insisted on using a sample size of at least 30 experts in order to ensure a large collection of viewpoints. We phrased our interview questions (see Section 8.2) to ensure overlapping coverage of the same topics from multiple points of view. As we gained knowledge from our initial set of interviews, we used this base to challenge our experts in certain areas as and when we felt necessary. For example, if an academic expert argued that stablecoins might be pushed out of the market by CBDCs, we would use this to challenge FinTech SMEs who believe otherwise, and recorded that expert's response in our analysis.

3.5.2 Assumptions

We have made the following core assumptions in our data gathering:

1. There is a direct positive correlation between knowledge and usage of *cryptocurrencies in general*, and *stablecoins in particular* – this assumption becomes particularly relevant in the construction of our survey questions (Section 8.4);
2. The P2P nature of blockchain-based payments represents both a threat and a potential opportunity to the intermediary-based, networked nature of payment processors and other financial intermediaries;

3. We would be able to size up the market for SaaPM by contacting merchants directly to understand their appetite for stablecoin payments;
4. We would be able to understand the consumer appetite for stablecoins through surveys;

Of these, we found that Assumption #3 was not justified. We originally planned to collect at least 20 merchant interviews in Phase 2 of our project, but got only one response. We mitigated this problem by using background research gleaned from public news articles and databases, and from our payment processor SMEs, to understand the merchant appetite for stablecoin payments.

3.5.3 Issues

As a result of our failure to secure additional merchant interviews, all of our B2B use cases are based on market expert opinions that have not since been cross-validated against the actual merchants mentioned by those interviewees. Our findings and conclusions with respect to the B2B and B2C use cases should therefore be subjected to additional inspection and independent validation.

We believe that we failed to secure 20 or more merchant interviews for 3 primary reasons:

1. **We did not reach out to the best-placed individuals for information**. We specifically tried to reach payments specialists and finance experts within the merchant companies through LinkedIn, but it is possible that these individuals did not know enough about their company's policies with respect to cryptocurrencies to be helpful.
2. **Merchants were reluctant to disclose their reasons for using cryptocurrencies to unknown outside entities**. We encountered this issue with several merchants and tech companies in Japan, for instance, where the corporate culture of those companies prevented them from speaking with us directly about company-specific policies.
3. **Cryptocurrency payments may not be as important to our target set of merchants as we had originally thought**. We confirmed this possibility during interviews with payment-processing experts, two of whom noted that merchants may be offering cryptocurrency payments as a "loss leader" to secure customers among the younger demographics.

We compensated for this issue – a serious one – by cross-referencing expert opinions received with respect to B2B and B2C use cases, against the available market literature. For example, our FinTech/Crypto and payment processing experts repeatedly stressed the viability of cross-border remittances as a key use case for stablecoins. We read around these use cases, gathered numerical data wherever possible, and found clear examples of stablecoins used within both closed-loop and open-loop systems for the explicit purpose of moving money across borders at low costs. In the case of cross-border remittances, the data validated the opinions of our experts (Sections 4.10.2, 5.2.2).

3.5.4 Dependencies

Our analysis depends very heavily upon the reliability, independence, and knowledge of our expert interviewees. We tested our initial hypotheses by relying on a wide variety of expert opinions to provide a clear picture of the current and future landscape for SaaPM. If these experts have passed on incorrect or incomplete information, our own conclusions will therefore be incorrect.

We mitigated this risk by ensuring that we asked essentially the same sets of questions to each of our four types of experts, and cross-examined our experts when one of them stated an opinion that

contradicted the emerging “consensus” view that we had received from others. When we found a justifiable difference of opinion, we included it in our thematic analysis for client consideration.

For example, 18% (6/33) of our experts view stablecoins as unnecessary given the wide variety of other payment options available, which are at least as fast, cheap, secure, and easy to use, as any stablecoin wallet. This opinion tends to be held by academics, and directly contradicts the opinions of the majority of FinTech/Crypto SMEs that stablecoins will rapidly emerge as a viable alternative to traditional payment processors.

3.6 Data Retention and Governance

All information used in our thematic analyses, and gained from interviews, has been fully anonymised and all personally identifiable information of any kind has been removed from this report. Whenever we have been asked to delete interview responses by external respondents, we have done so immediately, and removed all relevant interview notes and recordings. We sent all interviewees a Participant Information Sheet and Consent Form, to ensure informed consent for all interviews during our data gathering phase. We recorded and tracked those who returned these consent forms, and stored copies of our consent forms.

In line with UK GDPR and University of Manchester data retention policies, **all relevant interview notes and data have now been deleted, as our project is now fully complete.**

4 Results

4.1 Defining Stablecoins

To understand the market for SaaPM, we must first define what a stablecoin *is*. The most commonly accepted definition appears to be:

> *"[A] class of cryptocurrencies that attempt to offer price stability and are backed by a reserve asset" (Hayes et al. 2022)*

As Table 2 shows, are currently four types of stablecoins circulating in the market (Iredale 2021):

Type	Definition	Examples
Single-currency fiat-backed	Redeemable 1:1 for equivalent fiat currency	Tether Coin (USDT), USD Coin (USDC), Binance USD (BUSD), Pax Dollar (PUSD)
Commodity-backed	Redeemable for either a real or virtual share in a physical asset, such as oil or gold	Digix Gold Token (DGX), Xaurum (XAU), Pax Gold (PAXG)
Cryptocurrency-backed	Backed by volatile cryptocurrencies, such as Bitcoin or Ethereum, that are redeemable at ratios of 1:1.5 or 1:2 for the underlying asset	MakerDAO Dai (DAI)
Algorithmic (Seignorage)	Price of underlying coin is controlled by an algorithm which issues or redeems tokens to ensure a 1:1 peg against the tracking asset	Terra USD (UST)

Table 2 The Four Stablecoin Categories

We note that Facebook, now known as Meta, tried to introduce a stablecoin, *Libra*, backed by a basket of multiple currencies, in 2018, but this failed due to entrenched opposition from regulators, particularly in the USA. Despite rebranding as "Diem", the project shut down in 2022, and there is now no extant example of a multicurrency fiat-backed stablecoin pegged to a basket of currencies (Morris 2022; Heath 2022).

If it had succeeded, Libra/Diem would have constituted a fifth subtype of stablecoin. We are unaware at present of any serious attempts to launch such a cryptocurrency, due to the technological and regulatory challenges seen by the market with the Libra effort.

Parenthetically, Meta has now restarted its efforts to create a digital currency, but will no longer attempt to create a blockchain-based cryptocurrency, and will instead use digital tokens and in-app payments (Edheri 2022).

Figure 2 illustrates the different types of stablecoins in a straightforward flow-chart, and provides examples of the top stablecoins of each subcategory.

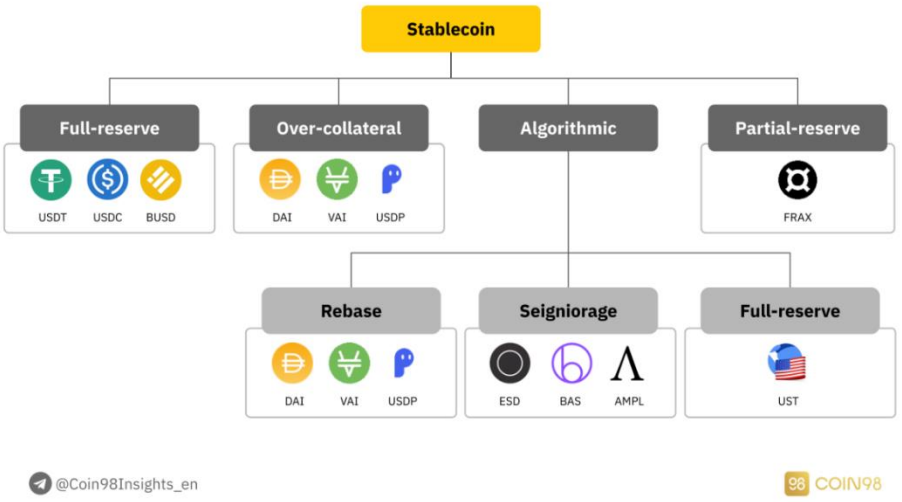

Figure 2 Stablecoin Types and Classifications (Phan 2022)

We provide further details of the current landscape of the stablecoin market, in terms of the leading types of stablecoin by market capitalisation, in Section 4.3.

In this report, we will concentrate ONLY on single-currency fiat-backed stablecoins. Some of our use cases and examples in our findings do make mention of seignorage or crypto-backed stablecoins, but these are for illustrative purposes only. The focus of our analysis and recommendations will centre on SaaPM specifically with respect to single-currency fiat-backed stablecoins.

4.2 Primary Results of Thematic Analysis

As noted in Section 3.4.1, the core focus of the first phase of our project was to understand the nature of the stablecoin market for payments by interviewing a broad cross-section of experts. We have collated their opinions into a *thematic analysis*. Table 3 summarises the most important and relevant of these themes. **The full set of thematic analysis tables can be found in Section 8.1**.

In performing this thematic analysis, we focused on key areas of consensus across all interviewees – Academics, Regulators, FinTech/Crypto SMEs, Payment Processors. However, we also attempted to incorporate alternative viewpoints to ensure rigorous balance and fairness when evaluating data gained from the market.

Theme	Insights
Size of the market (estimation)	• Market in 3-5 years: max 1% of current payment market volume (total online retail market alone is about US$10T in revenue, so max US$100B for SaaPM market size just in online retail) • Stablecoin market potential lies in developing world due to opportunity to those countries jump directly to digital banking avoiding retail banking step
Regulation	• No uniform global regulatory environment • Lack of clarity regarding legal characteristics and tax treatments (money vs assets) are considered as major barrier for mass adoption • Regulations regarding money-laundering, fraud prevention, audit are required
Technology readiness	• Heavy investment in technological solutions/workarounds to "Blockchain trilemma" (trade-off between scalability, speed, and security through decentralisation)

Fees involved	• Although fees vary depending on blockchain, high processing/transaction fees for Ethereum-based stablecoins (i.e. the market leaders) block mass adoption at present • However, fees are beneficial for high volume transaction
Consumer profile	• Young digital native generation aged between 20 to 45 years old • First adopters are crypto traders. High correlation between holding/using cryptocurrency and holding/using stablecoins

Sectors/industries/use cases	• Banks, investment firms, DeFi organisations and Insurance:
	  ○ Small and mid-size banks are drivers for innovation in payment industry
	  ○ Facilitate borrowing using margin accounts
	  ○ Loans collateralised against stable tokens held by borrower
	  ○ Significant "network externality" effects required to scale B2B transactions effectively among financial institutions
	• Financial institutions, B2B, C2B, C2C and among people in different countries:
	  ○ Cross-border payment and remittances are major current use cases, and this trend will continue in future
	• Trading and storing value are dominant current use cases
	• Retail:
	  ○ Small companies will adopt stablecoins as payment first due to agile nature of such companies
	  ○ Large corporations require more time to reconfigure their legacy IT infrastructures
	• E-commerce:
	  ○ Considered as first adopters of stablecoins due to digitally savvy nature of consumers
	• Gaming:
	  ○ Gaming platforms have started to accept cryptocurrencies for microtransactions, NFTs, and other payments
	• Metaverse
	  ○ Stablecoins potentially provide a natural payments method within Meta's planned AR/VR platform

Consumer perspective	• Barrier. Merchant acceptance is the key driver for stablecoin mass adoption. Lack of sufficient understanding of the technology by merchants make this a major barrier for promoting SaaPM to consumers. • Barrier. Lack of consumer awareness of stablecoins in general – both in terms of concept and underlying technology • Barrier. Lack of trust in blockchain technology, sufficient technology knowledge and understanding of DeFi from regulators, financial institutions, merchants and consumers • Barrier. Lack of simple, easy-to-use solutions which make user experience seamless • Opportunity. Lack of trust in fiat currency in countries with hyperinflation force populations to use cryptocurrencies and stablecoins (e.g., El Salvador has essentially adopted Bitcoin as legal tender and banned its own currency)

CBDC	• Governments are not sure whether there is market for CBDC, but they want to be prepared to step in, if necessary. There are plenty of CBDCs' project all around the world.
	• Target market for CBDC: small wealthy countries with high level of digital penetration
	• There are a lot of uncertainty regarding CBDC's design
	• Can CBDCs and stablecoins coexist?
	  ○ **No:** CBDCs eliminate needs for private issued stablecoins, because they solve all of the problems that stablecoins are supposed to, but unlike stablecoin issuers, central banks cannot (theoretically) fail
	  ○ **Yes:** There will always be a need for private stablecoins in the market, due to lack of trust in government authority, user desire for privacy and autonomy, and market desire for decentralised means of payments

Place for payment processors (stablecoins' mass adoption scenario)	• Needs for replacement of outdated technology to blockchain-based technology • Facilitation of crypto exchanges to reach critical mass of adoption • Issue own stablecoins or "white-label" existing stablecoins, leaving all settlement and conversion mechanics to the custodian account of the coin issuer while leveraging the payment provider network to facilitate transaction and guarantee trust • Cut acquirers (like WorldPay) out of the loop and charge fees directly to merchants • Get involved in lending • Go-away scenario under pure CBDCs model
Alternative views	• There is no short-term potential for stablecoins' mass adoption • There is no real gap in current payments' system that could be filled by stablecoins • Volatility is addressed by stablecoins but people in crypto world due to volatility and to make money from it • Stablecoins are "a solution in search of a problem" – there is nothing special about these cryptocurrencies that other payment methods cannot do just as fast and as cheaply

Table 3 Top Results from Thematic Analysis

Our secondary research substantially confirms and expands upon these findings, particularly with respect to the use cases and analysis presented below.

4.3 Current State of the Stablecoin Market

4.3.1 Stablecoin Market Growth & Capitalisation

Stablecoins are actually a relatively mature concept in the world of cryptocurrencies, having existed in conceptual form for nearly a decade (Willett 2012). The first true stablecoin, the crypto-backed (and now apparently defunct) BitUSD, was launched in 2014 as a crypto-backed coin, and the first true fiat-backed stablecoin, USDT, was launched shortly afterwards (Herdera Hashgraph LLC 2022).

Since then, stablecoins have been slow to gain widespread acceptance and use, as they were initially viewed primarily as a specialised form of cryptocurrency with few real-world applications, used primarily by dedicated traders to hedge volatility risks (according to one of our crypto trading experts). However, the rapid price appreciation, and commensurate price volatility, of Bitcoin since early 2017, has generated substantial interest in stable and low-cost means of locking in trading gains, as the cost of moving out of cryptocurrency positions into fiat tends to be quite high and settlement can take several minutes to several hours, depending on the type of blockchain protocol used.

Figure 3 shows the price history of Bitcoin, in USD, since January 2017. Figure 4 shows the total volume of stablecoins, of any kind, in circulation from the same time period. The rise in stablecoin volumes mirrors closely the rapid price appreciation of Bitcoin. This is due to the fact that the primary use case of stablecoins at present is in cryptocurrency trading and hedging. As Figure 5 shows, the correlation between stablecoin and Bitcoin volumes since early 2015 is quite strong, at 84%.

Stablecoin volumes have grown from US$9.95M on January 1, 2017, to US$178.93B on March 3, 2022, for a CAGR of 665.49%. This extremely high growth rate reflects the keen level of market interest in a stable alternative to volatile cryptocurrencies.

Figure 3 Bitcoin Price History Jan 2017 - Mar 2022 (Buy Bitcoin Worldwide 2022)

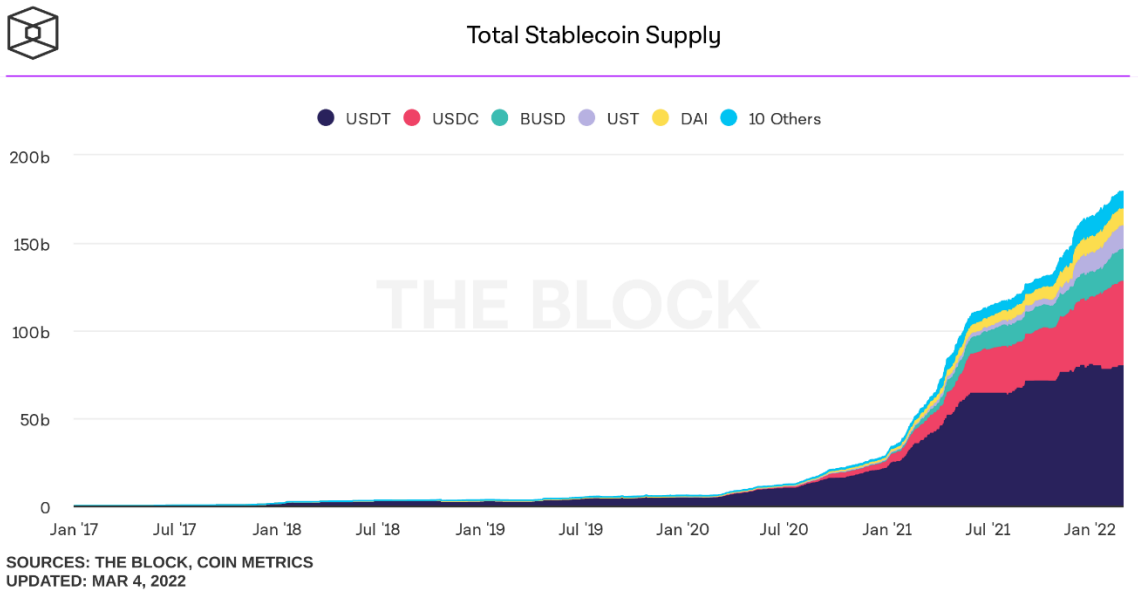

Figure 4 Historical Stablecoin Supply Jan 2017 - Mar 2022 (The Block 2022)

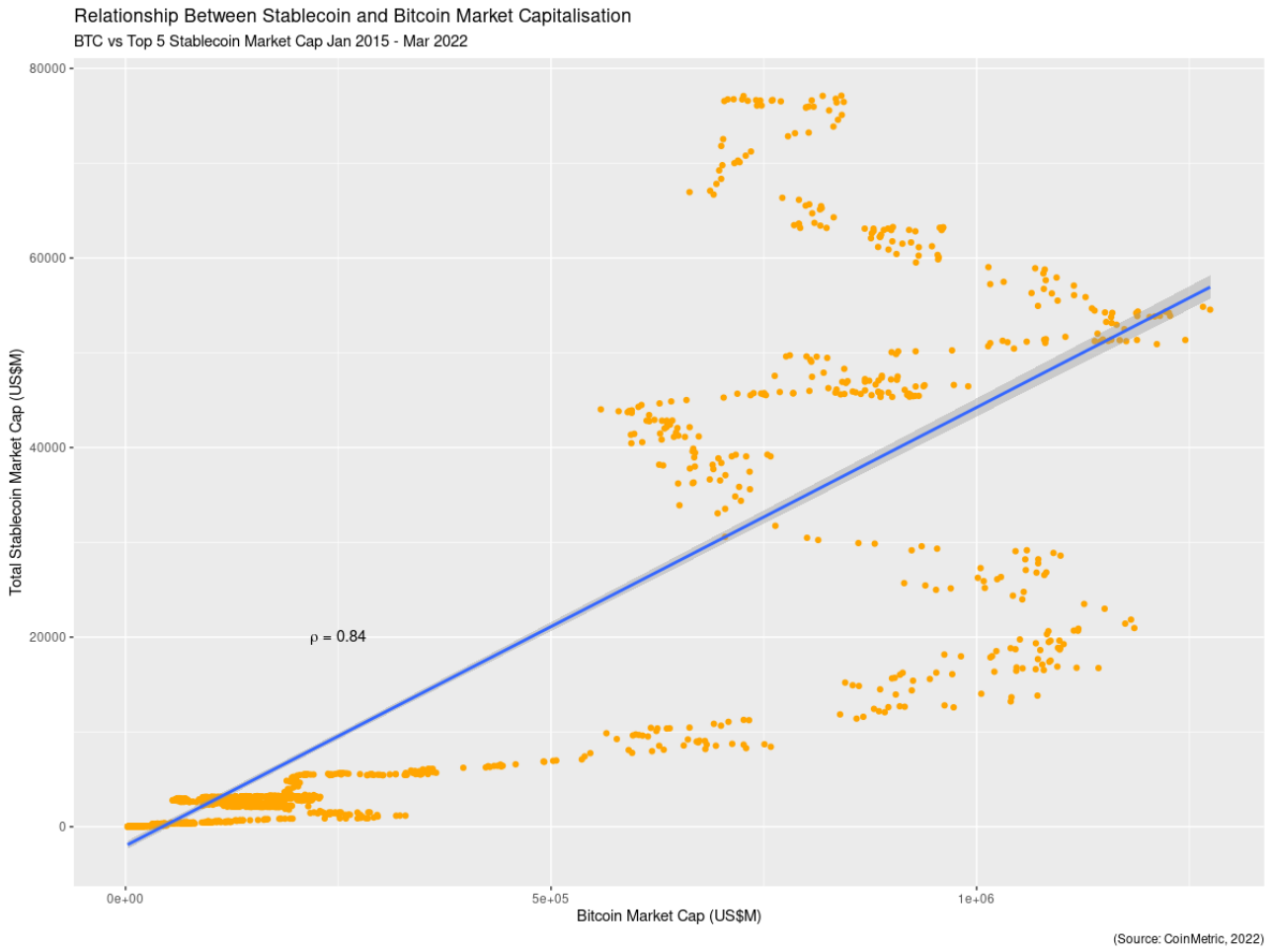

Figure 5 Link Between Bitcoin and Stablecoin Market Capitalisation

Figure 6 shows how stablecoins circulate through the market, using USDT as an example, but this applies with minimal variation for other types of stablecoins. This diagram applies regardless of user type, whether in a B2B or B2C context, as the stablecoin issuer is the primary point of focus for the entire settlements process.

For algorithmic stablecoins in particular, the supply of tokens is controlled entirely by a decentralised autonomous organisation (DAO), rather than by a centralised entity, and there is no issuance or withdrawal of fiat currency.

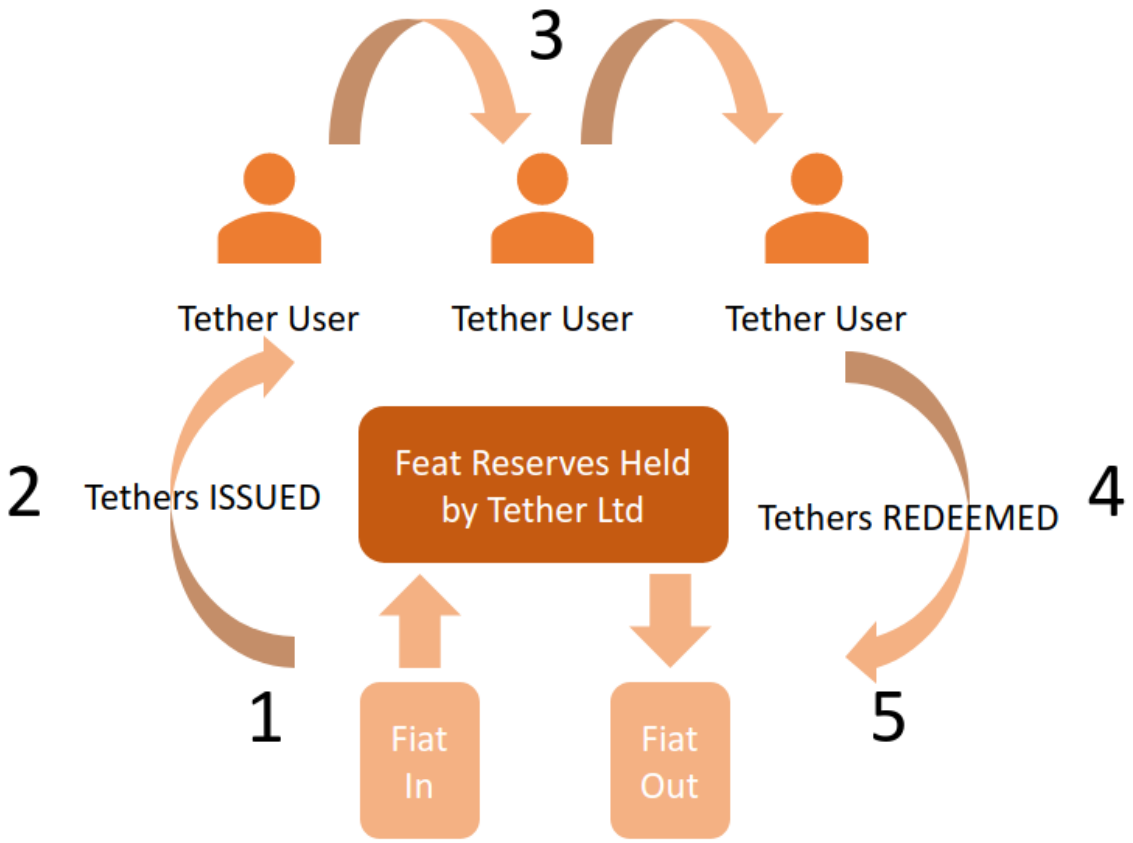

Figure 6 Fiat-Backed Stablecoin Circulation (Tether Corp. 2017)

4.3.2 Stablecoin Market Leaders

Table 4 shows the top 10 stablecoins by market capitalisation, as of March 7, 2022. Tether Corp.'s USDT is by far and away the market leader with nearly 45% of total stablecoin volumes. While its market share has declined from essentially 100% of the market before January 2018, it is still the most important and widely used stablecoin, of any kind, currently in circulation.

Rank	Name	Ticker	Type	Market Cap (US$M)	Circulating Supply (M Tokens)	Total Market Share (%)
1	Tether	USDT	Single-Currency Fiat	79,532.26	79,513.06	44.45
2	USD Coin	USDC	Single-Currency Fiat	53,166.34	53,195.04	29.71
3	Binance USD	BUSD	Single-Currency Fiat	17,978.62	17,996.25	10.05
4	TerraUSD	UST	Algorithmic	13,482.39	13,393.65	7.54
5	Dai	DAI	Crypto-Backed	9,652.89	9,658.84	5.39
6	TrueUSD	TUSD	Single-Currency Fiat	1,441.35	1,441.52	0.81
7	Pax Dollar	USDP	Algorithmic	945.17	945.64	0.53
8	Neutrino USD	USDN	Crypto-Backed	511.77	517.37	0.29
9	Fei USD	FEI	Algorithmic	421.59	425.00	0.24
10	Tribe	TRIBE	Algorithmic	262.22	453.45	0.15
			GRAND TOTALS	177,394.60	177,539.81	99.14

Table 4 Top 10 Stablecoins by Market Capitalisation (The Block 2022; CoinMarketCap 2022)

4.3.3 Known Issues and Controversies

Stablecoins have been the subject of numerous controversies in recent years. As noted earlier (Section 4.1), Facebook's original attempt to create essentially a multicurrency stablecoin came under heavy regulatory scrutiny and criticism, due to fears – particularly among US regulators – of concentration of financial and market power, as well as systemic risk, in the hands of a single dominant tech monopoly (Morris 2022; Heath 2022).

More recently, regulators have focused heavy attention upon the potential systemic risks posed by stablecoins. Because stablecoins take in fiat reserves, and issue tokens that are theoretically redeemable for those same reserves, there is a considerable concern among regulators that stablecoin issuers are a significant source of systemic risk in the financial markets.

For example, if Tether does not actually hold 1:1 USD reserves against issued tokens, and a large number of Tether users (say, 25% or more) seek to redeem their tokens into fiat simultaneously, Tether may become insolvent. This will likely destabilise the entire cryptocurrency market, due to Tether's commanding position as the leading stablecoin in circulation, by far.

The fact that market power among stablecoin issuers is so heavily concentrated among just a few issuers, with the top 5 issuers controlling a full 97% of the outstanding stablecoin supply (Table 4), combined with the extremely rapid growth in stablecoin transaction volumes in the past 3 years, has drawn the attention of global regulatory authorities. The President's Working Group/FDIC joint report from 2021 recommended that stablecoin issuers ought to be regulated like banks, with stringent audit requirements for their reserves (FDIC et al. 2021). More than 25% of our expert interviewees (8 out of 33, mostly regulators), believe that there will be a strong trend toward tighter regulation of stablecoins in general due to fears of systemic risk associated with potential issuer failure.

Concern about the quality of the reserves used by stablecoin issuers to back their circulating coins has only been exacerbated in recent years by the controversy surrounding Tether Corp. The issuer of USDT has maintained since 2014 that all tokens are backed 1:1 by US dollars, but deeper investigations proved this to be false. In reality, Tether maintains less than 4% of its total reserves in cash, with the remainder of its reserves distributed among assets such as commercial paper, loans, corporate bonds, Treasury bonds, and even Bitcoin (Harper 2019; Kelly 2021). The US CFTC has fined Tether Corp. and its parent company, Bitfinex, US$42.5M in total, for what the regulator argues are false claims as to the quality of Tether's reserve base (CFTC 2021). The resulting scandal has called into question the credibility of Tether's 1:1 USD peg (Coppola 2019), and Tether has since been required to issue regular attestations of its reserve base.

About 10% of our expert interviewees (3 out of 33, all FinTech/Crypto experts) note that, in spite of these controversies, USDT continues to be the dominant stablecoin in the market, by far. (Other experts either were not asked about this issue, or had no opinion.) These are experts in crypto trading, primarily. The scandal did not affect Tether's status as the market-leading stablecoin, which indicates that USDT has likely reached "too big to fail" status within this market.

4.4 Primary Current Stablecoin Use Cases

Stablecoins are currently used primarily for the following purposes, in descending order of importance and volume.

4.4.1 Cryptocurrency Trading & Hedging

This is by far the single most important use case for stablecoins, as they provide a useful safe-haven asset that allow traders to move their realised volatile crypto gains into an asset that will not lose value rapidly. Given the 24x7 nature of crypto markets, traders need an asset to permit them to lock in gains during trading in a low-cost, low-friction manner. Stablecoins perform precisely this function, as trading into and out of stablecoins can be done at fractions of a cent, in terms of transaction cost, on many of the newer blockchains. About half of our experts (15 out of 33) note that this is the dominant use case for stablecoins at present, which is why **the daily *circulation speed* of USDT and USDC**, as measured by **the volume traded in the past 24 hours, divided by outstanding market capitalisation**, is often 60% or higher on any given day. This means that at least 60% of the total available supply of stablecoins is used for trading and hedging purposes. (The other 18 interviewees made no mention of this issue.)

At least one Crypto and two Academic SMEs with whom we spoke, noted that there were times in the past when 100% of the available tradeable supply of a stablecoin would be used in a single day, due to the need for rapid hedging and P&L lock-ins by traders, without the costs and inefficiencies of translating cryptocurrencies back directly into fiat.

4.4.2 Cross-Border Remittances

Cryptocurrencies offer a substantial price and speed advantage to traditional methods of remitting money across borders. Ripple, a **volatile** cryptocurrency (not a stablecoin), is already being used by financial institutions for cross-border transfers, at rates, speeds, and completion rates that the standard SWIFT network simply cannot match, as shows.

Note that the SWIFT network handled an average of 42 million messages a day in 2021, with 44.5% of these messages being related to payments (Seth et al. 2022), while the Ripple network handles between 1 and 4 million transactions daily (bitinfocharts.com 2022). Ripple is able to do this because it is a private consortium blockchain, maintained by the banks that use it, and because it uses a pre-mined token with a consensus protocol that does not rely on the time-consuming and cumbersome process of solving cryptographic hash problems, as Ethereum does through a *Proof-of-Work* (PoW) schema (Frankenfield et al. 2021).

Currently, crypto payment systems for cross-border remittances are faster, cheaper, and more robust than the SWIFT payments network, which is the global payments standard, but cannot yet compete in terms of scale with SWIFT.

	CB (based on SWIFT)	Ripple XRP Payments
Transaction Cost	Up to US$50	~ 0.00028 USD
Speed/Settlement	1-5 bd	~ 4 sec
Transactions Per Second (TPS) & Availability	1,700 TPS, business hours only	1,500, 24/7
Transparency	Low	Mid/High
Settlement/FX Risks	High	Low/Mid
Network	Established	Growing

Table 5 Comparison of SWIFT and Ripple Attributes (Frost & Sullivan 2020)

Ripple achieves these speeds by avoiding time-consuming and costly consensus mechanisms used by other blockchains, and by acting as a "digital *hawala* service", that is, a method of transferring money without actually physically moving assets via a set of, effectively, IOUs that settle physically at a later date (Frankenfield et al. 2021).

Stablecoins have a similar level of cost, speed, and settlement reliability as Ripple, and are increasingly relevant in the world of cross-border settlements due to their cost advantages. As a result, OKCoin and The Stellar Development Foundation recently announced a partnership to use USDC for cross-border settlements in direct competition with XRP (The Stellar Development Foundation 2022). We explain this specific use case in Section 4.12.2.

The growth in global remittances, combined with the fact that stablecoin-based remittances can be done for fractions of a cent while traditional methods can take between $5 and $50 per transaction (Figure 45, Figure 46), makes stablecoins an appealing and growing alternative remittance method (The World Bank 2021b; The World Bank 2021a).

4.4.3 Powering Decentralised Applications

Stablecoins provide a useful method of paying out and settling *smart contracts* embedded within dAPPs. These are essentially pieces of code that run automatically on blockchains, triggering currency pay-outs on that blockchain if certain conditions are met.

One example provided by our expert involved a form of weather-related smart insurance contract that pays out when the insured location records a contractually specified level of rainfall. The automatic payment can be settled in stablecoin, rather than cryptocurrency, in order to ensure a more robust ecosystem and stable payment method to the end client.

Such smart contracts eliminate much of the overhead associated with the insurance industry, in the form of underwriting, claims processing, and fraud prevention, because all of these features are already handled within the context of the blockchain itself (Berry 2016). This results in substantially faster turnaround time insurance payouts, and lower costs to the premium payer.

In fact, a number of insurance companies already offer blockchain-based insurance smart contracts that offer payouts in seconds, not days, and in fields such as maritime, homeowner's, renter's, crop, term-life, and catastrophe insurance (Daley 2019).

DAPPs go far beyond this in the current blockchain industry, into areas as diverse as payments, attention-based search, charitable giving, AML/KYC RegTech, and counterfeit prevention (Mearian 2019). For example, Brave, the browser company started by Firefox co-creator Brendan Eich, uses *Brave Attention Tokens* (BAT) as a tradeable cryptoasset to reward users for viewing personalised advertisements with their consent (ibid). These tokens can be traded on crypto exchanges for other currencies.

Stablecoins fit naturally into the world of dAPPs. They have a substantial advantage over other payment methods, because they can be converted into fiat currency rapidly and settle directly into the beneficiary's real-world bank account, without any intermediate conversion steps.

4.4.4 Decentralised Finance

Decentralised Finance (DeFi) is an area of rapid growth and development, noted by about 25% of our experts (6 out of 33, primarily Academic and FinTec/Crypto experts). DeFi allows customers to access banking services without ever needing an actual bank branch, or even a bank account. Stablecoins provide a number of different financial functions within the DeFi world.

Because stablecoins are effectively smart contracts themselves (at least, those that are not native to a specific blockchain, such as market leaders USDT and USDC), they can completely automate the existing escrow system to ensure that fungible assets are held in escrow until the conditions of a DeFi loan or obligation are met in full.

Stablecoins can also be used to finance lending products, such as the Circle Yield product used by corporate treasuries hunting for yield (Song 2022). This specific product acts like a Certificate of Deposit (CD), yet provides a yield in excess of 5.50% for maturities up to 12 months (Team Circle 2021).

These products provide much higher yields than traditional financial products because the buyer pays to purchase a CD-like product, and deposits fiat with Circle, which then converts this to USDC, and lends that USDC out to institutional borrowers who will use that USDC for trading and hedging purposes. Due to the limited supply and circulation of USDC, and the very high demand among institutional investors for a stable vehicle for trading and hedging volatile crypto exposures, borrowers are willing and able to pay substantially higher rates of interest to holders of USDC than are available through other market instruments (ibid).

Coupons for these products pay out in stablecoins, which can then be redeemed for actual fiat currency. This is a very appealing product for corporate treasurers seeking to manage and preserve cash on their balance sheets, while still seeking yields higher than those currently available through liquid government securities (Song 2022).

Finally, stablecoins have the potential, though this seems to be unrealised at present, to allow "unbanked" populations – that is, those without recourse to traditional retail banking solutions – to be able to use digital currencies for payments, salaries, and other needs. While this is a largely unexplored area, except for limited examples in Latin America and Africa, several of our experts (5

out of 33, mostly Academic) view this as a significant current and future use case of stablecoins. This is because – in their view – retail banking systems in these regions are fragmented and have limited penetration, in parts of the Third World with a combined population exceeding 3 billion people. (Other interviewees did not discuss this topic or were not asked about it.)

4.5 Stablecoin Regulatory Regimes

The global landscape for stablecoin regulation is diverse and complex, and is a direct function of the regulatory environment for cryptocurrencies in general. Figure 7 shows global attitudes toward cryptocurrency regulations:

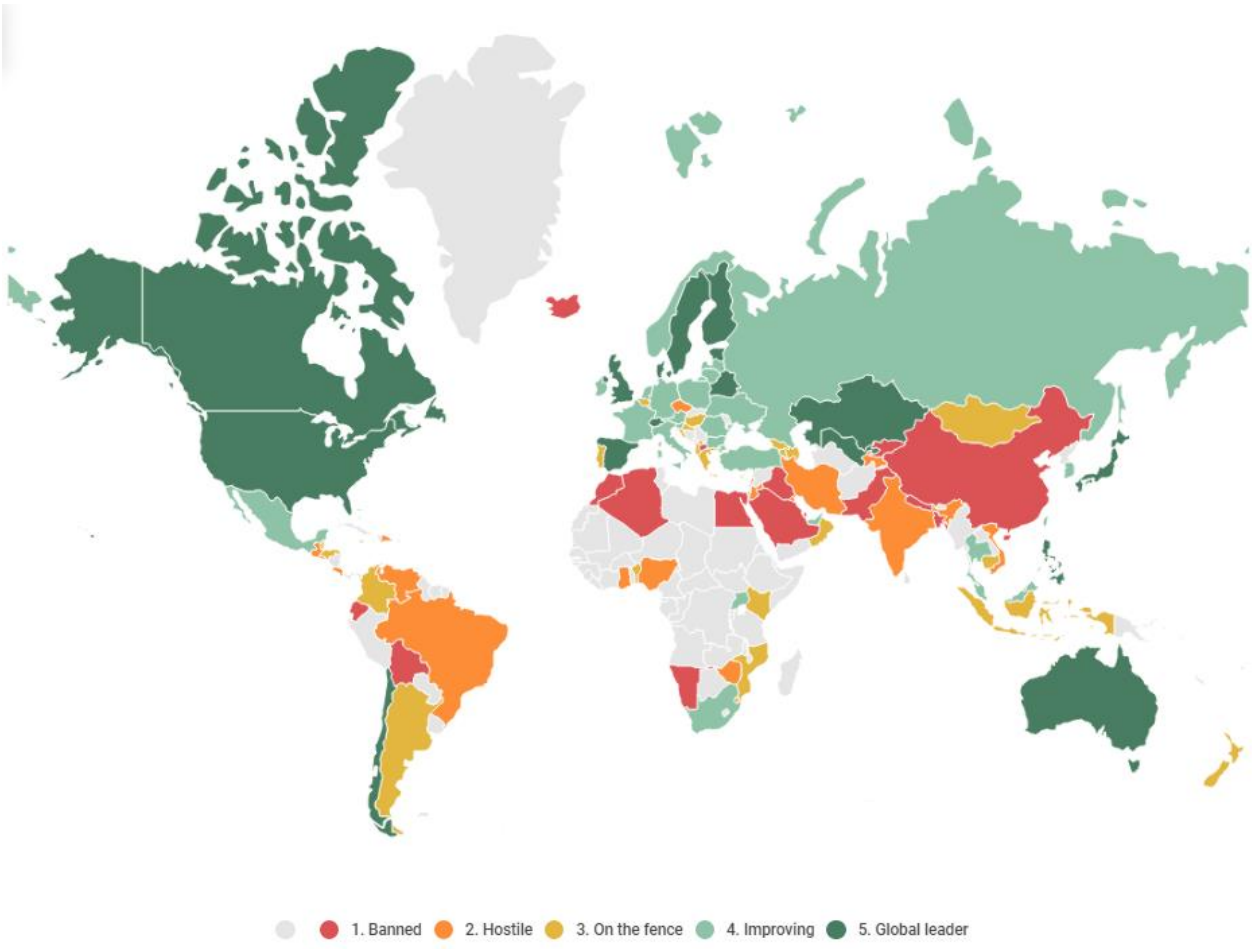

Figure 7 Global Landscape of Cryptocurrency Regulations (Falk 2018)

Note that this is the global landscape for *cryptocurrencies*, of which stablecoins are a special subcategory. Our expert interviewees stress that, due to the special risks posed by stablecoins from the centralised failure point of the issuer, the actual nature of laws and regulations within particular jurisdictions may be considerably more hostile toward stablecoins, specifically, than they are toward general cryptocurrencies.

4.5.1 Are Stablecoins Assets or Money?

This is *THE* fundamental question concerning SaaPM viability – as to whether stablecoins are *assets*, or *money*. As our expert interviewees indicate (Table 3), there is considerable debate among regulators on this issue, and significant differences of opinion between jurisdictions.

The issue here is that, if stablecoins are *assets*, their use generates a taxable liability for capital gains and income. Such a tax treatment renders them essentially useless as a transaction method. However, if they are *money*, they are **exempt** from taxation, and thereby can be used by average consumers for transactions (PYMNTS 2021).

At this time, global regulatory frameworks in general are still unclear, non-uniform, and uncertain. However, some jurisdictions, such as Singapore and Thailand (until very recently) (Section 4.5.5), and Japan (Section 4.5.6), treat stablecoins as effectively a more advanced form of e-money. Other jurisdictions, most notably the EU (Section 4.5.4) make clear distinctions based on the *type of reserve* used to back a particular stablecoin.

We note that, in general, the academic literature indicates that stablecoins have many, but not all, of the characteristics of e-money (Sokolov 2021) – that is to say, "an electronically (including magnetically) stored monetary value as represented by a claim on the issuer issued on receipt of funds for the purpose of making payment transactions, and which is accepted by a person other than the issuer" (ibid).

4.5.2 North America (United State of America & Canada)

Broadly speaking, North American regulators are friendly toward cryptocurrencies in general, yet hostile to stablecoins. This paradox is due to fears of systemic risks and a lack of regulatory trust in the asset bases of most stablecoin issuers (FDIC et al. 2021). The rapid rise in stablecoin volumes in the past 3 years (Figure 4, Figure 5) has made regulators think of stablecoins as financial instruments with potentially systemic importance (Cermak 2021). The regulatory environment in the USA is notable primarily for its lack of cohesion and clarity with respect to the status of stablecoins. Tax and regulatory regimes vary widely by state, as well, and issuers must often acquire 50 different state-level licenses to operate within the USA.

In 2021, the Office of the Comptroller of the Currency (OCC) permitted US banks to use stablecoins as payments (Cermak 2021). Yet, the November 2021 release of a report on stablecoins, published jointly by the President's Working Group, the OCC, and the Federal Deposit Insurance Corporation (FDIC), argued for stronger special regulation of stablecoins due to the concerns and risks posed by stablecoin issuers to the broader banking system (FDIC et al. 2021; Cermak 2021). The FDIC/PWG report reflected significant concern among US regulators with respect to collateral quality. In general, US regulators appear to be inclined to regulate issuers of **USD-only fiat-backed stablecoins**, specifically, like banks.

US regulators appear to take no strong position at the present time on any other type of non-USD or non-fiat-backed stablecoin. The US regulators appear to have taken a one-size-fits-all "blanket approach" to stablecoin regulation, and for the moment appear unwilling to deviate from this approach.

This may change soon, however. We learned of the idea of a *Narrow Bank* from one of our academic experts with a background in banking regulation. The concept essentially comes down to *full-reserve banking*, wherein a Narrow Bank takes in $1 of reserves, and issues $1 of "loans", in the form of stable tokens. By definition, there is zero risk of a bank run or systemic failure. The Narrow Bank would make a safe, regular, predictable income from exchanging those deposits for liquid short-maturity Treasury securities, and regulators would be able to inspect the quality of such a bank's asset base on a monthly or quarterly basis. Our academic expert notes that this is already happening with attempts to establish stablecoins headquartered in Wyoming, and expects this to become a more prevalent trend in the USA for stablecoin issuance.

Our expert interviewees based in Canada report that the country is fairly hostile to crypto-assets in general. They expressed the view that it is almost impossible to launch a token in Canada, and indeed customers based in Canada often cannot use cryptocurrencies of any kind via regulated exchanges. One of our interviewees, a FinTech/Crypto expert, speculated that this may be because Canadian regulators do not yet fully understand, and therefore do not trust, the technology behind cryptocurrencies.

4.5.3 The United Kingdom

The UK does not presently have any particularly clear significant regulatory regime for cryptocurrencies, in general. Its regulatory authorities face a difficult and complex balancing act trying to preserve the country's reputation as one of the world's most advanced nation for payments innovation (Nag 2018), and preventing financial crime and fraud.

Our experts in UK regulations, as well as a UK-based stablecoin issuer, expressed the view that any stablecoin issuer must comply with the specific regulatory rules and oversight of the UK's Financial Conduct Authority (FCA), in all of its dealings. The FCA appears to be working at present on a new regulatory regime for cryptoassets (Frost & Sullivan 2020), and is seeking opinions from both other regulatory authorities and market participants with respect to the benefits and risks of stablecoins.

Furthermore, our experts (4 out of 33), particularly academics with knowledge of UK regulations, express the view that the UK seeks to become a hub of offshore financial innovation in the wake of Brexit, and as such is probably more willing to allow blockchain-based products to take advantage of their technical and financial benefits. The same types of experts (5 out of 33) also express the view that the UK is not as strict as other jurisdictions, that regulations are currently at a relatively good and sensible level that permits innovation without undue risk-taking, and that the UK is a favourable environment for private sector development of blockchain technology. (Our other experts either were not asked, or offered no opinions, on these questions.)

Substantial clarity around UK attitudes toward stablecoins has emerged in recent weeks. The Financial Conduct Authority (FCA) and Prudential Regulatory Authority (PRA) issued a joint statement in March 2022 which reminded cryptoasset market participants of the need to ensure full and proper compliance with AML/KYC directives, avoid dealings with customers seeking to evade sanctions, and ensure that cryptocurrency transactions are for legitimate purposes wherever possible (Financial Conduct Authority 2022). This joint statement was merely a reminder of existing practices, and did not introduce any new regulations, but made clear the level of concern and attention paid by

UK regulators to the potential for fraud, tax evasion, and money-laundering using cryptocurrencies in general, and therefore stablecoins in particular.

Furthermore, on April 7, 2022, **British Chancellor Rishi Sunak announced that stablecoins would be recognised by the UK as a payment method**, though the announcement did not specify which particular types of stablecoins would qualify (Sephton 2022). In the same announcement, the FCA will sponsor a two-day consultation in May 2022 called "CryptoSprint", to allow the cryptocurrency industry in the UK to provide direct feedback in consultation to the British government (ibid).

Despite these positive developments, our experts warn that regulators in the UK have some concerns about the potential systemic and fraud risks involved with the inherently anonymous nature of blockchain technologies in general, and are particularly worried about whether stablecoins can be used to get around AML/CTF and sanctions laws.

4.5.4 European Union

Our experts with knowledge of EU regulations with respect to cryptocurrency note that the EU is neither unanimous nor harmonised in its approach to stablecoin regulation, which confirms the data shown in Figure 7. Our regulatory and academic experts, in particular, argue that the EU is adopting a more conservative (in the sense of non-interference in the market) approach to most fiat-backed single-currency stablecoins. The recently issued Markets in Crypto Assets (MiCA) regulation, makes a very clear distinction between different types of stablecoins (PYMNTS 2021):

- **Single-currency, fiat-backed stablecoins** will be treated as *a more advanced form of e-money* (Sokolov 2021), with the critical difference being that such stablecoins can act as collateral for loans within the world of *decentralized finance* (DeFi);
- **Stablecoins backed by other cryptoassets** (e.g. DAI), baskets of currencies (e.g. Saga), or commodities (e.g. Paxos, Tether Gold) will be treated as *digital assets, subject to taxation*;
- **All other stablecoins, including seignorage (algorithmic) coins**, will be potentially considered as money;

In addition, the Regulatory Infrastructure for Crypto Assets (RICA) framework emphasizes that assets which reference another asset for price discovery, can be considered as assets themselves. However, stablecoins pegged to a fiat currency can potentially be used as money. Under this framework, e-money licenses may be necessary for stablecoin issuers to operate within the EU, depending on the regulation and jurisdiction.

This issue of jurisdiction becomes particularly important when looking at differences within EU member countries with respect to attitudes toward stablecoins. A small number (3 / 33) of our experts, primarily with academic expertise in cryptoasset regulation, argue that Nordic nations, particularly Sweden, are more likely to permit the adoption of stablecoins, due to their small populations and quite robust financial systems. These same experts noted that population size matters because the complexity and difficulty associated with a blockchain scales with population size, so a smaller population will by definition have an easier time transacting on a blockchain than a larger one. (Other experts had no view about EU regulation.)

By contrast, Germany and Italy are generally quite hostile to cryptocurrencies. Germany's regulation of cryptocurrencies tightened significantly in the wake of the Wirecard scandal, which exposed serious flaws in the BaFin's ability to regulate the crypto market (Ferguson 2020). Our academic and

regulatory experts also argue that Italian regulators tend to be hostile toward cryptocurrencies, due to their potential for bad actors to use them for fraudulent purposes and tax avoidance in an already weak and poorly regulated banking system.

Outside of the EEC, Switzerland is also known for being an early adopter of blockchain technology – in fact, Switzerland recently finished running its own PoC for CBDCs (Section 4.8.2) (Frost & Sullivan 2020). The Federal government of Switzerland has somewhat more relaxed laws for blockchain and crypto start-ups relative to much of continental Europe and the EU, and the Swiss Financial Market Supervisory Authority (FINMAN) is entitled to use its discretionary powers to relax rules affecting decentralised securities trading (Frost & Sullivan 2020). Due to its relatively strong government support for innovation and blockchain development, Switzerland appears to be a permissive environment for the testing and implementation of blockchain-based currency solutions.

4.5.5 Southeast Asia (Singapore & Thailand)

Southeast and East Asia, with the notable exception of China, appear to view stablecoins as a viable and acceptable form of money. Singapore has adopted blockchain-related projects early and has since achieved a market leadership position among Asian countries in this regard (Frost & Sullivan 2020).

One of our interviewees, a FinTech/Crypto SME, explained that two regulatory regimes exist in Singapore for cryptoassets. The first treats security tokens as tradable securities, subject to income taxation. The second treats digital payment tokens as money. Cryptocurrencies and stablecoins generally fall into the second category under Singaporean law, and therefore follow the dictates of the Payment Services Act and are regulated by the Monetary Authority of Singapore (MAS). Issuers require separate MAS licenses to operate. Singapore has already approved four cryptocurrencies for general payments usage under this framework. Any new cryptocurrencies submitted for consideration, to include stablecoins, must be submitted to the MAS with a due diligence report performed by a reputable law firm domiciled in Singapore.

Another interviewee, who has significant insight into the regulatory processes of Thailand, notes that Thailand regulates stablecoins as a form of e-money under the purview of the Bank of Thailand (BoT). Like Singapore, Thailand also has two separate regimes for stablecoins and cryptocurrencies in general, and also requires stablecoin issuers to secure licenses for operation from the BoT.

However, Thailand's attitudes toward cryptoassets in general has hardened significantly, and quite recently. In January 2022, the BoT issued a statement seeking to regulate cryptoassets for payment purposes, due to concerns by the Thai SEC and BoT that "use of digital assets [as a means of payment] could also pose further risks to consumers and businesses through price volatility, cybertheft, personal data leakage, or money laundering, etc." (Bank of Thailand 2022).

The BoT/Thai SEC joint press release went on to state that "[f]urther regulatory guidelines will be issued for certain digital assets that are supportive of the financial system and financial innovation while not posing systemic risks", and that "[f]eedback from relevant stakeholders and the general public will be taken into consideration to determine the appropriate regulatory frameworks" (ibid).

The BoT and Thai SEC subsequently banned cryptoasset use outright for the purpose of payments on March 23, 2022, taking effect on April 1, 2022 (Associated Press 2022).

Therefore, Thailand is currently hostile to stablecoins for payments, though we emphasise that this may change, as the market for cryptoasset payments is developing at a very rapid rate.

4.5.6 Japan

As narrated to us by a former senior Japanese regulator, Japan was the first UN member to introduce a regulatory framework for virtual currencies, initially as a means of payment. However, market participants tended not to use cryptoassets for payments, but rather for trading and speculation. For this reason, Japan developed a new regulatory framework for cryptoassets to be treated in a manner similar to stocks, bonds, and other securities. Japan currently has regulatory frameworks in place for intermediaries that use cryptoassets, and is working on regulations to ensure full compliance of those intermediaries with national and international AML/KYC requirements.

With respect to stablecoins, specifically, the Financial Services Agency (FSA) is currently working on a new regulatory framework to accommodate the special features of these currencies, as existing regulations did not anticipate the development of stable cryptoassets backed by collateral. The Japanese Securities and Exchange Commission (JSEC) is working on developing a regulatory structure around SaaPM as well. Therefore, at present, there appears to be considerable ambiguity in the regulatory regime for stablecoins in Japan, but regulators have taken a more forward-looking and market-friendly approach to stablecoins than many other Asian nations, notably China (Figure 7), and presently treats stablecoins as essentially equivalent to e-money.

Our expert noted that Japanese regulators do not presently see significant sources of systemic risk with stablecoins, due to their rather marginal use as a payment method at the moment. However, Japan's regulatory bodies are keeping a close eye on the potential for the systemic risks posed by issuer failure, particularly to the Japanese banking system and other regulated industries in which stablecoin usage might become prevalent in the future.

4.5.7 China

China's attitude toward cryptocurrencies in general, including stablecoins, is markedly different from that of other countries, and can be summed up as "extremely hostile". The Bank of China has outright banned the ownership and trading of privately issued or decentralised cryptocurrencies (Lyons 2021), and this appears to be due to the Chinese Communist Party's desire to maintain fully hegemonic monetary control over the yuan. The push by the Chinese government to issue its own digital yuan hybrid RCBDC (Section 4.8.2), illustrates the government's desire to ensure that all uses of the yuan can be tracked and logged, and also will permit the government to continue its current digital banking transformation. As such, China does not and most likely will not tolerate privately issued and held stablecoins.

4.5.8 Rest of the World

Looking beyond these specific cases, we see that some other Asian and Latin American countries are more positively disposed toward cryptocurrencies generally, and stablecoins specifically. For example, South Korea's government is actively discussing the possibility of running a PoC for UST-based payments in Busan (Alper 2021), and has recently wrapped up a CBDC PoC as well. In El Salvador, Bitcoin is now legal tender, in order to increase accessibility to financial services among the population, and to ease the ability of Salvadoreans globally to remit money to the country (Zafar

2021). However, at least three of our regulatory experts pointed out that this has been problematic, as the high volatility and expense associated with using BTC has resulted in many users simply cashing out their BTC balances for USD instead.

Other nations are openly and highly hostile to cryptocurrencies. Nigeria has banned any dealings with cryptocurrencies due to the Nigerian Central Bank's view that these are only used for speculative purposes (Cermak 2021), and Turkey has banned the use of cryptocurrencies for payments due to what its government views as the "riskiness" of such transactions (ibid). In Russia, the central bank seeks to ban cryptocurrencies, but the Finance Ministry actually opposes that ban (Frost & Sullivan 2020; Baydakova 2022).

4.6 Technological Barriers Against Stablecoin Payments

There are a number of significant technological barriers to adoption for SaaPM. We outline the most relevant ones here. All of these issues are essentially interlinked, and their root cause lies in the *blockchain trilemma* (Section 4.6.5).

4.6.1 Slow Transaction Speeds on the Ethereum Blockchain

We must note that most stablecoins are not actually *direct* digital currencies – they are in fact a special type of *smart contract* that pays out in a specific currency. As such, most of the leading stablecoins were originally implemented using the *Ethereum Request for Comments-20* (ERC-20) protocol. This means that stablecoin transactions must run on the Ethereum network (though this is becoming less true by the day, due to *bridging solutions* which allow stablecoin transactions to be processed on other networks and protocols). Presently, about 75% of all stablecoins issued, across all categories, run on the Ethereum network (Beck 2021).

In practical terms, this means that most stablecoin transactions must be processed through Ethereum's *Proof-of-Work* blockchain, where each authenticating node in the chain records all data on the chain and must verify the validity of each new block added to the chain. Due to this processing requirement, an Ethereum-based smart contract transaction can take anywhere from 15 seconds to a few days, depending on the current level of network congestion and the *gas fees* (essentially, the "toll" paid by the user to ensure that the transaction is processed and prioritised) associated with the new block.

Figure 8 shows the historical transaction processing time on the Ethereum blockchain for new blocks of data (note that this applies specifically to *native Ethereum currency transactions*, not to smart contract processing times, which are considerably longer).

The main reason for the slow Ethereum processing time appears to be the high volume of USDT transactions, which now account for 25-50% of the network's PoW validation processing on any given day.

The sluggish nature of stablecoin transactions on the Ethereum network, at present, is a serious and significant barrier to the adoption of SaaPM, a point raised with, and agreed upon, by every expert whom we interviewed, regardless of field of knowledge or specialisation. Presently, Ethereum-based stablecoins, such as USDT, USDC, and a number of others, simply cannot compete at all with mainstream payment processing networks in terms of speed.

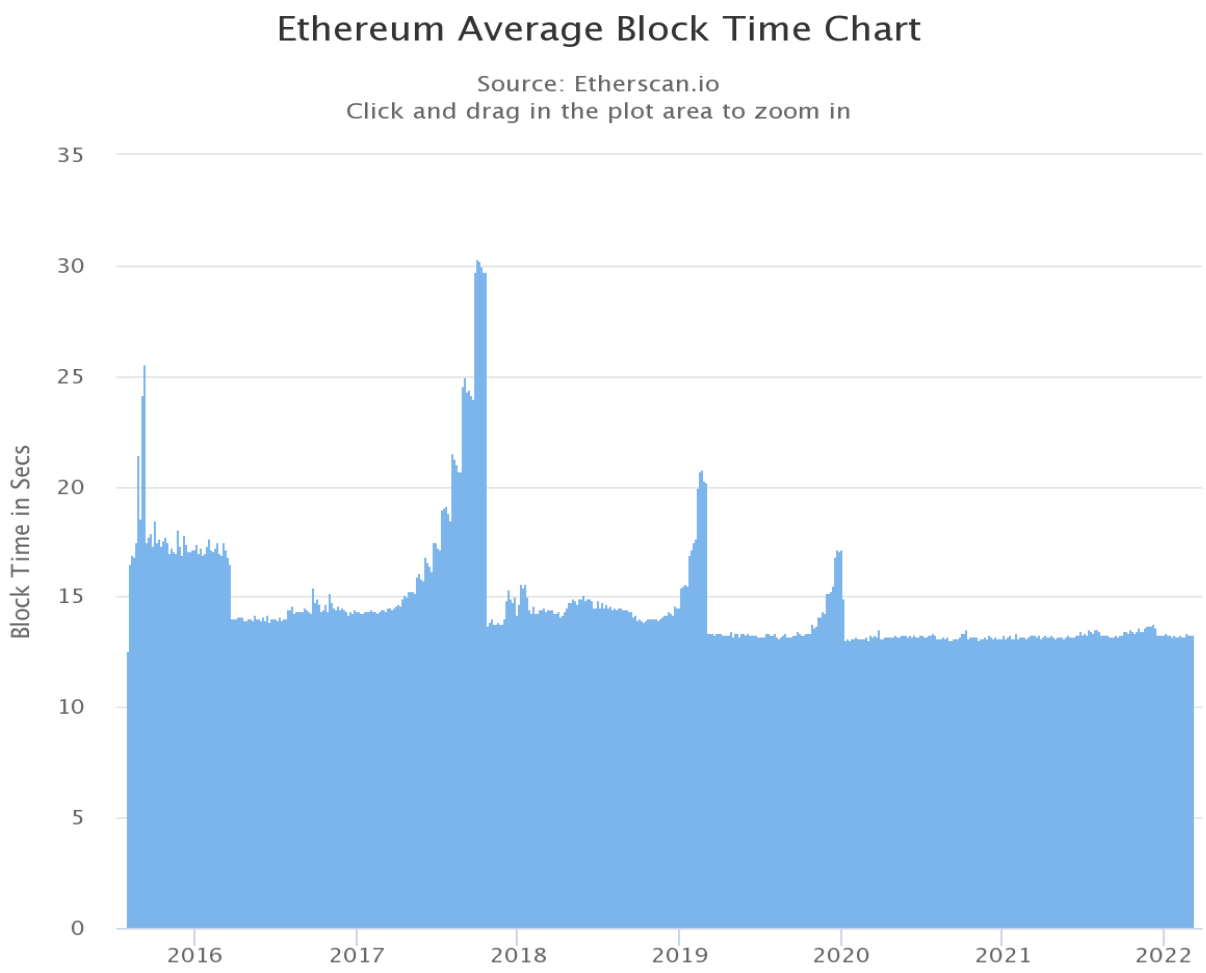

Figure 8 Processing Times on the Ethereum Blockchain 2016-2022

4.6.2 Volatile and Unpredictable Transaction Costs

With respect to blockchain technology in general, there is a cost associated with processing transactions, as the validation of each transaction requires time and effort, regardless of the method used in that validation. In Proof-of-Work environments, such as that used by the Ethereum blockchain on which many current market-leading stablecoins sit, incentives must be paid to cryptocurrency miners to solve the complex and difficult cryptographic problems that permit new information to be added to the chain – and, thereby, allow new transactions to be added to the universe of existing ones.

In the Ethereum environment, this incentive is known as the *gas fee*. This is essentially a variable toll that users must pay in order for their transactions to be accepted for processing by nodes on the chain. Unlike the Bitcoin blockchain, users can pay extra to prioritise their transactions. As a result of this unique setup, the average Ethereum gas fee is quite volatile, particularly during times of high network congestion.

The gas fee for Ethereum-based transactions has been rising since early 2020, and has experienced quite dramatic spikes in recent times, as Figure 9 shows. Gas fees have ranged from US$10 to US$250 in the past year.

It is possible to run stablecoin transactions using USDT and USDC on other protocols, as well, but even then, the cost of running those transactions can be prohibitively high. One of our academic experts, who also has experience in cryptocurrency transactions, noted that running a transaction on the Uniswap protocol would have cost US$700 at the time.

These high fees render transactions of less than US$1,000 completely impractical for consumer payments, at the present time.

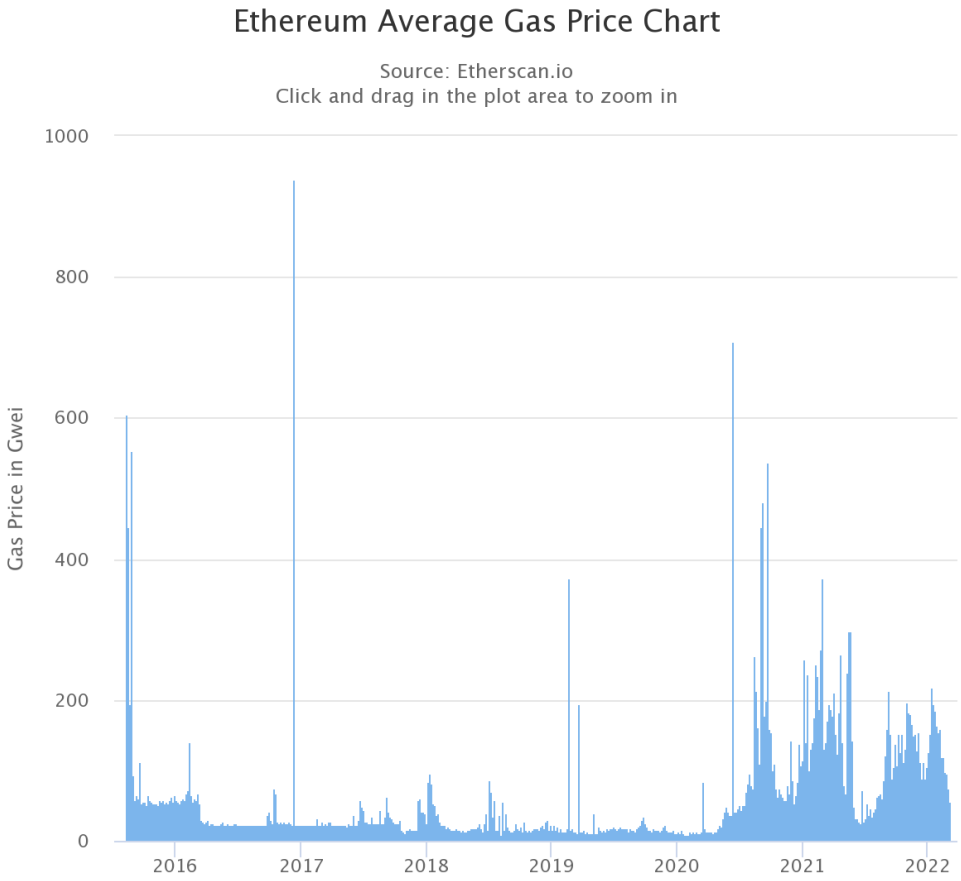

Figure 9 Transaction (Gas) Fees on Ethereum Blockchain 2016 - 2022

Fees are so high on the Ethereum network, and associated protocols, because Ethereum is used for much more than just currency transactions. It is in fact a fully integrated application environment, and numerous smart contracts run on the network. This leads to congestion and crowding, and because stablecoins are smart contracts themselves, this leads to high fees on the Ethereum network.

4.6.3 Lack of Scalability

Because of the slowness and high cost of blockchain transactions for stablecoins, the technology is not currently considered sufficiently *scalable* to be relevant or useful for payments. Our experts (4 out of 33) note that the Ethereum blockchain runs at roughly 9-30 TPS. By comparison, VISA, MA, and AMEX can **easily** manage at least 10,000 or more TPS, and can authenticate their transactions in under 50 milliseconds, at a cost basis of below 10bps per transaction, on their own proprietary networks. Other experts did not touch upon this issue or had no opinions.

The Ethereum blockchain, on which most of the world's leading stablecoins reside as smart contracts, cannot come anywhere close to that level of scale in terms of transaction volume and settlement speed.

In general, our expert interviewees (11 out of 33) argue that blockchain technology cannot, *at this time*, support mass stablecoin usage. However, the same experts note that this state of affairs is not permanent – fast, scalable blockchain technologies are already emerging and are rapidly changing the blockchain landscape (Section 4.7). Other experts did not touch upon this issue or had no opinions.

4.6.4 Conflict Between Anonymity and Regulatory Requirements

The ability to engage in anonymous transactions is a core feature of distributed ledger technology (DLT). However, the anonymity afforded by DLT also poses significant risks with respect to illicit activities, such as money laundering, terror financing, tax evasion, and engagement in transactions for purposes that are "questionable" at best.

Central banks and regulators seek to protect end-users by establishing clear rules for AML/KYC due diligence. Many regulators also have stringent Combating Terror Financing (CTF) laws in place, as well as a raft of other anti-corruption and public order measures. Blockchain technology permits users to skirt or bypass these regulations entirely. As such, regulators around the world have strong concerns about the potential for stablecoins, specifically, to be used for a wide variety of illegal activities. Because stablecoins are, by definition, linked to fiat currency, they can be used to settle illicit activities electronically, thereby removing the need to conduct illegal transactions in cash, and thus removing a key tool of law enforcement for tracking such deals.

4.6.5 The Blockchain Trilemma

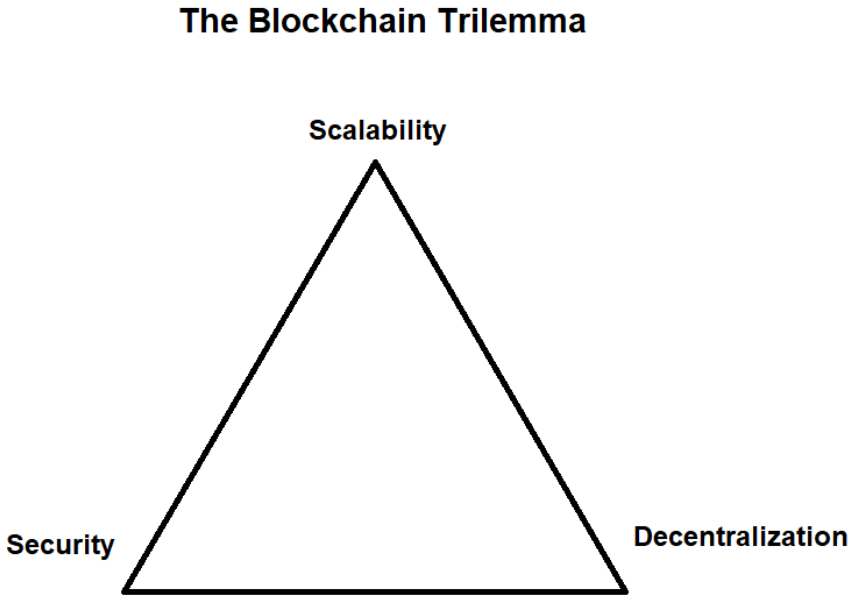

Figure 10 Conceptual Explanation of the Blockchain Trilemma (Prasanna 2019)

The *blockchain trilemma* is a concept coined by Ethereum co-founder Vitalik Buterin, that proposes a set of three main issues — decentralization, security and scalability — that developers encounter when building blockchains, forcing them to ultimately sacrifice one "aspect" for as a trade-off to

accommodate the other two (Prasanna 2019). The cryptocurrency developer community generally agrees that decentralised networks can only provide at most two of these three benefits, and even then only with great difficulty.

The trilemma lies at the core of the issues encountered above. Stablecoins are, by definition, exposed to the consequences of this issue. Thus, it is extremely difficult, if not impossible, for a pure Layer 1 blockchain solution (i.e. a blockchain that has to process every transaction individually, without any consolidation or assistance from higher-level solutions) to provide the right combination of user-demanded anonymity and speed, institutionally-required scale, and legally-compliant transparency, that will drive SaaPM to broader acceptance.

4.7 Current and Proposed Technological Solutions to Known Issues

Despite the substantial technical challenges noted above, our experts (8 out of 33), particularly those with a FinTech/Crypto SME background, are in fact quite optimistic that technologically driven solutions can be found for most of these issues. (Other interviewees expressed no view on the subject.) Here we outline some of the solutions mentioned, referencing practitioner literature where appropriate.

4.7.1 Blockchain Layers

To understand these solutions, we must first examine a fundamental aspect of blockchains.

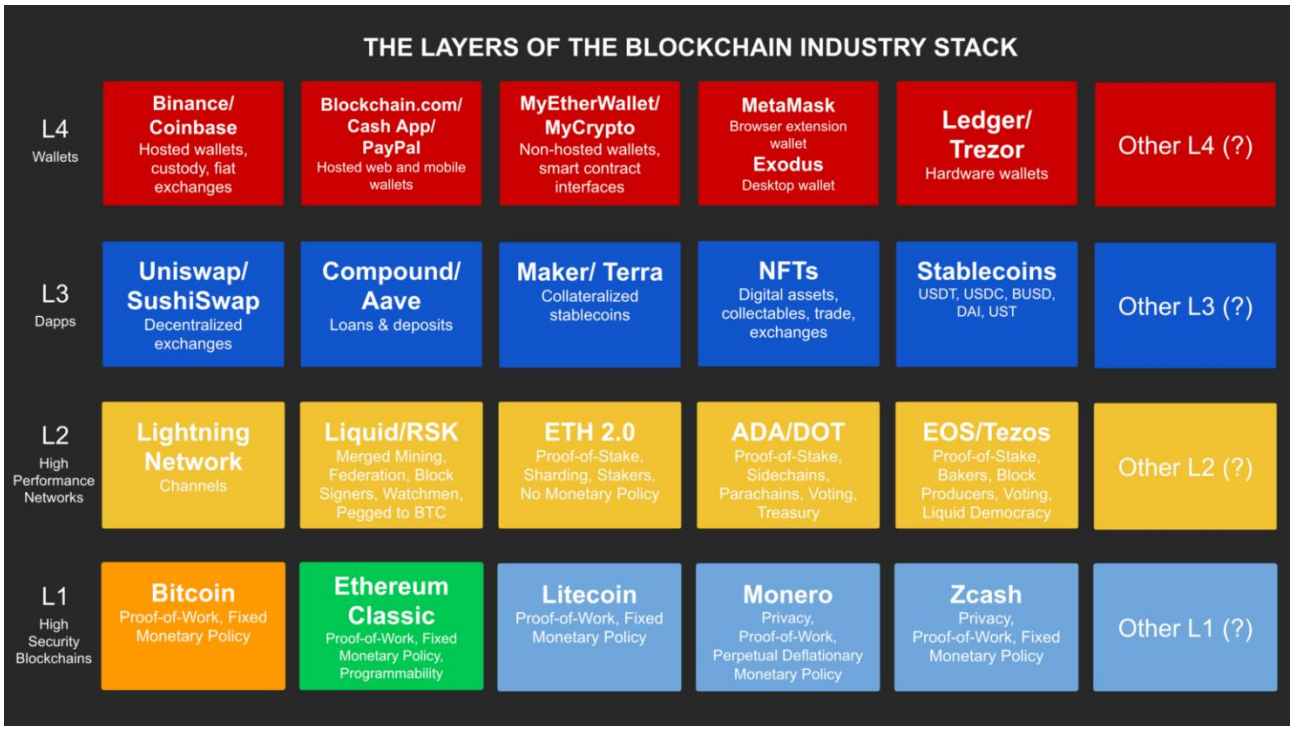

Figure 11 Blockchain Layers for Major Industry Chains (McIntyre 2021)

Every blockchain has multiple *layers* to it (Sanchez 2021):

- **Layer-0**: the fundamental hardware and technical components required to power the blockchain;

- **Layer-1**: the consensus mechanisms, computer code, specified block size and processing time, and other rules and parameters that govern how a blockchain functions;
- **Layer-2**: additional networks overlaid on top of the fundamental layers designed to ease the burden of computation on the Layer-1 chain, such as *sidechains, zero-knowledge (ZK) rollups, Optimistic rollups,* and a number of other powerful technological and cryptographic solutions;
- **Layer-3**: often known as the *application layer*, which allows dAPPs to run as automated pieces of code on top of other layers;
- **Layer-4**: the *wallet/exchange layer*, which is the closest to the user, and which provides the user with the front-end experience of using wallets, trading on exchanges, and running actual transactions;

Note that all stablecoins which do not run on their own blockchain (i.e. almost all of the market-leading fiat-backed stablecoins) must run as dAPPs on Layer-3, with all transactions then processed in lower layers. For blockchains that do not have a high-performance Layer-2, such as Ethereum (though this is changing), processing times can be quite slow, as noted in Section 4.6.1.

This means that stablecoins will typically benefit greatly from Layer 1 and higher solutions. The problems associated with speed and scalability of blockchains in general cannot be solved through raw computing power alone. Cryptocurrency developers and enthusiasts must develop, and are developing, more refined solutions at the Layer-1 level and higher.

4.7.2 Layer 1 Solutions

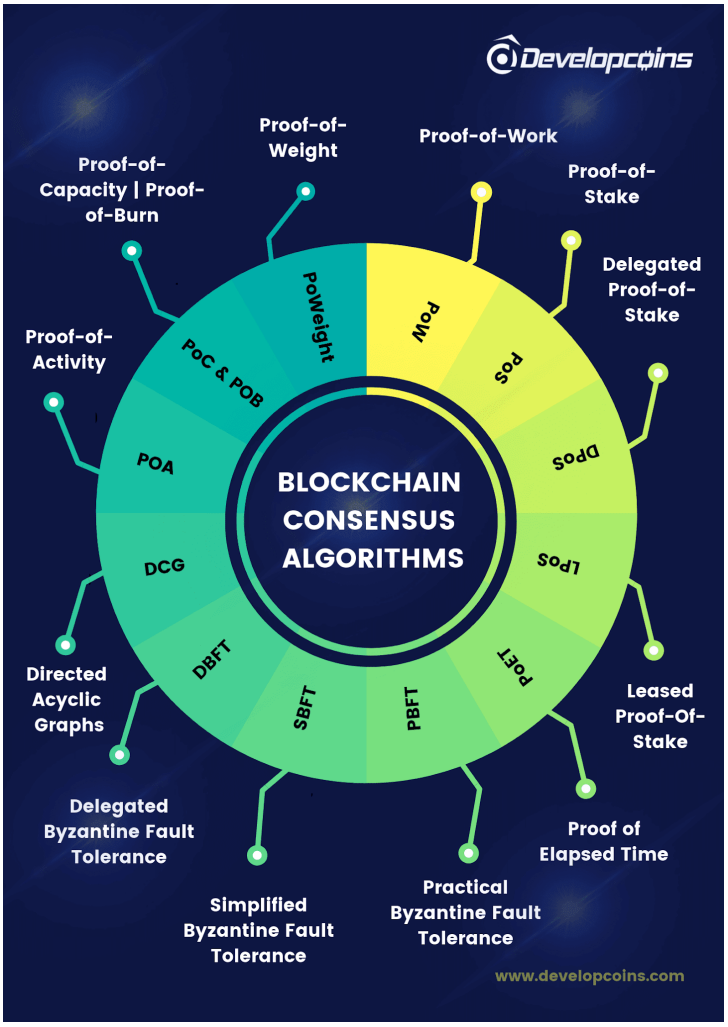

Figure 12 Current and Proposed Blockchain Consensus Mechanisms (DevelopCoins 2022)

At the Layer-1 level, developers have proposed a number of changes and solutions on the Ethereum blockchain to resolve these issues of speed, transaction cost, and scalability.

Fundamentally, a blockchain is simply a distributed database, with copies of a "single source of truth" spread out across many nodes. Every blockchain requires a *consensus mechanism* to ensure that new entries to the database are valid. There are a great many possible mechanisms - Figure 12 provides a graphical representation of the many different categories and subcategories of such mechanisms.

Presently, Ethereum uses a *Proof-of-Work* (PoW) consensus mechanism, which requires each individual transaction to be validated by all of the nodes in the network by *miners*, solving quite complex cryptographic problems in exchange for rewards provided to the first miner to solve the problem in the native currency of the chain (in this case, Ether) (DevelopCoins 2022).

The literature and our academic experts note that PoW mechanisms are effective, secure, and decentralised – but as the blockchain grows, it inevitably also slows down, as ever more mining power is required to process new transactions.

One potential solution proposed for Ethereum is the switch to *Proof-of-Stake* (PoS) consensus mechanisms for the Ethereum 2.0 code release. Under this framework, those who have the most accumulated Ether in their wallets, will be given top priority in evaluating the validity of a given block of transactions, and will be penalised by forfeiting their existing "stake" if they incorrectly validate a block.

Switching to PoS *may* substantially increase transaction speeds – one of our academic experts argued that once Ethereum switches to PoS, and in the process implements an update to the consensus protocol known as *sharding* (see below), the chain will be able to process up to 100,000 TPS. This would also result in the elimination of gas fees and network congestion.

However, our experts and the literature are quite divided on this subject. Several of our experts (4 out of 33, mostly academics) note that switching to PoS is not a solution at all, as it does not solve the *block size* limitation of Ethereum, which restricts the total number of transactions that can be added to any individual new data block. Others (2 out of 33, both academic) argue that the switch will result in substantial centralisation of power and authority with only a handful of nodes, nullifying the security of the chain. (Our other experts either had no view on the subject, or were not asked about this issue.)

This is a subject of hot debate within and outside the Ethereum community, and there has been no substantial agreement yet. We note that Ethereum 2.0 has been under discussion since 2017 (Buterin 2017), and was supposed to be rolled out between 2019 and 2021 (Ogwu 2020), but is still in development and testing stages as of Q1 2022.

As mentioned, one proposed Layer-1 solution on the Ethereum blockchain as part of the Ethereum 2.0 rollout is a process known as *sharding*. This partitions the chain to spread out the computational and storage load across a P2P network, so that each node only contains information relevant to its own section, or *shard*, of the chain. The information stored in this shard can still be seen and shared across the entire chain, but individual shards do not need to contain the entire ledger. This allows for substantial increases in speed, though our experts could not give us a clear estimate as to how much faster the chain will become.

These Layer-1 solutions are consequential for stablecoins because they directly affect the speed and scalability of the Ethereum network, on top of which most (though not all) of the dominant stablecoins currently run. If Ethereum can be sped up and achieve significant scalability, then SaaPM becomes significantly more viable.

4.7.3 Layer 2 Solutions

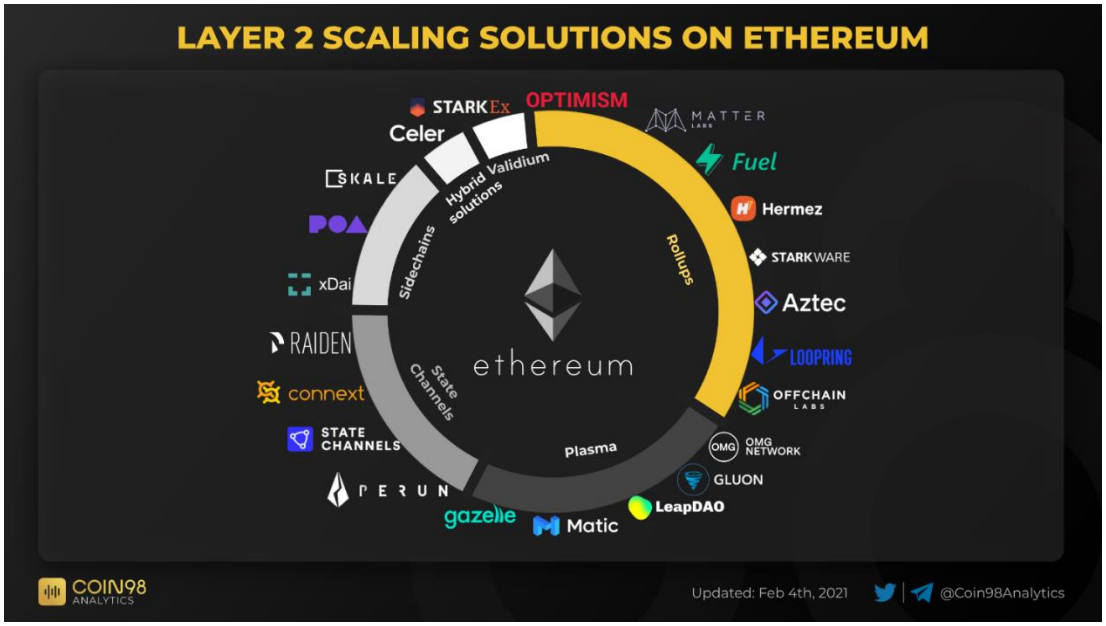

Figure 13 Array of Layer-2 Solutions for Ethereum Network (Coin98 2022)

Beyond improving the speed and scalability of computations on the main blockchain, experts and developers propose a number of *Layer-2 solutions*, designed to alleviate congestion and increase speed on the main chain. As noted above, Layer-2 solutions refer to additional networks that branch out from the nodes of the main chain.

One example of a Layer-2 solution directly relevant to stablecoins is the Polygon network. This is an example of a *side-chain*, which branches off from nodes of the main chain, runs and processes high-volume and repeated transactions separate from the main blockchain for dAPPs, and then collapses the results down into one set of consolidated data to be processed on the main chain (Bhalla 2021).

The Plasma network for Ethereum works in a similar fashion, by processing large data sets for dAPPs off the main chain, then collapsing and netting out completed transactions for validation on the main Ethereum chain (Liebkind 2019).

Most of our FinTech/Crypto, and several of our academic, experts highlight the ways in which Layer-2 solutions of this kind have the potential to dramatically increase the scalability and speed of primary blockchains, such as Ethereum. In their view, Layer-2 solutions have the potential to increase TPS to over 10,000. They also have the potential to significantly improve the user experience with blockchain technology, because developers are presently focusing on making these solutions as seamless and invisible to the end-user as possible.

However, we note that most of our experts believe many of these Layer-2 solutions are still in test phase and will not truly begin to make a significant difference to blockchain speed and scalability issues for at least 12-24 months.

4.7.4 Latest Developments in Blockchain Technology

Both our expert interviews (12 out of 33) and the market literature argue that the technological obstacles preventing mass stablecoin adoption are well on their way to being resolved. Recent developments in blockchain technology promise to address many of the outstanding issues seen with stablecoin payments. These include:

- **Algorand blockchain**: Provides the scalability and speed that Ethereum currently lacks. By running USDT and USDC on Algorand protocols, users can transact in their preferred U.S. dollar-backed stablecoin at a fraction of the cost and time taken on Ethereum.
- **Binance Smart Chain**: an Ethereum-like chain created by Binance, a large centralised crypto exchange. To use the Binance Smart Chain, investors can use the same wallet software as Ethereum, at a fraction of the current cost, and transactions complete in seconds, rather than minutes.
- **Terra Network**: alternative to Ethereum with two native tokens – LUNA and UST – that allow for rapid decentralised transactions**.** One of our FinTech/Crypto SMEs used Terra to send UST from a decentralised wallet, to the Binance exchange, in order to run a trade, and then deposited the resulting gains in a bank account. The total cost of the cryptocurrency transactions came to US$0.0005, and the cost of transferring to a bank account came to about US$0.27.

Other alternatives, such as Cosmos, Avalanche, the Lightning Network, Solana, and a wide variety of other Layer-1 and Layer-2 solutions already exist in the market to provide fast, scalable solutions for stablecoin transactions. *Bridging solutions*, which allow users to jump between blockchains for transactions, also provide a level of freedom and flexibility that increasingly make stablecoins a viable alternative to traditional payment methods.

4.8 Central Bank Digital Currencies

The discussion of SaaPM is incomplete if it does not consider CBDCs. These specialised cryptocurrencies are a source of significant research, government investment, and not a little controversy. The existence in any particular geography of a CBDC will have direct implications for the viability, or lack thereof, of an SaaPM strategy.

4.8.1 Definitions and Types

At its core, "[a] CBDC is a digital payment instrument, denominated in the national unit of account, that is a direct liability of the central bank" (Bank of International Settlements 2020a). In practical terms, this implies a stablecoin issued by the central bank of a sovereign nation or currency bloc, backed 1:1 with the underlying fiat currency.

Critically, the fact that CBDCs are issued by central banks, immediately eliminates the questions of credibility that currently surround privately issued stablecoins. Since central banks provide full backing for the currency, and can provide liquidity at will when tokens are redeemed for fiat, there is no question of the quality of a CBDC's underlying assets or collateral.

CBDCs currently remain broadly a theoretical exercise, with some important exceptions. Both academic and practical literature split CBDCs into two broad categories – wholesale, and retail (Ononeme 2020).

Wholesale CBDCs (WCBDCs) are generally used for commercial purposes, and will typically be used only by a narrow group of financial institutions and market participants to facilitate large-scale funding inflows and outflows (Ononeme 2020).

Retail CBDCs (RCBDCs), on the other hand, are designed specifically for use by everyday consumers and merchants, and are much broader in scope and complexity. Retail CBDCs can be broken down into three further subcategories. Figure 14 provides an illustration of these three types of RCBDC – pure, hybrid, and synthetic.

In practical terms, the differences between these three types are as follows:

- **Pure RCBDC**: Merchants and customers have accounts maintained directly with the central bank, with all settlements carried out by that central bank and with no need for any intermediaries;
- **Hybrid RCBDC**: Network and banking intermediaries handle onboarding and tracking of transactions between customers and merchants, settling accounts periodically with the central bank;
- **Synthetic RCBDC**: intermediaries issue their own "ICBDC", backed 1:1 by actual CBDCs, which are themselves backed by fiat, and handle KYC and onboarding requirements for merchants and customers, with accounts settled periodically against the central bank;

It must be noted that synthetic CBDCs, which are essentially public-private partnerships between large international banks and central banks, are arguably not CBDCs at all, according to practitioner literature (Bank of International Settlements 2020a).

Generally speaking, WCBDCs are favoured in countries with strong existing retail banking systems, due to their potential to reduce operational frictions, increase efficiencies, improve transparency and stability of the monetary system, and greatly upgrading the overall flexibility of the financial system (Ononeme 2020; Bank of International Settlements 2020a). RCBDCs, on the other hand, are more favoured in developing countries with weak or non-existent retail banking systems, due to their potential ability to allow such countries to leapfrog the retail banking stage of development and jump straight to direct, democratised, open digital banking (Ononeme 2020).

Central banks are interested in CBDCs because they have the *potential* to solve some very serious known issues with current monetary policy. In theory, CBDCs allow central banks to issue currency directly to merchants and customers alike. This permits them to bypass the traditional banking system, within the context of open-market operations and fractional-reserve lending. This is of particular interest in a modern *Zero Interest Rate Policy* (ZIRP) environment, where a number of central banks appear to be struggling with a *liquidity trap* situation, wherein further monetary easing has little to no effect on actual output. This in turn has led central bank economists to seek unconventional monetary policy tools, and CBDCs are one such possibility (Prat et al. 2020).

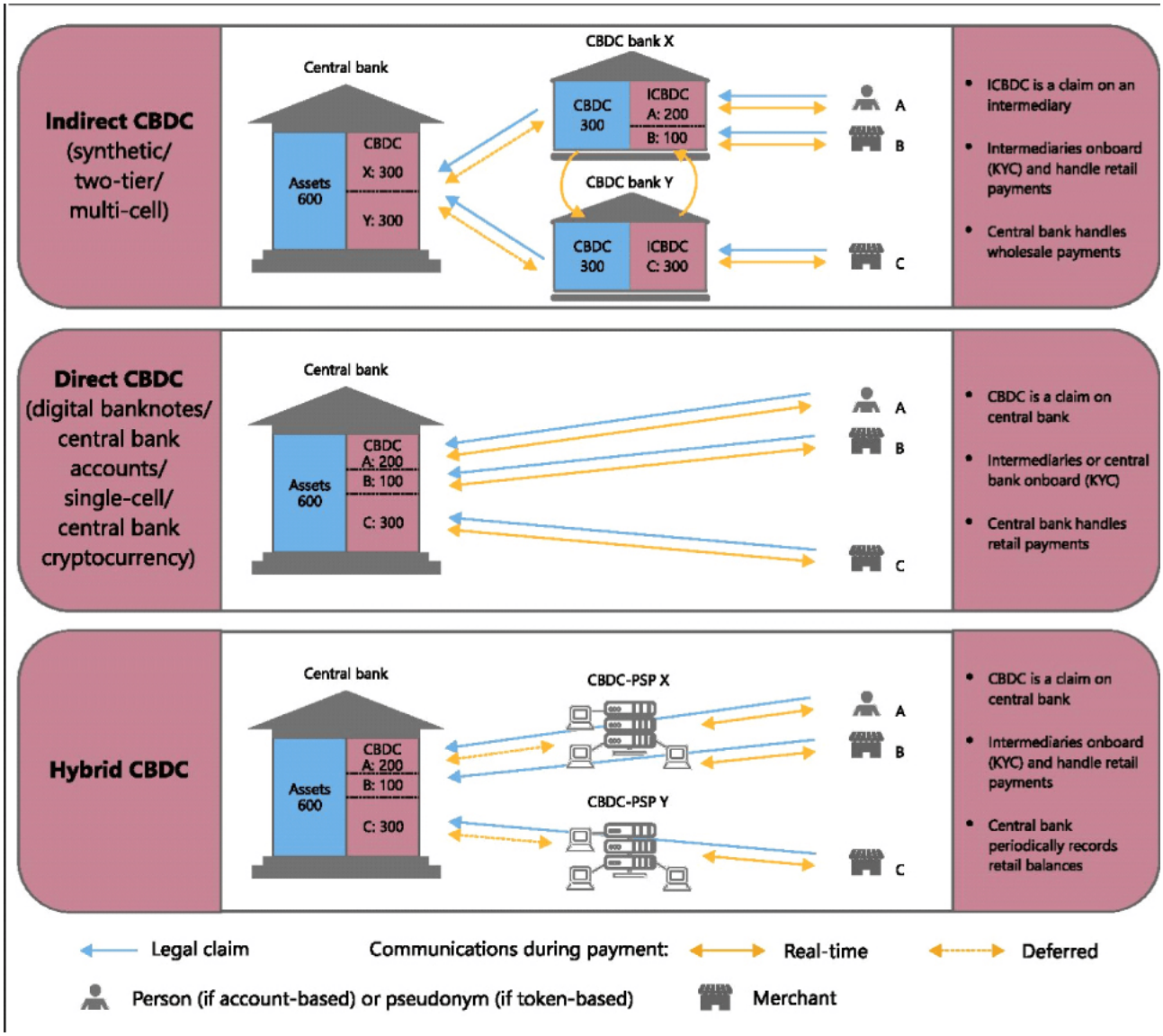

Figure 14 The Three Types of RCBDC (Ononeme 2020)

4.8.2 The CBDC Landscape

Despite the promise offered by CBDCs, in terms of an unconventional monetary policy tool for injecting liquidity directly into the economy, actual implementation is a complicated, difficult, and expensive exercise, especially within the RCBDC model. Significant technological, legal, and privacy challenges exist to prevent rapid adoption of CBDCs, of any type, in most countries, "any approach to issuing a CBDC will naturally be cautious, incremental, and collaborative" (Bank of International Settlements 2020a).

A number of countries around the world have attempted to implement CBDCs, in various ways. Figure 15 shows the latest available information by country for CBDC implementation progress. We note the following points (all data from CBDC Tracker):

- **USA**: Currently in the process of running a relatively small-scale pilot through the Boston Fed;

- **Singapore**: Already running a proof-of-concept (PoC) via the Monetary Authority of Singapore (MAS);
- **Denmark**: *Cancelled* its CBDC exploration of an e-kroner, because Danskebank does not believe that the benefits outweigh costs of implementation and potential losses of user privacy and autonomy;
- **Switzerland**: BIS and SNB recently wrapped up *Project Helvetia*, a PoC aimed at examining feasibility of CHF-backed CBDC, with positive results (Bank of International Settlements 2020b; Bank of International Settlements 2020c);
- **China**: Already running a mostly operational *hybrid CBDC* model in some cities in the south, looking to roll out nationwide;

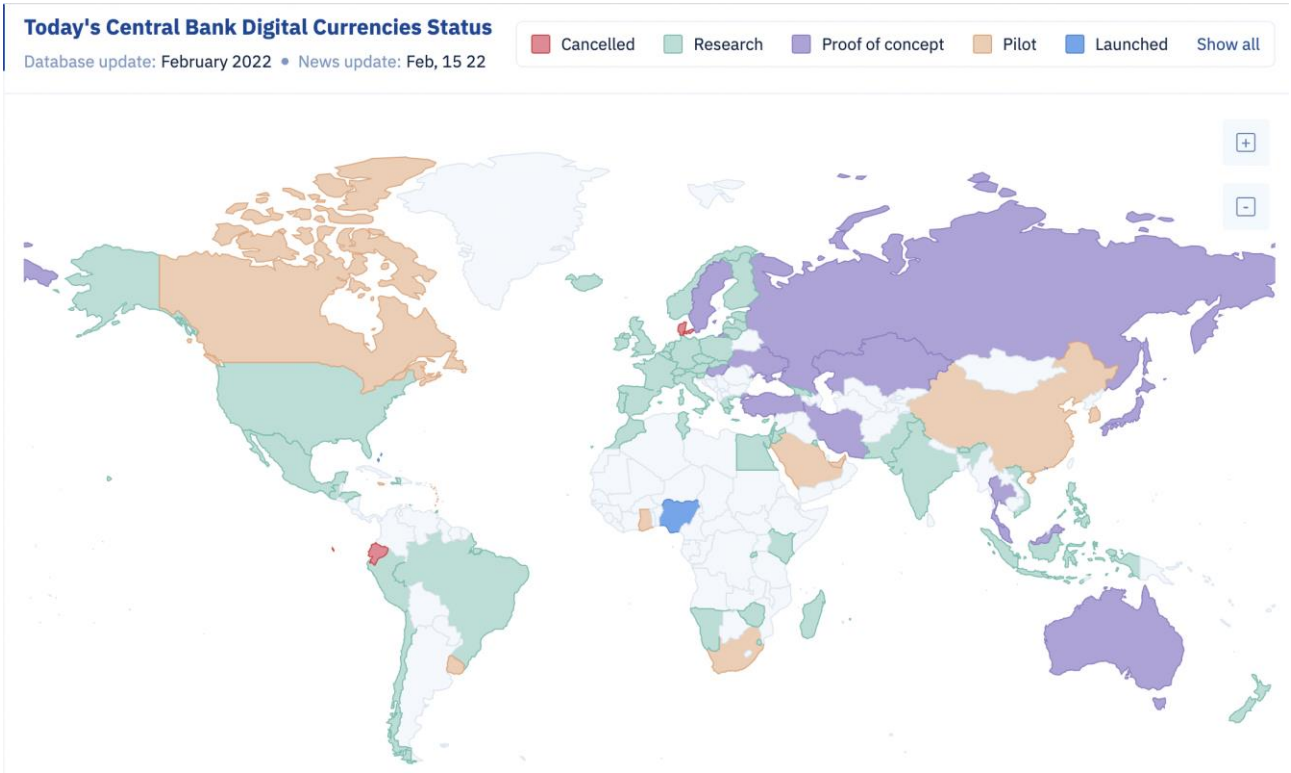

Figure 15 CBDC Implementation Status as of Feb 15, 2022 (CBDC Tracker 2022)

4.8.3 Feasibility of Stablecoins Under Different CBDC Types

As noted in Section 4.8.1, each type of CBDC has implications for the viability of stablecoin payments. Since CBDCs are directly issued by the central bank, *in theory*, the existence of a CBDC of *any* kind would immediately obviate any need or use case for privately held and issued stablecoins.

In practice, however, the situation is not nearly so clear-cut. Our expert interviewees (10 out of 33), particularly those with regulatory backgrounds, argue that under the WCBDC and hybrid/synthetic RCBDC models, privately issued stablecoins do have a place in the market. (Other experts were not asked or had no view.) The primary customers for these privately issued stablecoins will likely be

individuals with a high level of interest in privacy and autonomy. Furthermore, under the synthetic RCBDC model (Figure 14), each large-scale international bank will likely issue its own stablecoin to facilitate payments between merchants and customers, and then will settle its own accounts with the central bank itself.

The only exceptions to this rule of coexistence are pure RCBDC models, in which there is simply no need whatsoever for any other stablecoin – and, by implication, for any payment processing intermediary of any kind – and hybrid RCBDCs where the issuing country has banned the issuance and use of private cryptocurrencies. The latter situation currently exists in the People's Republic of China, which is actively developing its own hybrid RCBDC in collaboration with China's largest banks, and has simultaneously banned the trading and use of any private cryptocurrency, including stablecoins, by definition (Lyons 2021).

4.9 Consumer Views of Stablecoin Payments

4.9.1 Market Research Insights

The available literature on stablecoin adoption shows a decidedly mixed picture for both consumers and businesses with respect to using cryptocurrencies in general, and stablecoins in particular, for payments.

As Figure 16 shows, there are presently over 300 million cryptocurrency users worldwide, and the current growth rate of ownership is 3.9% as of 2021 (TripleA 2021).

Figure 16 Global Map of Crypto Ownership (TripleA 2021)

Here, the term "user" denotes anyone who has ever held or used cryptocurrencies for any purpose, regardless of frequency, or whether users currently own cryptocurrencies. As percentages of the population, cryptocurrencies have a small user base (Table 6).

Continent	Population (M)	Crypto Users (M)	Crypto Users as % of Pop
Asia	4,715.93	160	3.39%
Africa	1,406.72	32	2.27%
Europe	748.59	38	5.08%
North America	601.05	28	4.66%
South America	437.69	24	5.48%
Oceania	43.76	1	2.29%

Table 6 Crypto Users as % of Population (World Population Review 2022; TripleA 2021)

Figure 17 shows cryptocurrency adoption rates among internet users by region, and shows that the Asia-Pacific region leads the world in terms of the percentage of internet users who own cryptocurrencies of any kind.

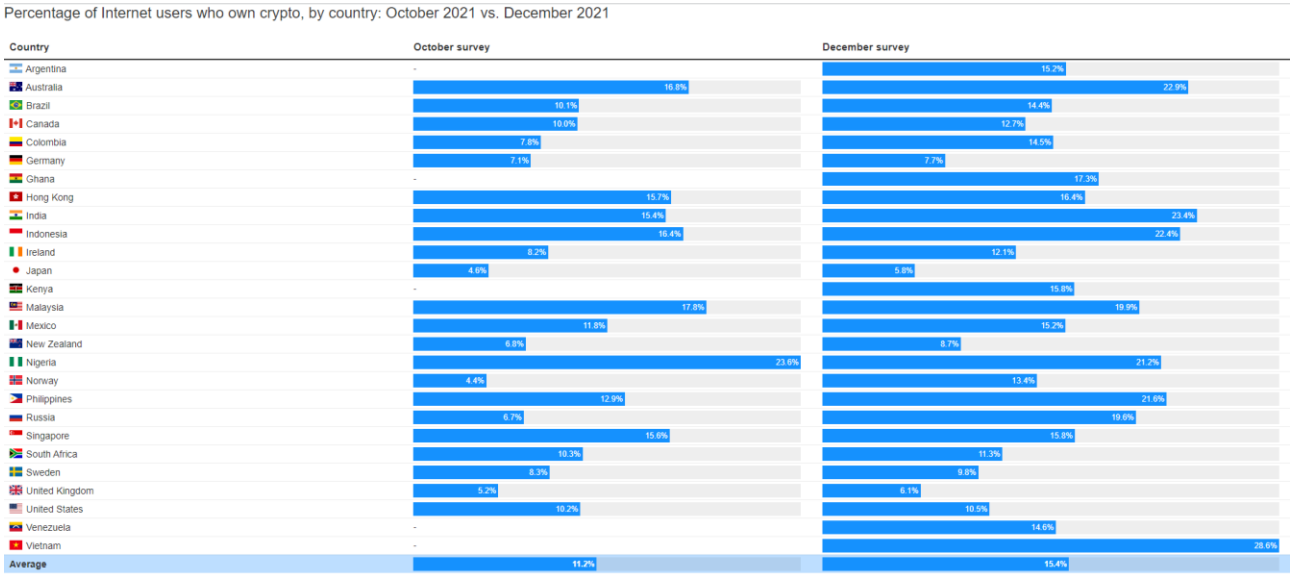

Figure 17 Cryptocurrency Adoption Rates by Country (Laycock 2021)

Figure 18 shows that, among 10,000 users of Crypto.com, aged 18 and older, there appears to be a strong interest in using cryptocurrency to pay for goods and services across a wide variety of sectors – but, as Figure 18 shows, there appears to be a significant mismatch between those sectors where consumers want to use cryptocurrencies for payments, and those where merchants are willing to accept digital currencies. Note that the consumer data from Figure 18 are concentrated heavily in Europe, which will bias the sample set, and as such, this cannot be viewed as representative of global consumer sentiment.

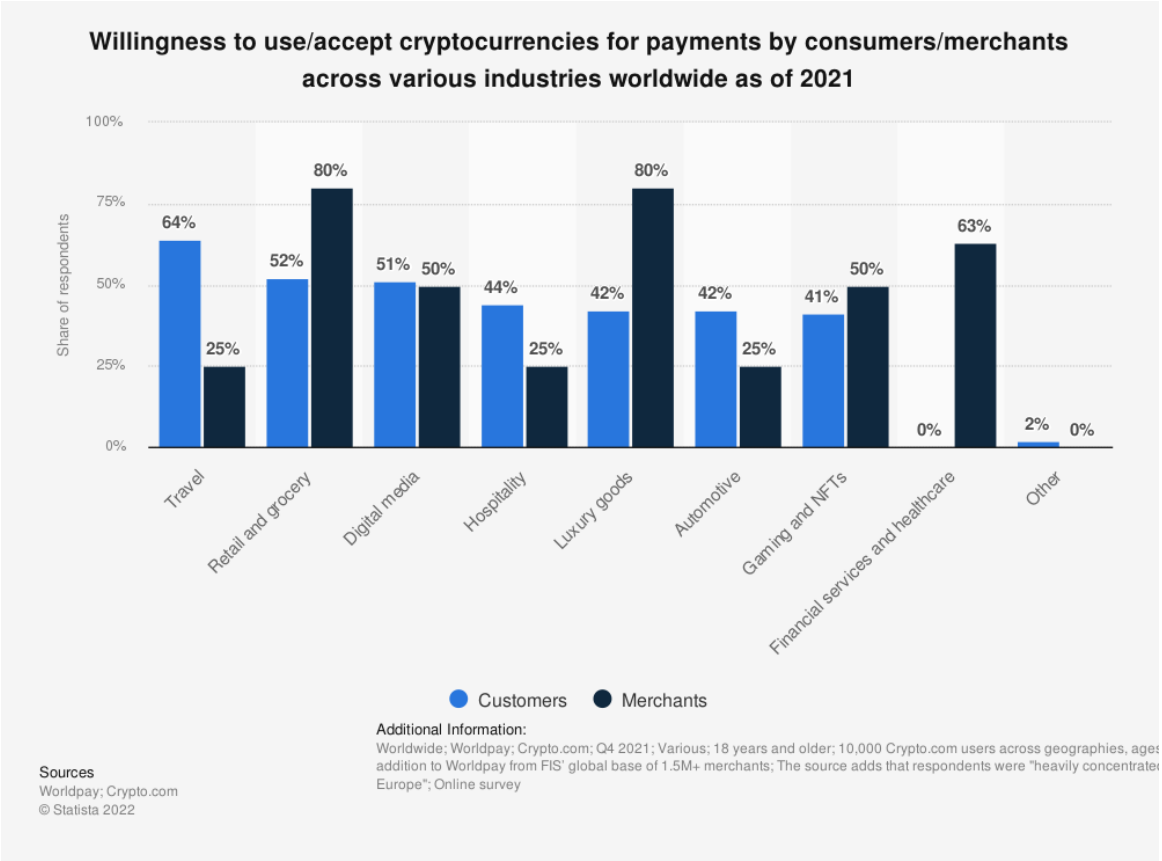

Figure 18 Consumer & Merchant Crypto Payment Adoption Rates (de Best 2022b)

With respect to stablecoins, specifically, consumer knowledge on the subject is limited, at best. A recent survey of nearly 4,000 respondents across 89 countries showed that, while 83.6% of all respondents had heard of cryptocurrencies, only 25.4% had heard of stablecoins (Wirex Team 2020).

4.9.2 Selected Qualtrics Survey Results

As noted in Section 3.4.2, understanding consumer sentiments with respect to stablecoins was one of our primary goals in working through this study. To this end, we constructed a survey using the UoM-approved Qualtrics platform and gathered as many responses as possible. We specifically sought to understand why consumers would choose to use stablecoins instead of, or in addition to other existing methods of payment.

A full outline of the survey logic, and the questions used for the survey's construction, can be found in Section 8.4. We present here the most pertinent results.

We received **57** survey responses. However, **please note that the branching logic incorporated into our survey means that a number of our questions received considerably less than this original sample set**. *This is entirely deliberate*, as the logic of the survey dictates that certain responses will subdivide the results set into different groupings of responses. **We highly recommend reviewing the survey logic design in Section 8.4 (Figure 62) before proceeding**.

We stress once again that we originally expected to gather at least 100 responses, but only received 57. We believe that this is too small a sample size from which to draw robust inferences – however, the results show some clear trends that our broader Survey Monkey results (Section 4.9.3) largely support, and sample sizes in those results are generally sufficient to provide useful inferences.

Figure 19, Figure 20, Figure 21, Figure 22, and Table 7 provide an overview of the demographics, professions, and income levels of our Qualtrics survey respondents. Our Qualtrics respondents skewed toward the Millennial generation, with incomes in the lower to middle class range. We received responses from 18 different countries and territories, and across a wide range of professions. However, possibly because we distributed our survey through LinkedIn and other professional and social networks, which may skew more toward male activity and participation, our results are biased toward males in Millennial demographic with business and financial services backgrounds.

This means that our sample is biased toward those who will naturally have a higher level of knowledge of cryptocurrencies than average.

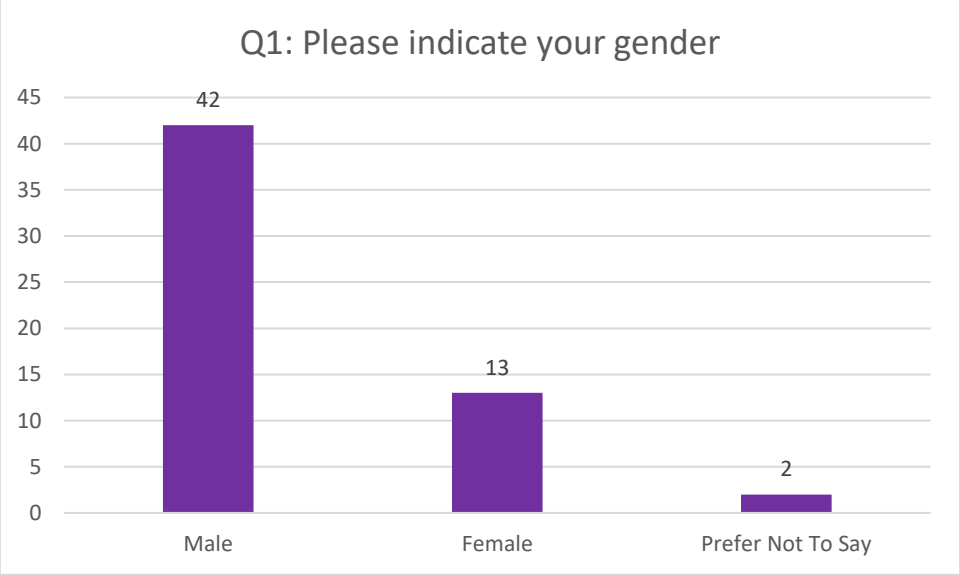

Figure 19 Qualtrics: Gender of Respondents (n = 57)

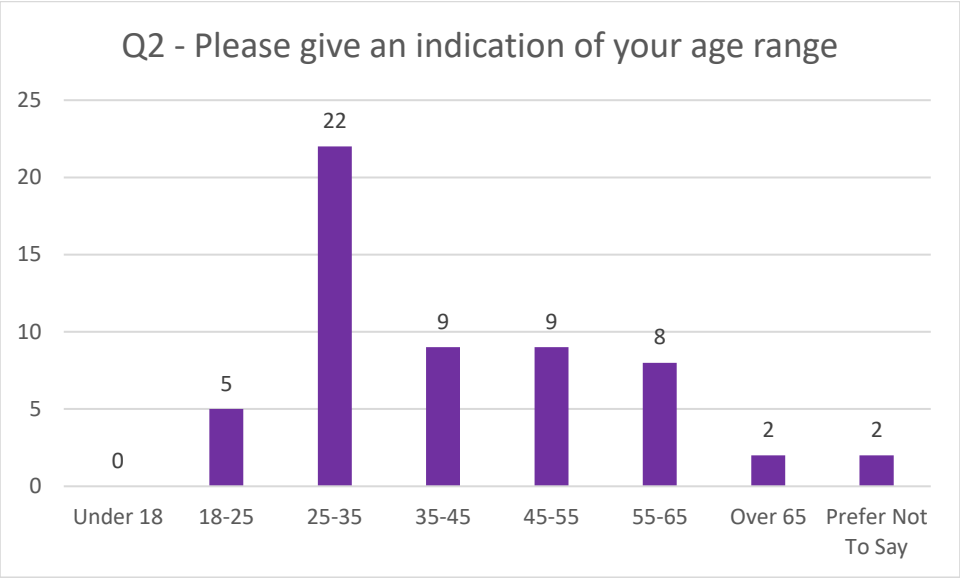

Figure 20 Qualtrics: Age Range of Respondents (n = 57)

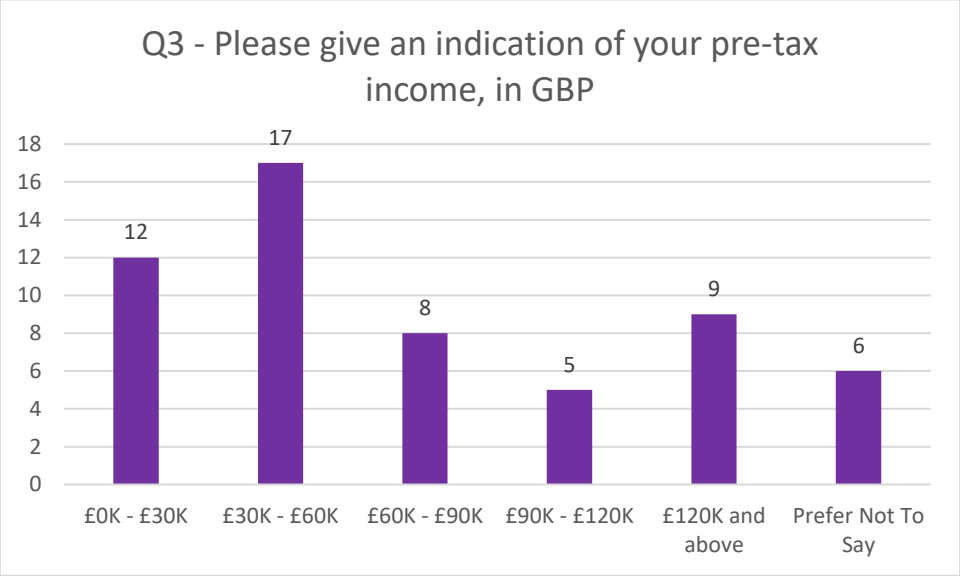

Figure 21 Qualtrics: Pre-Tax Income of Respondents (n = 57)

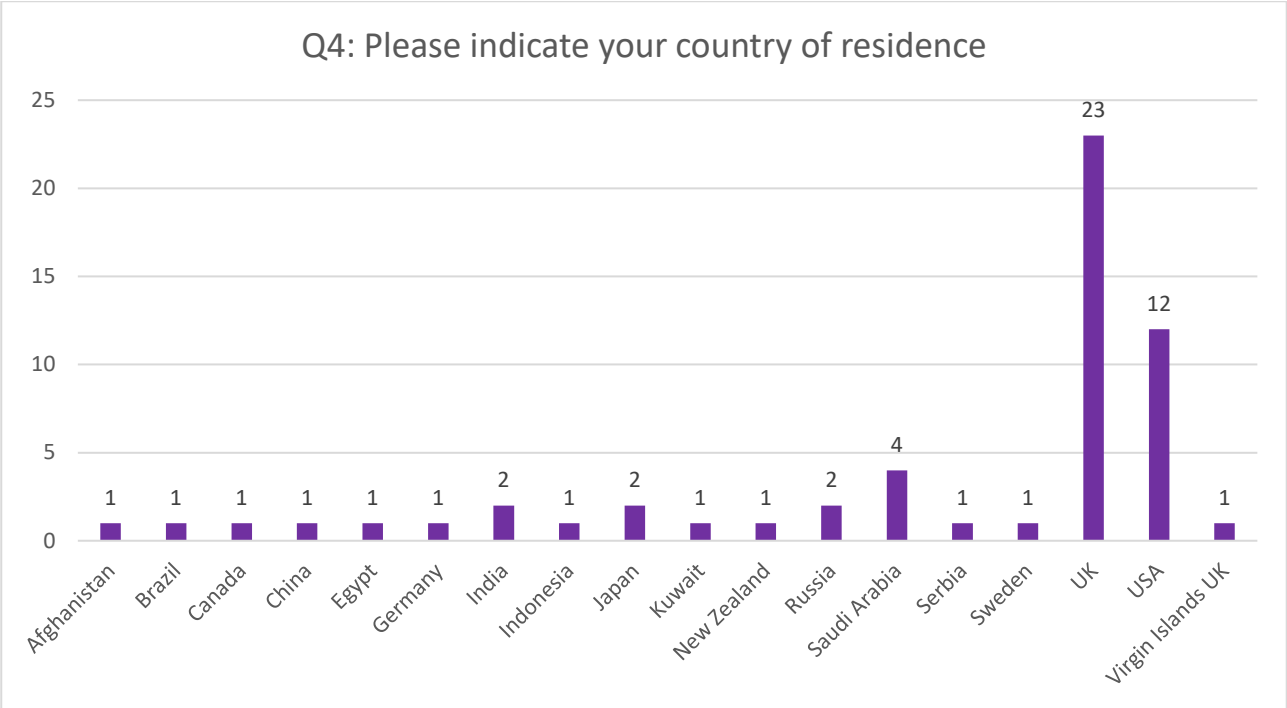

Figure 22 Qualtrics: Country of Origin of Respondents (n = 57)

Profession	Count
Architecture and Engineering	3
Arts, Design, Entertainment, Sports, and Media	3
Building and Grounds Cleaning and Maintenance	0
Business and Financial Services	12
Business Management	10
Community and Social Services	0
Construction and Extraction	1
Education, Training, and Library	0
Farming, Fishing, and Forestry	0
Food Preparation and Serving Related	0
Healthcare Practitioners and Technical	3
Healthcare Support	1
Information Technologies	8
Installation, Maintenance, and Repair	1
Legal	2
Life, Physical, and Social Science	1
Military, Police, Firefighting, Civilian Protective Services	1
Office and Administrative Support	0
Other	3
Personal Care and Service	0
Sales and Related	3
Student (High School, Undergraduate, Postgraduate, Doctoral)	4
Unemployed	1

Table 7 Qualtrics: Summary of Respondent Professions (n = 57)

Of the **57** responses received, 54 (94.7%) indicated that they had heard of cryptocurrencies of *any* kind, including stablecoins (Figure 63). Of the 3 who had *not* heard of cryptocurrencies, all 3 respondents indicated little to no desire to learn more about the subject (Figure 67). The branching logic of our survey routed these 3 respondents straight to questions about spending patterns (Figure 74, Figure 75) and did not inquire further about their views with respect to stablecoins.

We then asked those respondents who *HAD* heard of cryptocurrencies (54 respondents), including stablecoins, to indicate their level of familiarity with the technology behind digital assets of this kind. The results in Figure 23 indicate that 78% of respondents have at least a basic level of understanding of blockchain technology.

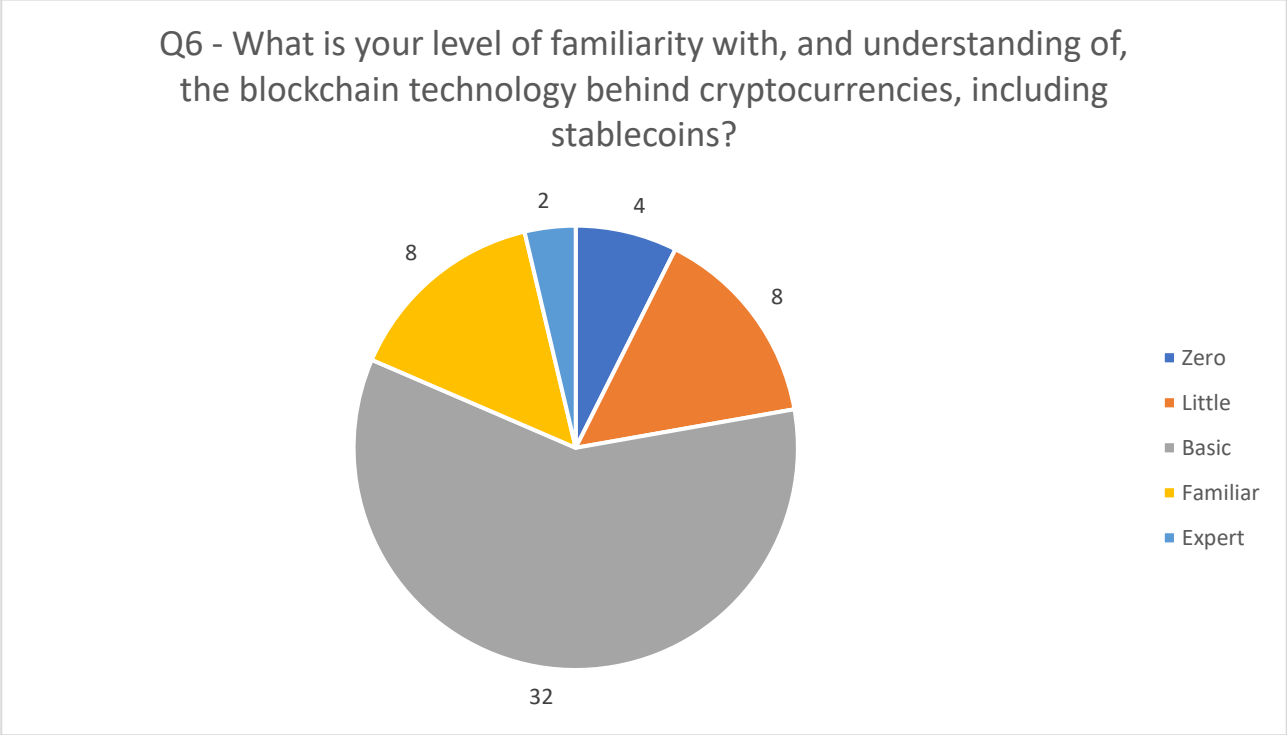

Figure 23 Qualtrics: Level of Familiarity with Cryptocurrencies (n = 54)

We then asked those 54 respondents who had heard of cryptocurrencies, whether they had owned cryptocurrencies, including stablecoins, in the past. Of these 54, 25 stated that they had owned cryptoassets (Figure 64).

We also asked those same 54 if they had ever used cryptocurrencies, including stablecoins, for any form of transaction (Figure 65). Nine responded "Yes", 45 responded "No".

Then, we asked those 9 who had used cryptocurrencies, the purpose of those transactions. **Note that a sample size of 9 is too small to draw inferences of any reliable sort**. We therefore present this data for illustrative purposes only:

- 8 of 9 stated that they had used cryptocurrencies 2 or more times in the past 12 months (Figure 68);

- 8 of 9 stated that they had a neutral, positive, or excellent experience using cryptocurrencies (Figure 69);
- Typical complaints with respect to running transactions in cryptocurrencies included losses associated with fees, difficulties with onboarding, finding counterparties to do business with, and a lack of familiarity with the technology involved;

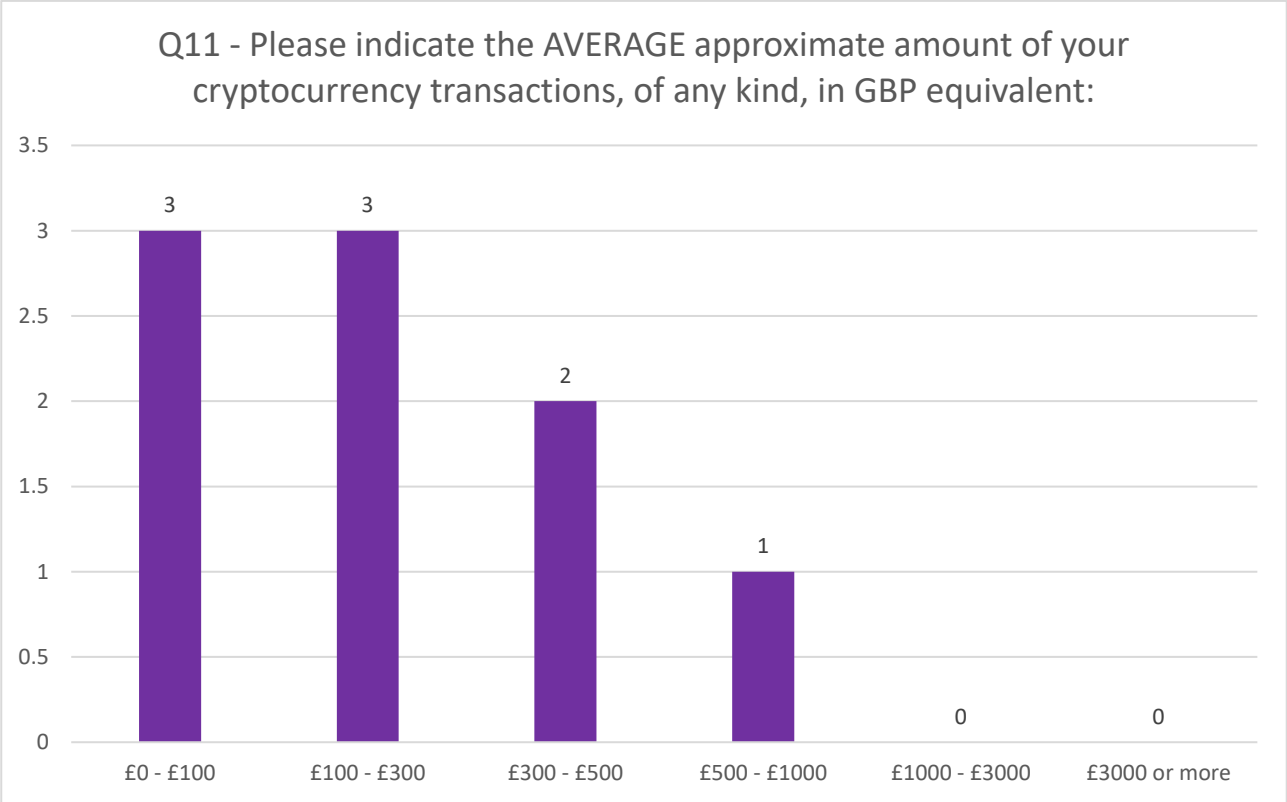

Figure 24 Qualtrics: Size of Cryptocurrency Transactions (n = 9)

Of the 9 who had used cryptocurrencies, we asked what appealed to them about the technology behind *stablecoins*, specifically (Figure 25). From this set of 9, we received 8 answers.

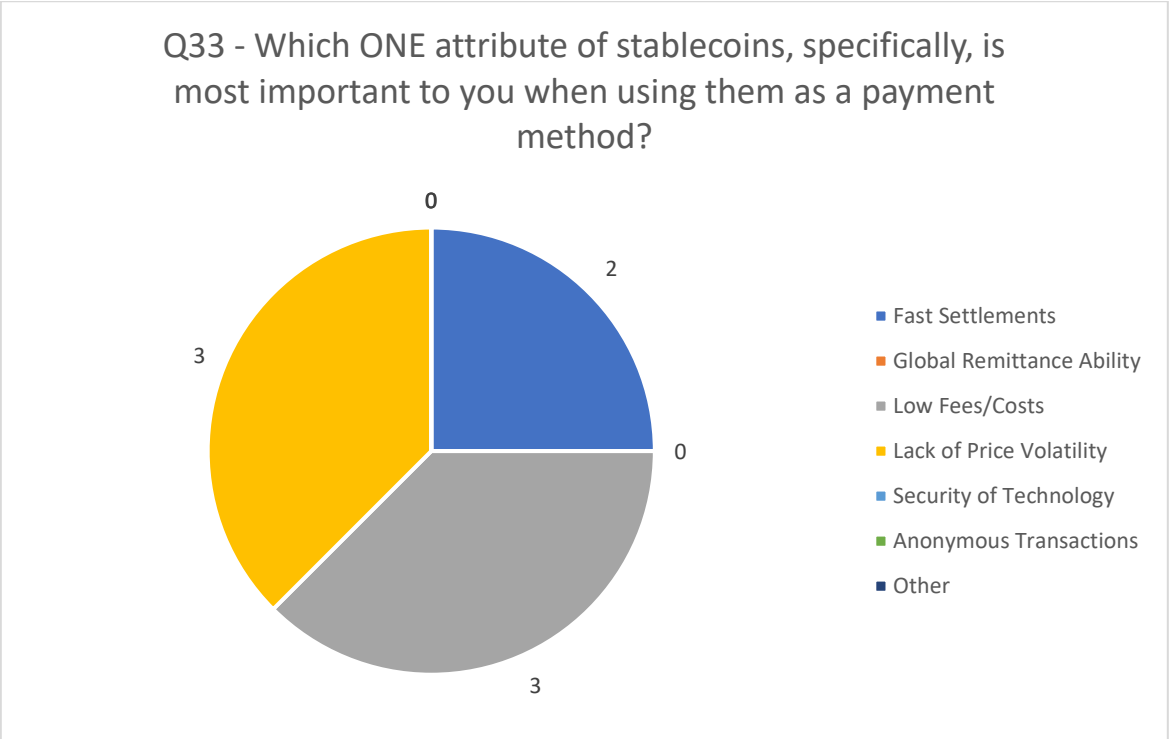

Figure 25 Qualtrics: Most Important Feature of Stablecoins (n = 8)

The key part of the survey came when we came to the survey section (Figure 62) in which we asked respondents whether they would be willing to use *stablecoins, specifically*, for online and retail transactions. **Of 51 respondents, 42 (82.53%) stated that they would be interested in doing so** (Figure 70).

We asked those 42 how soon they would be willing to use stablecoins for online and retail payments (Figure 26). Of the 40 responses received, over 50% want to wait until the technology matures – that is to say, they have no fixed timelines for adoption.

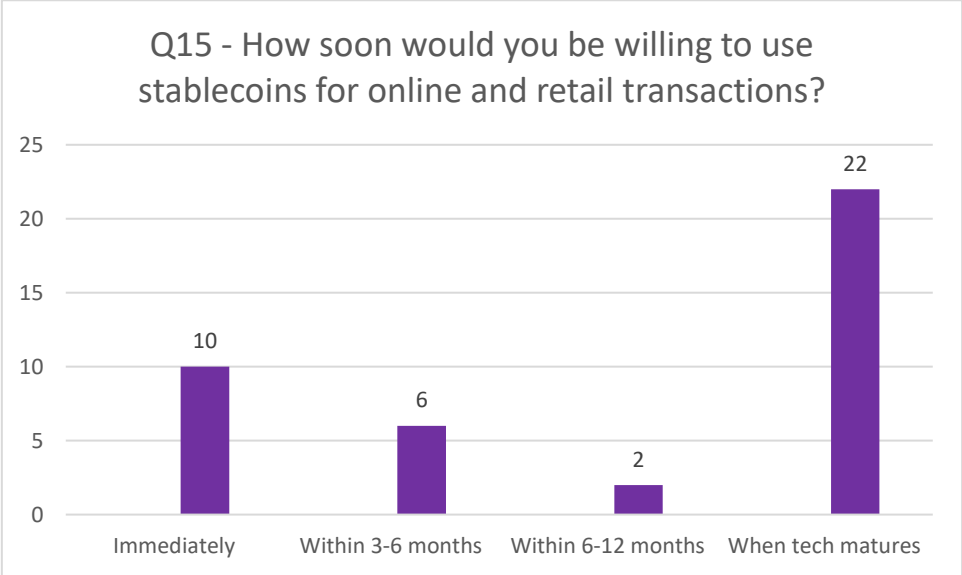

Figure 26 Qualtrics: Respondent Timeline for Stablecoin Payments (n = 40)

We asked those same 40 respondents whether they thought that stablecoin transactions would be safe and secure – 32 (80%) stated yes (Figure 72).

We also asked the same 40 respondents whether they believe that stablecoins are a viable alternative to existing payment systems – 31 (77.5%) stated yes (Figure 73).

In terms of use cases, those 40 respondents were asked to select *ANY AND ALL* uses that they might have for stablecoins (Figure 27). Each respondent could choose multiple answers, hence the total number of responses is greater than 40. Beyond trading and hedging, online retail dominated potential use cases, followed by cross-border payments, in-store retail, and online gaming.

Figure 27 Qualtrics: Potential Use Cases for Stablecoins (n = 40)

USDT is the most popular stablecoin of choice for these use cases among 39 of the 40 respondents who would use stablecoins (Figure 71) – and of those 39, 20 (51%) would use USDT for the kinds of transactions outlined in Figure 27. Interestingly, BUSD, not USDC, is the second most popular stablecoin of choice, with 9 of 40 (23%) stating that they would use it for transactions.

The key benefit of stablecoins, for those who are interested in using the technology for payments, is lower transaction costs (Figure 28). Potential users also rate security highly as a key benefit.

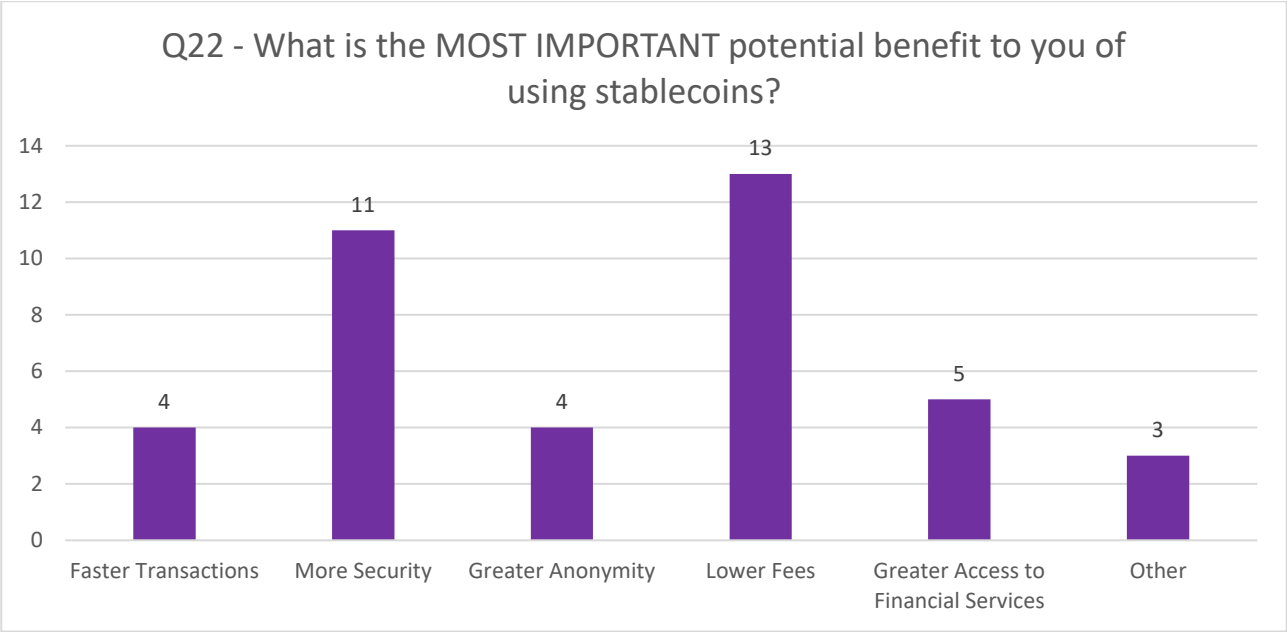

Figure 28 Qualtrics: Most Important Feature of Stablecoins (n = 40)

Respondents use a wide variety of payment methods (Figure 74), though crypto wallets are a very uncommon method of transactions for average weekly spending at this time.

We closed our survey by asking how much respondents spend, on average, every week on all items excluding large costs such as rent and utilities (Figure 75). We also asked respondents on their views as to how much debit and credit cards, specifically, cost them in transaction fees.

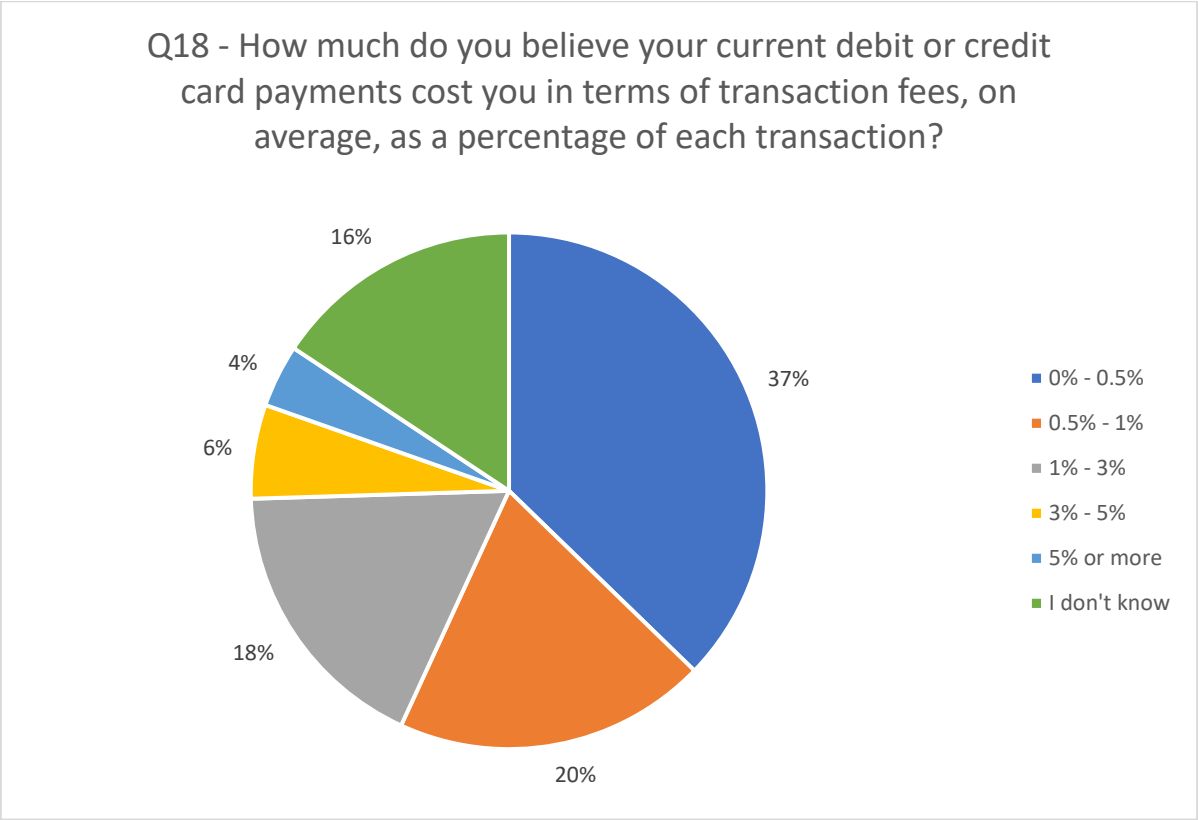

Figure 29 Qualtrics: Respondent Views on Debit/Credit Transaction Costs (n = 51)

4.9.3 Survey Monkey Results

The survey results presented in Section 4.9.2 show a particular bias toward Millennial men in professional services in the USA and UK. Thus, it is difficult to draw valid inferences for general populations from this sample set. To ameliorate this problem, we used Survey Monkey's paid responses feature to request a much broader sample set from 6 countries:

- Singapore
- Thailand
- Japan
- USA
- UK
- Sweden

We chose these 6 countries due to our findings in previous sections, which indicate that these countries will have the most digitally aware populations, and will therefore have the greatest level of understanding of stablecoins and their relevant uses. Furthermore, our expert interviewees and background literature suggest that regulations in these countries are more relaxed (except for the USA), which in turn may result in a broader set of applicable use cases for respondents. We paid for

at least 600 responses, and received **747**. We have consolidated the data below, to allow for a direct contrast between our general Qualtrics survey, and more precise, country-specific data.

Table 8 shows the questions, and total number of complete responses, for each question, by country for all of our Survey Monkey results:

Question	USA	UK	SWE	JPN	THD	SGP
Please indicate your gender	206	104	104	111	122	100
Please give an indication of your age range	206	104	104	111	122	100
Please give an indication of your annual pre-tax income, in GBP	206	104	104	111	122	100
Have you ever heard of cryptocurrencies (including stablecoins of any kind)?	206	104	104	111	122	100
What is your level of familiarity with, and understanding of, the blockchain technology behind cryptocurrencies?	184	87	88	47	116	91
Do you currently hold, or have you ever held in the past, any form of cryptocurrency asset?	184	87	88	47	116	91
Have you ever used cryptocurrencies, of any kind (including volatile cryptos, such as Bitcoin, and stablecoins), in any retail or online transactions?	184	87	88	47	116	91
What were the general purposes of your transactions using cryptocurrencies, including stablecoins? Please select ALL that apply:	90	24	56	38	264	86
Can you please indicate how many times you have used cryptocurrencies, including stablecoins, of any kind, to the best of your recollection, in the past 12 months?	48	16	33	25	109	40

Please indicate the AVERAGE approximate amount of your cryptocurrency transactions, of any kind, in GBP equivalent:	48	16	33	25	107	40
What was your experience like when conducting a transaction with cryptocurrency?	48	16	33	25	107	40
Would you be willing to use stablecoins, specifically, in the future for your retail or online transactions?	48	16	33	25	107	40
How soon would you be willing to use stablecoins for online and retail transactions?	42	15	29	22	103	39
If you could use stablecoins as a payment method, do you believe that your transactions would be secure and safe?	42	15	29	22	103	39
Do you believe that stablecoins are a viable alternative to more traditional payment methods?	42	15	29	22	103	39
Which ONE attribute of stablecoins, specifically, is most important to you when using them as a payment method?	175	85	83	43	110	90
Would you consider using stablecoins, specifically, for ANY of the following applications? (Please select ALL that apply)	337	132	160	62	257	231
What is the MOST IMPORTANT potential benefit to you of using stablecoins?	175	84	82	42	110	90
Which stablecoin would you be most likely to use?	175	84	82	42	110	90
What is your level of interest in learning more about cryptocurrencies, including stablecoins?	22	17	15	61	6	9

Turning to your current transactions, do you use any of the following payment methods on a daily basis? Please select all that apply:	475	252	196	158	292	265
Please indicate the AVERAGE approximate amount of your cryptocurrency transactions, of any kind, in GBP equivalent:	200	100	100	100	117	100
How much do you believe your current debit or credit card payments cost you in terms of transaction fees, on average, as a percentage of each transaction?	200	100	100	100	117	100

Table 8 Survey Monkey Sample Sizes by Question Per Country

Note that we have considerable disparity in our original sample sizes across countries – we were able to gather 206 total respondents for the USA through Survey Monkey, but only 104 for the UK and Sweden, each. Therefore, in our graphs below and in the appendices (Section 8.4.3), we present the *percentages* for each response, to permit easy comparisons across countries. **These percentages MUST be evaluated against the sample sizes in Table 8, and the survey design in Figure 62, for complete understanding of the data presented. The branching logic in Figure 62 explains why the sample sizes change significantly across multiple questions.**

Note also that some questions allow for respondents to select more than one answer, hence the total number of responses is higher than the total number of survey takers. For these questions, we evaluate percentages against the total number of responses received, not the total number of survey takers.

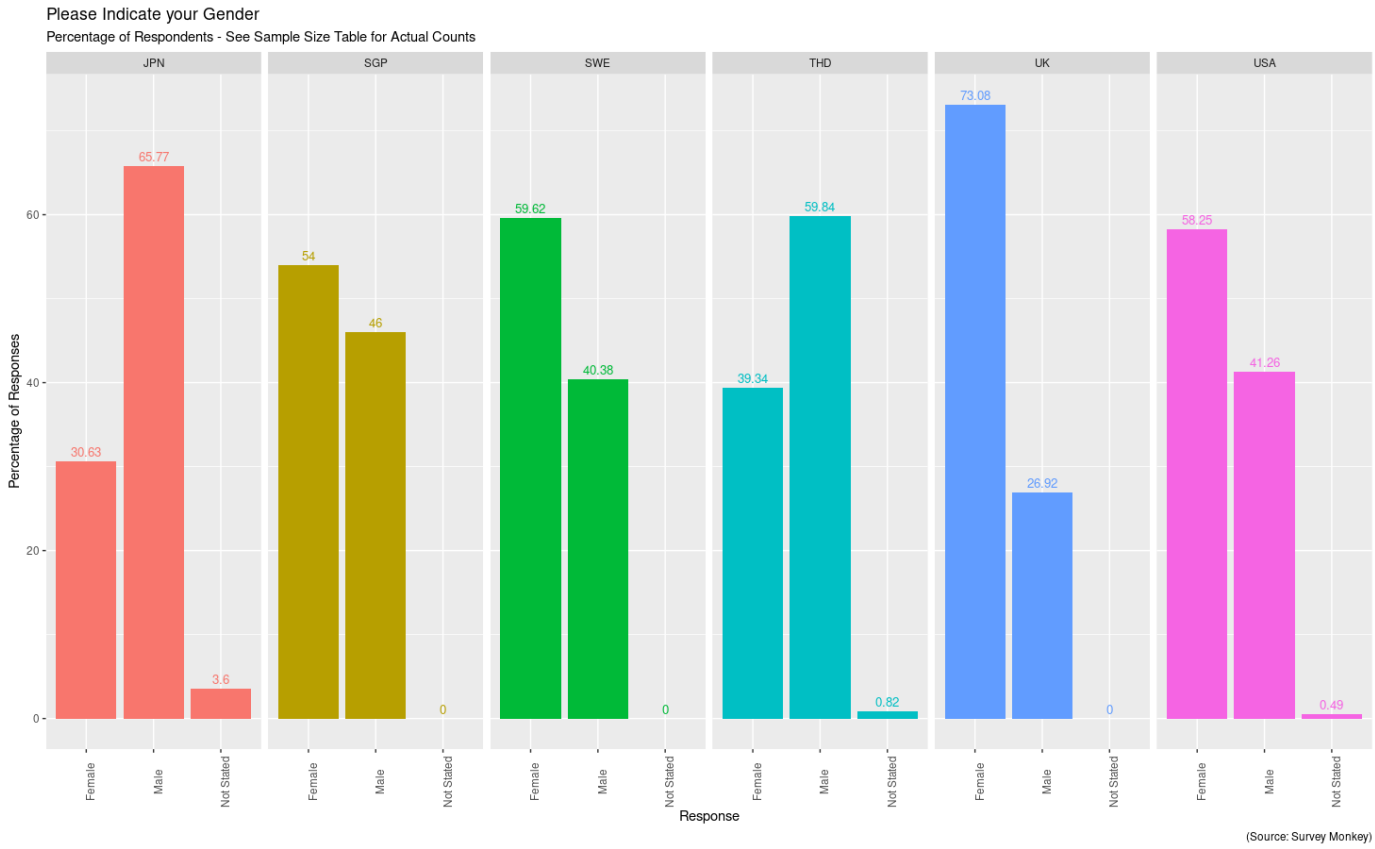

Figure 30 SM: Gender of Respondents by Country

Figure 30 shows that, contrary to our Qualtrics results, the majority of respondents across our sampled countries is *female*, except in Japan and Thailand. This lends credence to the results when cross-compared with Qualtrics, as our Survey Monkey samples use a wider cross-section of society.

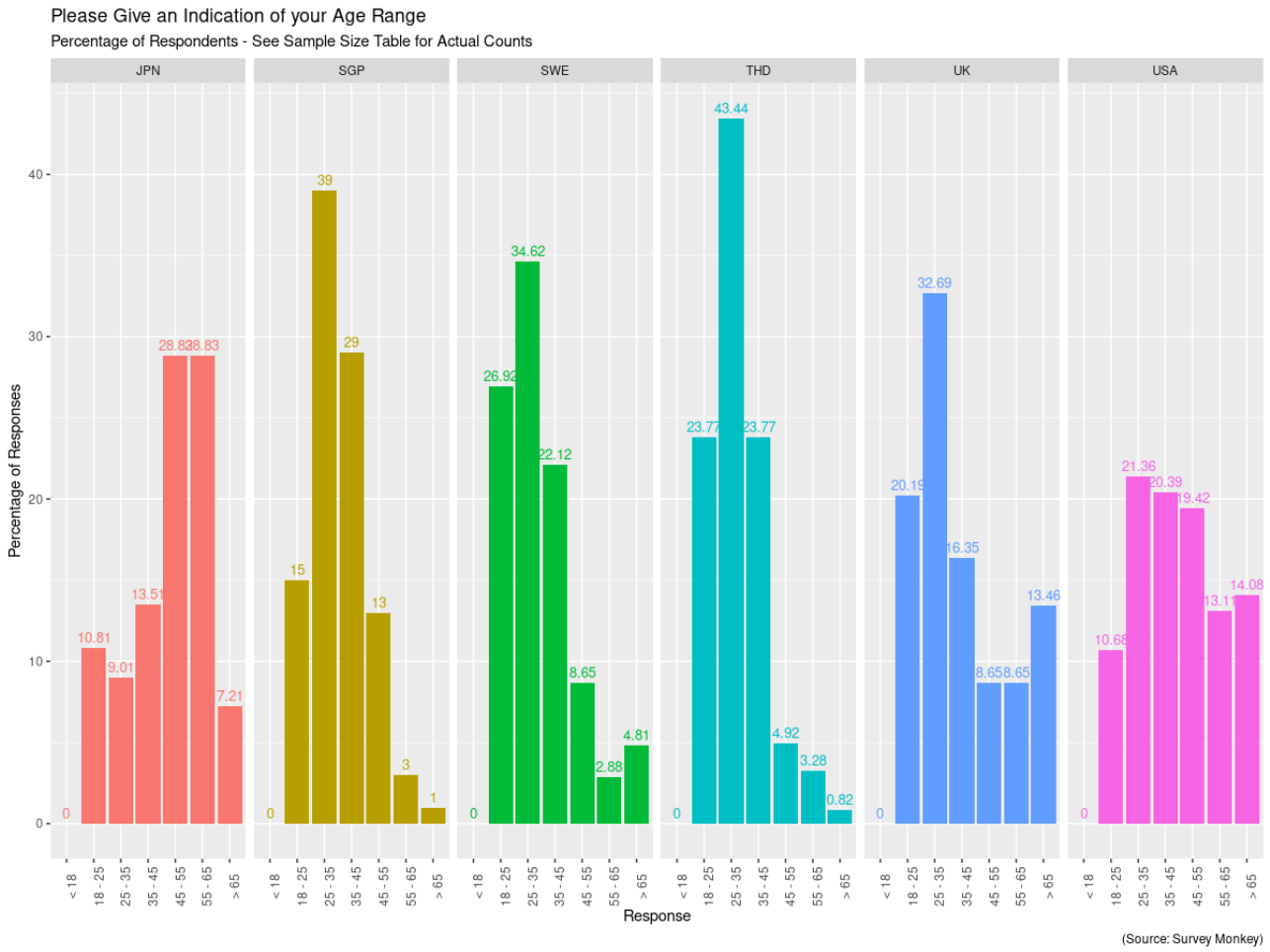

Figure 31 SM: Age Range of Respondents by Country

Figure 31 shows that respondents skew heavily toward the Millennial generation (ages 25-45). Japan is the outlier, where respondents skew older (ages 45-65).

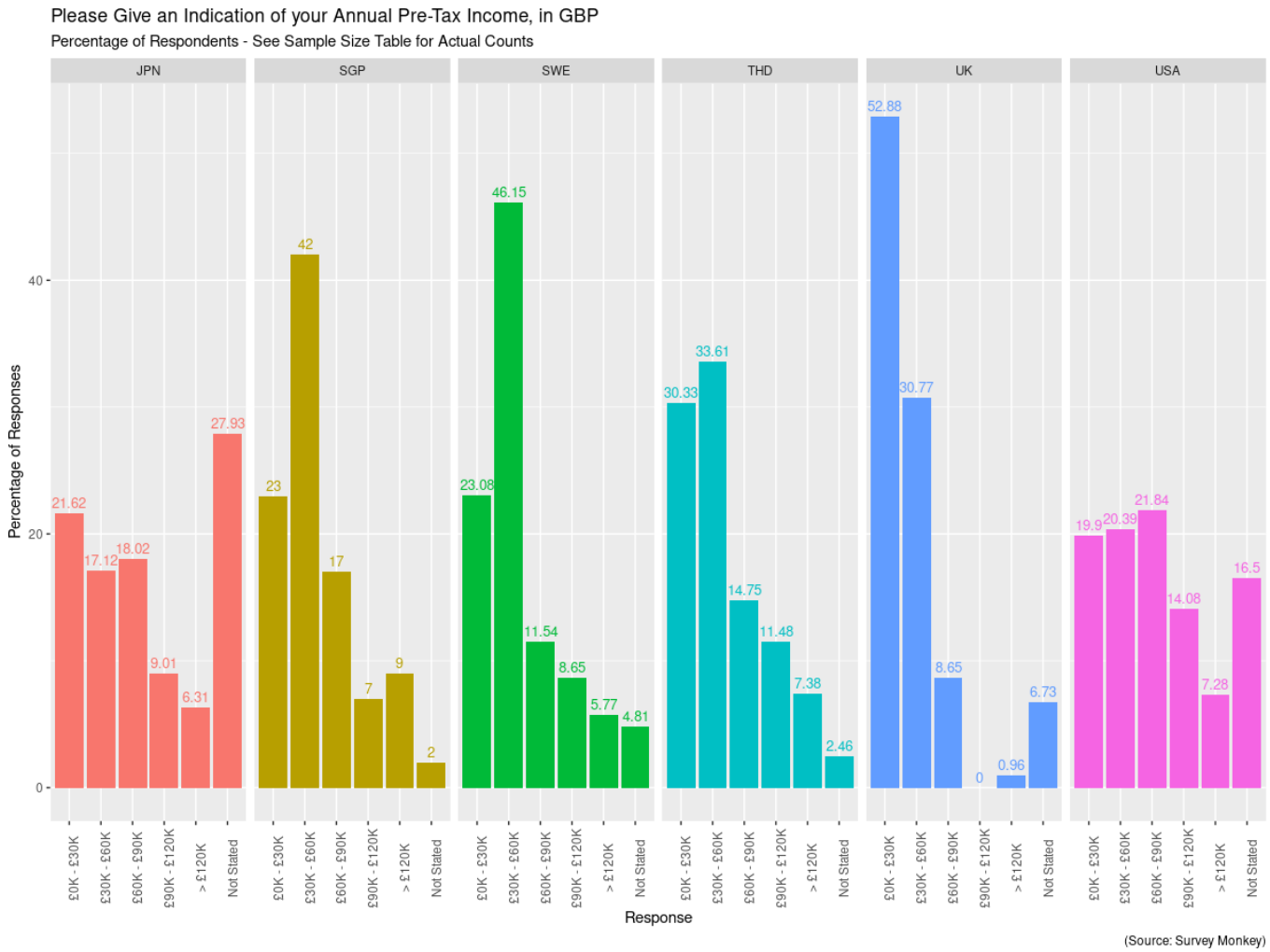

Figure 32 SM: Income Distributions by Country

Figure 32 shows the income distributions by country. The income distributions are similar to those seen in Qualtrics, except for the UK and USA. We see a much more uniform distribution of incomes in the USA, and a much more peaked distribution in the UK, when compared with Qualtrics.

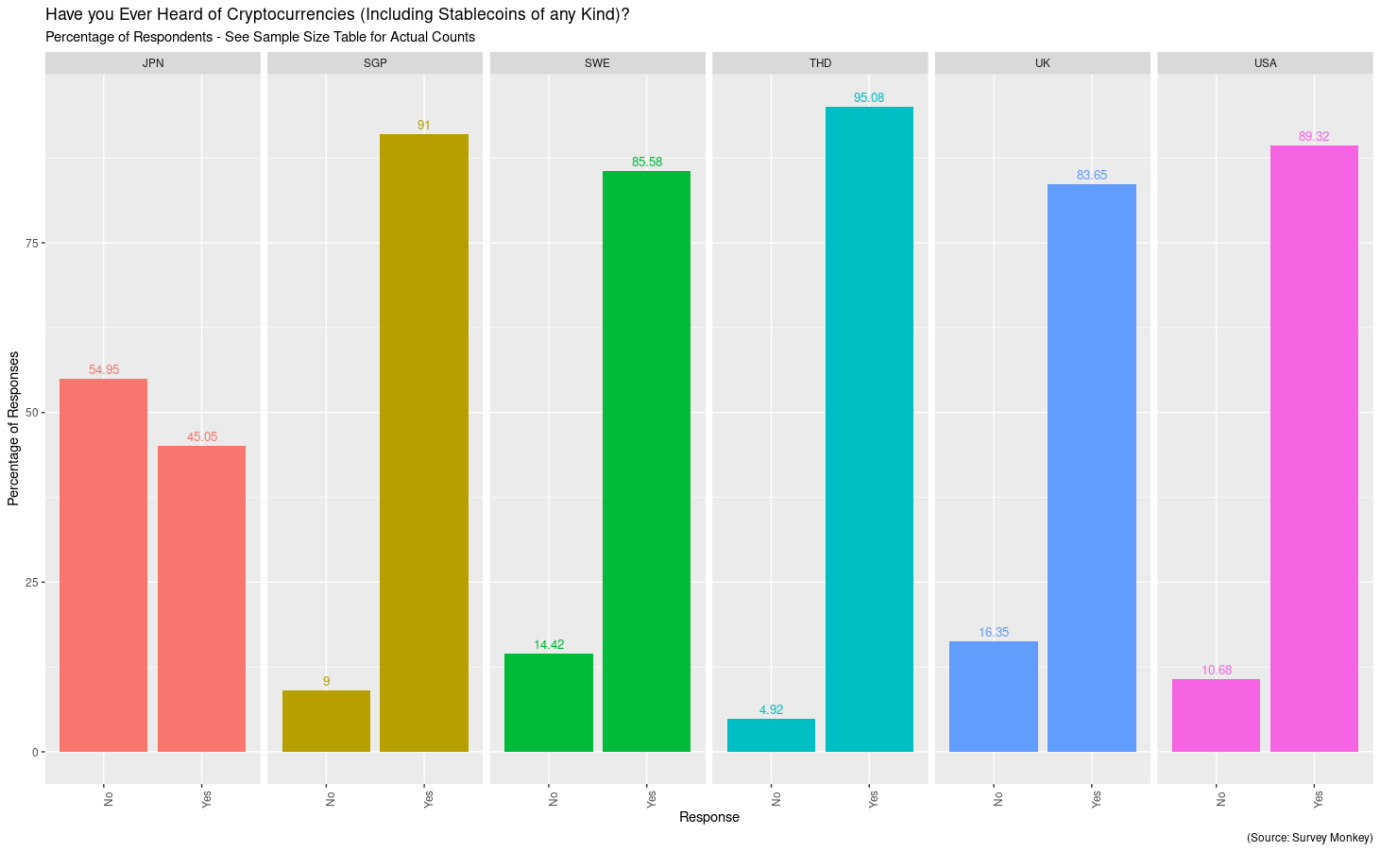

Figure 33 SM: Existing Awareness of Cryptocurrencies by Country

Figure 33 shows that awareness of cryptocurrencies in general is quite high among respondents, except in Japan. We see that, in all other countries, at least 83% of respondents know about cryptocurrencies, which largely validates earlier findings from our expert interviews and background literature about the general level of awareness of cryptocurrencies in these countries.

As Figure 81 shows, those who *have not* heard of cryptocurrencies show limited to moderate interest, in general, in learning about the concept and the technology.

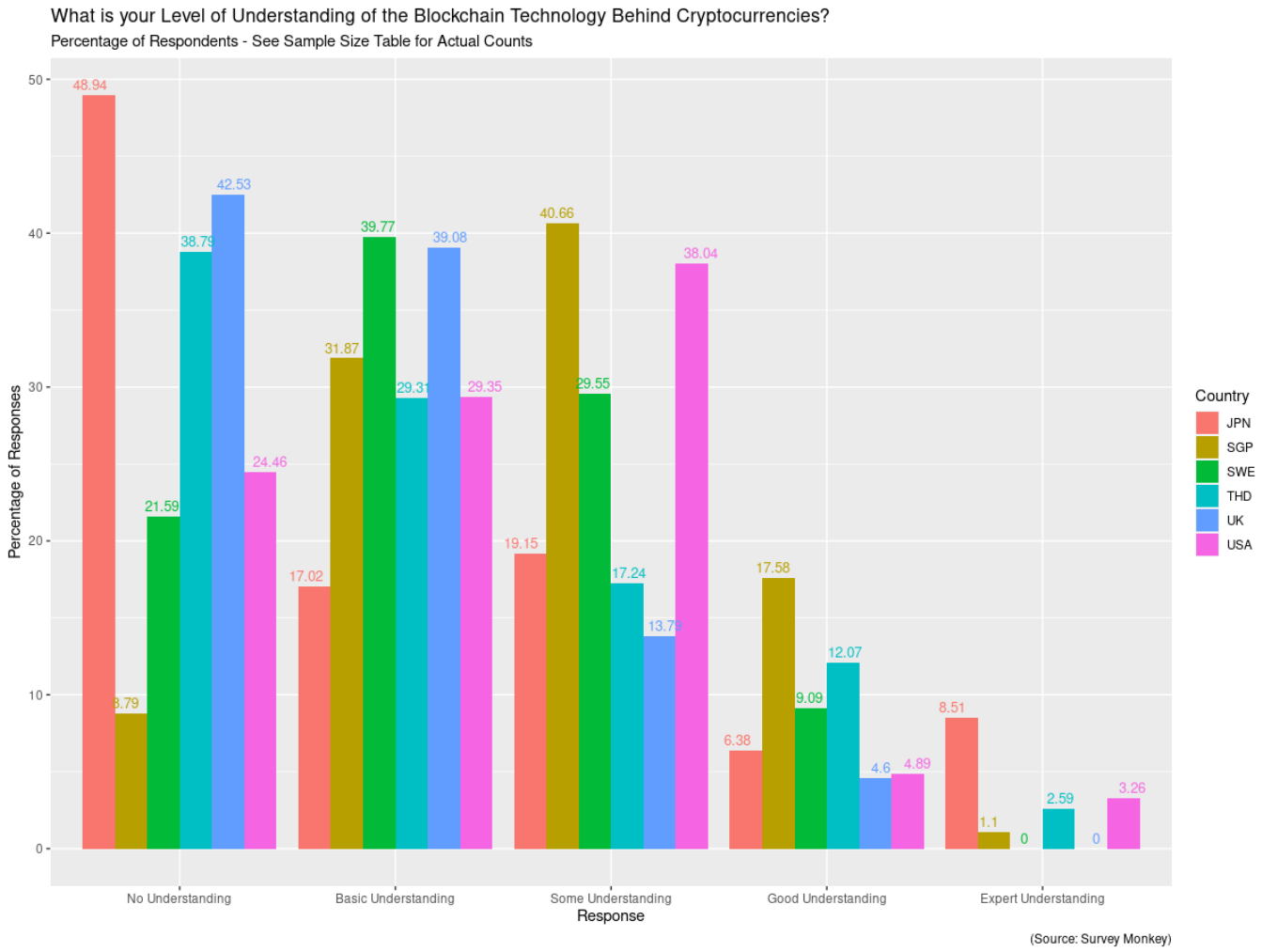

Figure 34 SM: Level of Knowledge of Cryptos Among Aware Users

Figure 34 shows that, of those who have heard of cryptocurrencies in general, the majority of respondents have relatively limited understanding of blockchain technology. This shows that our Survey Monkey data reached a broader cross-section of the population than Qualtrics.

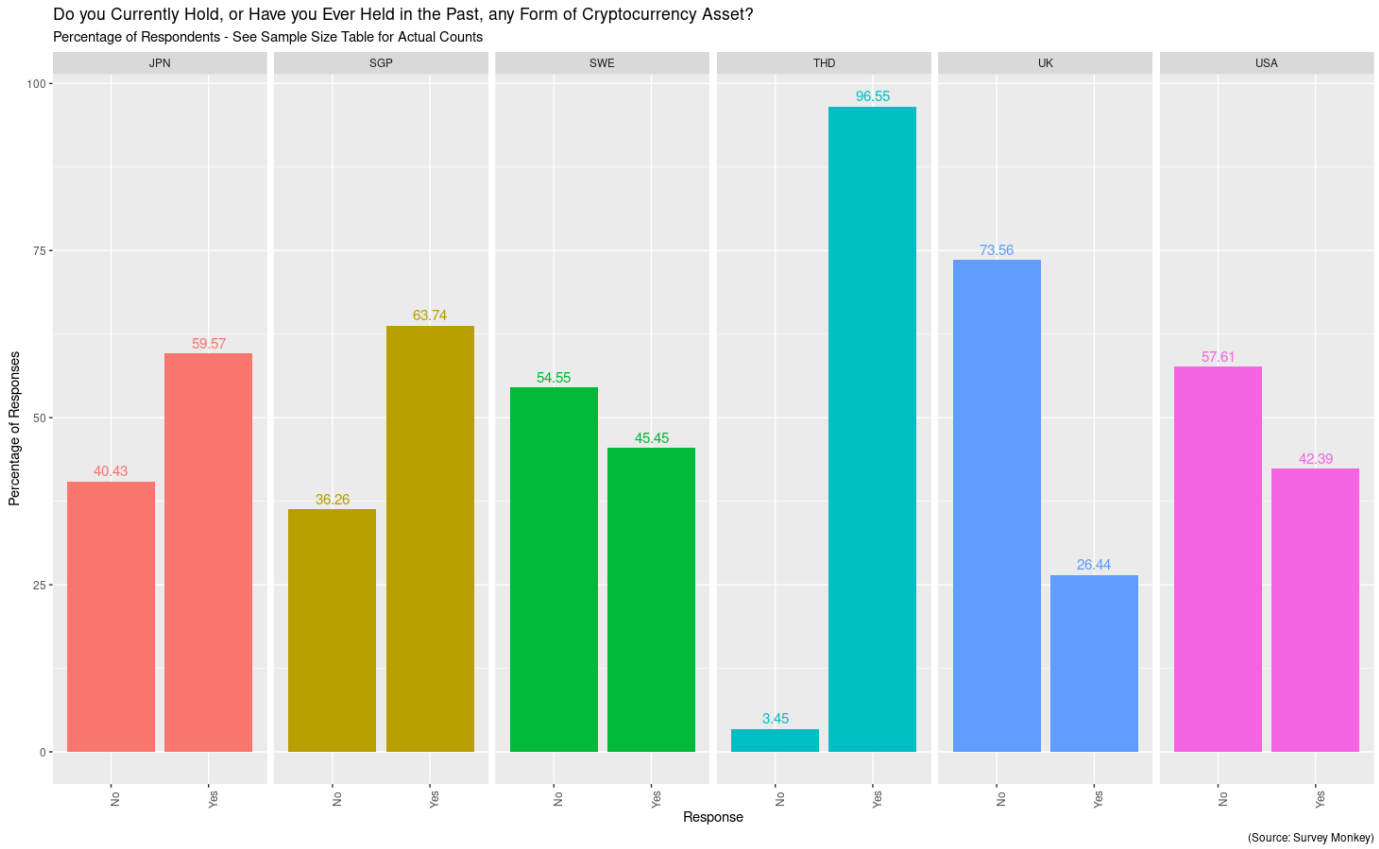

Figure 35 SM: Usage Rates of Cryptocurrencies by Country

Of those who know about cryptocurrencies, usage rates are generally low to moderate, as Figure 35 shows. The exception is Thailand, where we see anomalously high rates of cryptocurrency usage among those who have actually heard of the concept. We also see relatively high rates of usage in Singapore.

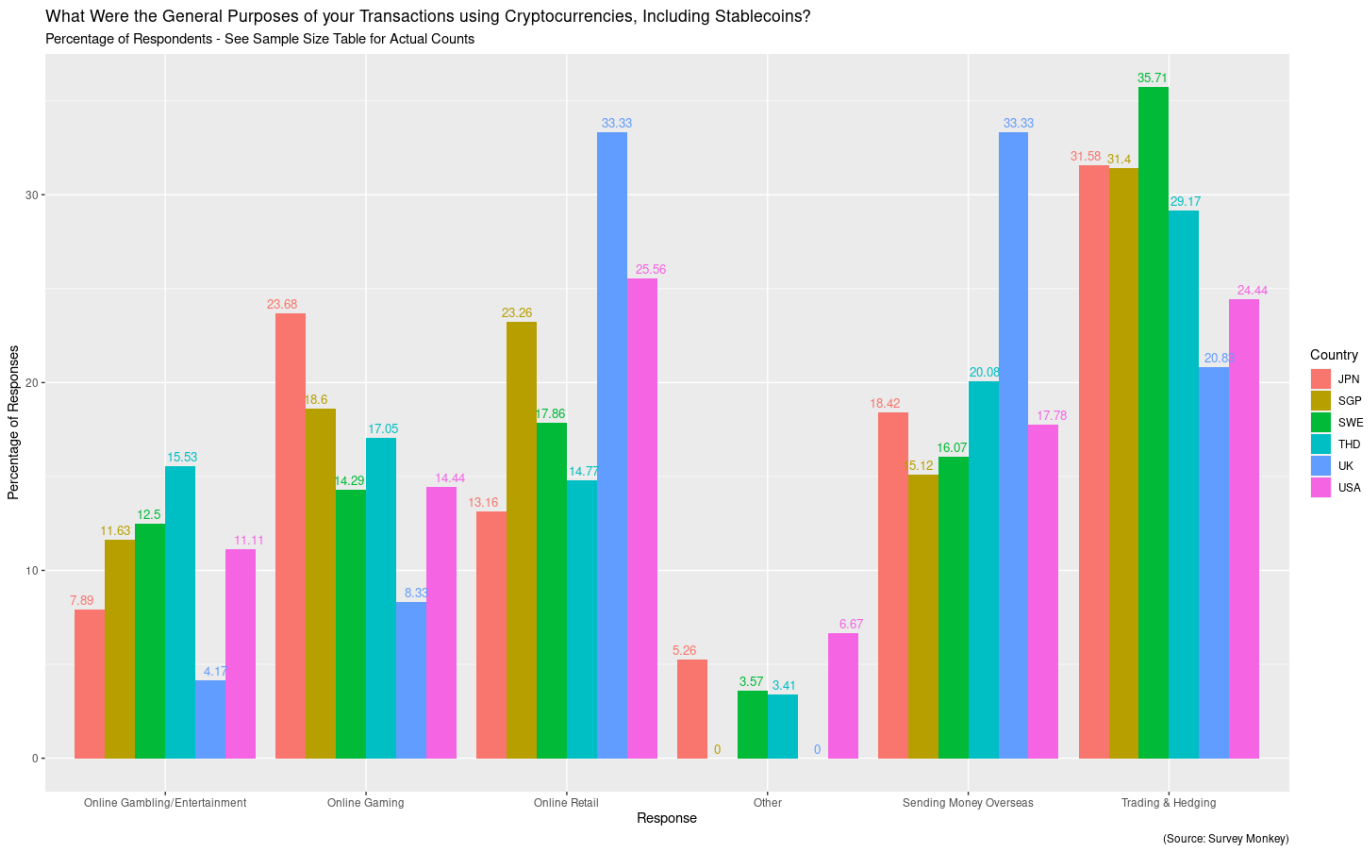

Figure 36 SM: General Purposes of Crypto Transactions Among Actual Users

Figure 36 shows that, outside of trading and hedging, online retail, cross-border remittances, and online gaming are the most prevalent use cases for cryptocurrency transactions. This is in line with our general Qualtrics results, and reaffirms the points made by our expert interviewees and by the background literature.

Among those who did use cryptocurrencies within our sample set, transaction amounts tended to be between £0 and £300, for the most part (Figure 76). Those who use cryptocurrencies generally report a neutral to positive experience in doing so (Figure 77).

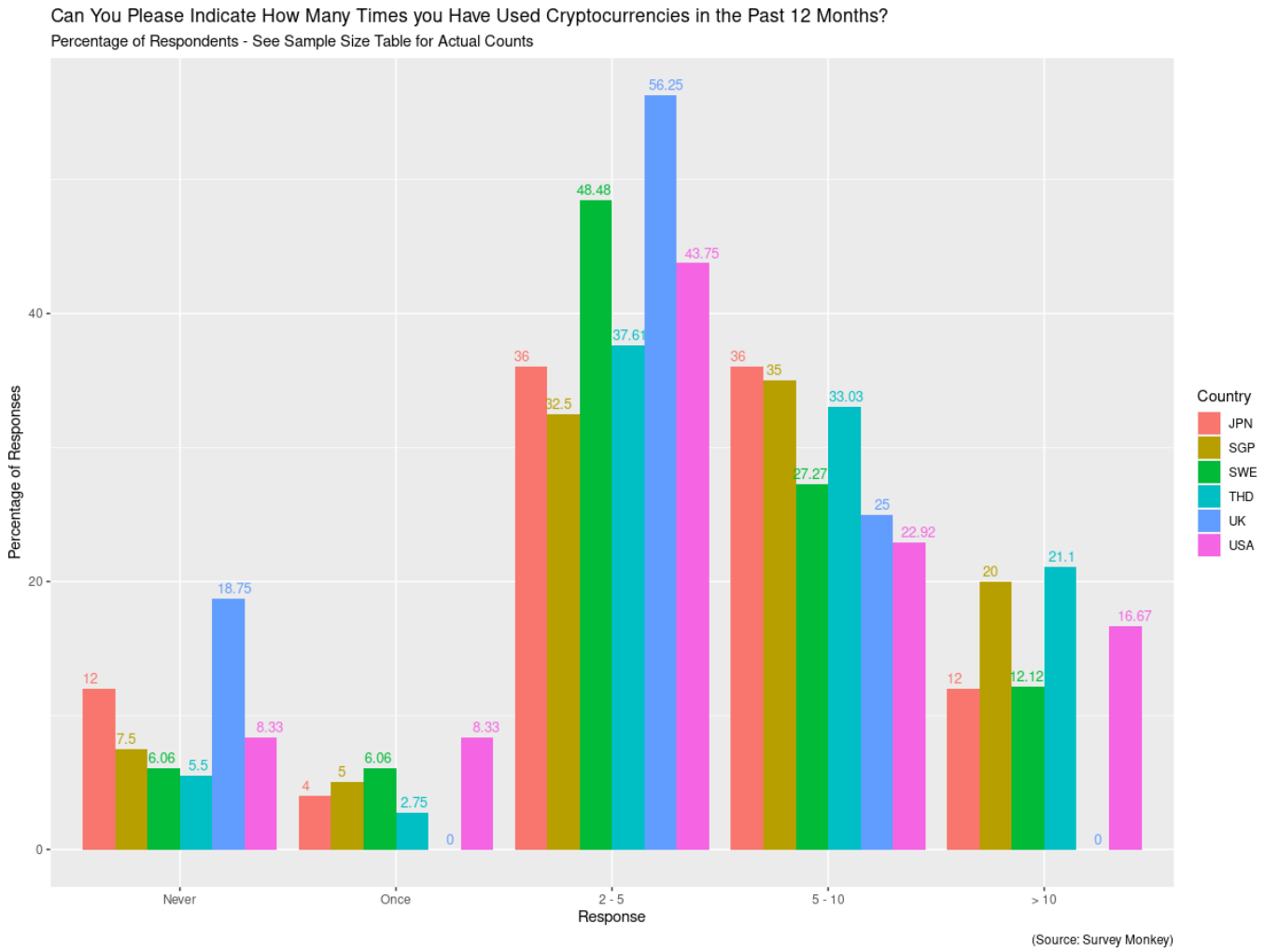

Figure 37 SM: Frequency of Crypto Transactions Among Actual Users

Most respondents who have used cryptocurrencies, have generally used them between 2 and 10 times in the past 12 months, as Figure 37 indicates. This is generally in line with Qualtrics data as well, and shows that cryptocurrencies in general, therefore stablecoins in particular, are still a very long way away from mainstream use. Those who use cryptocurrencies very frequently (more than 10 times in the past 12 months) may be dedicated cryptocurrency traders, though **we stress that this is conjecture at best.**

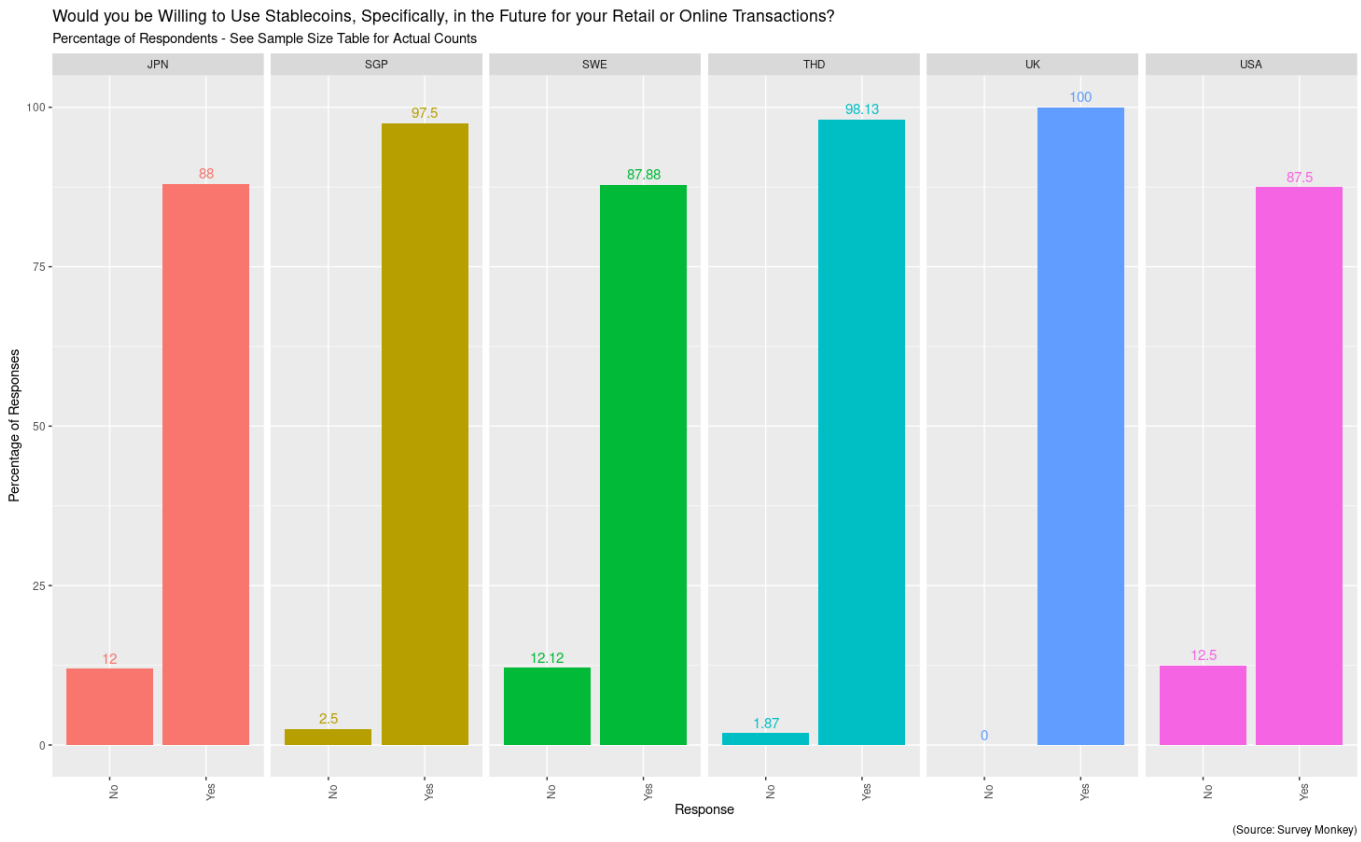

Figure 38 SM: Willingness to Use SaaPM by Country

Figure 38 is the key finding, and shows that, when cross-referenced against the sample sizes table (Table 8), there is very strong interest across *every* country surveyed, among those who have heard of cryptocurrencies, to use *stablecoins, specifically*, for general online and retail transactions.

Note, however, that **the sample sizes for Japan (25) and especially the UK (16) are too small to provide reliable inferences**. The larger sample size for the USA, Singapore, Thailand, and Sweden provide offsets to this, and the strength of the overall sentiment indicates that there is a real interest in using SaaPM.

Of those willing to use cryptocurrencies, respondents overwhelmingly view stablecoins as a safe, secure transaction method which can serve as an alternative to existing ones (Figure 78, Figure 79) – though, again, in the case of the UK and Japan sample sizes, we advise caution in accepting these figures at face value.

In terms of which stablecoin likely users would be interested in utilising for SaaPM, Figure 80 shows considerable diversity of opinion. Users in Japan and the UK seem to prefer the two dominant stablecoins, USDT and USDC, but in Singapore, Sweden, and especially Thailand, BUSD appears to be a very appealing alternative. Sentiments in the US are decidedly more mixed, where respondents seem to be willing to use a much wider range of possible stablecoins outside of just the top 5.

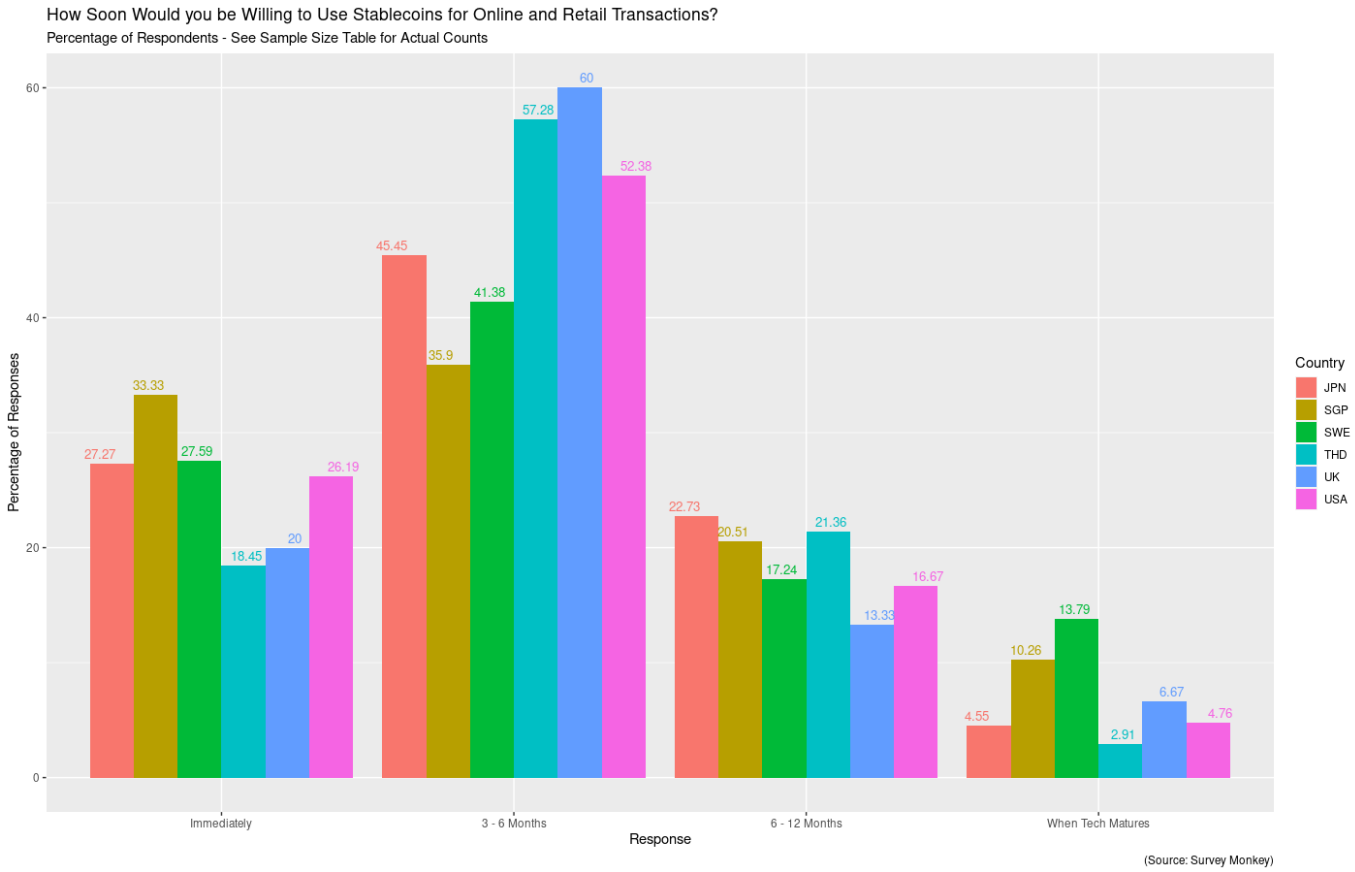

Figure 39 SM: Time to Adoption of SaaPM Among All Respondents

Figure 39 shows that most surveyed consumers are willing to adopt SaaPM within the next 12 months. This is quite surprising when compared with Qualtrics results, but the results in Figure 39 come from larger sample sizes and are likely to be more robust.

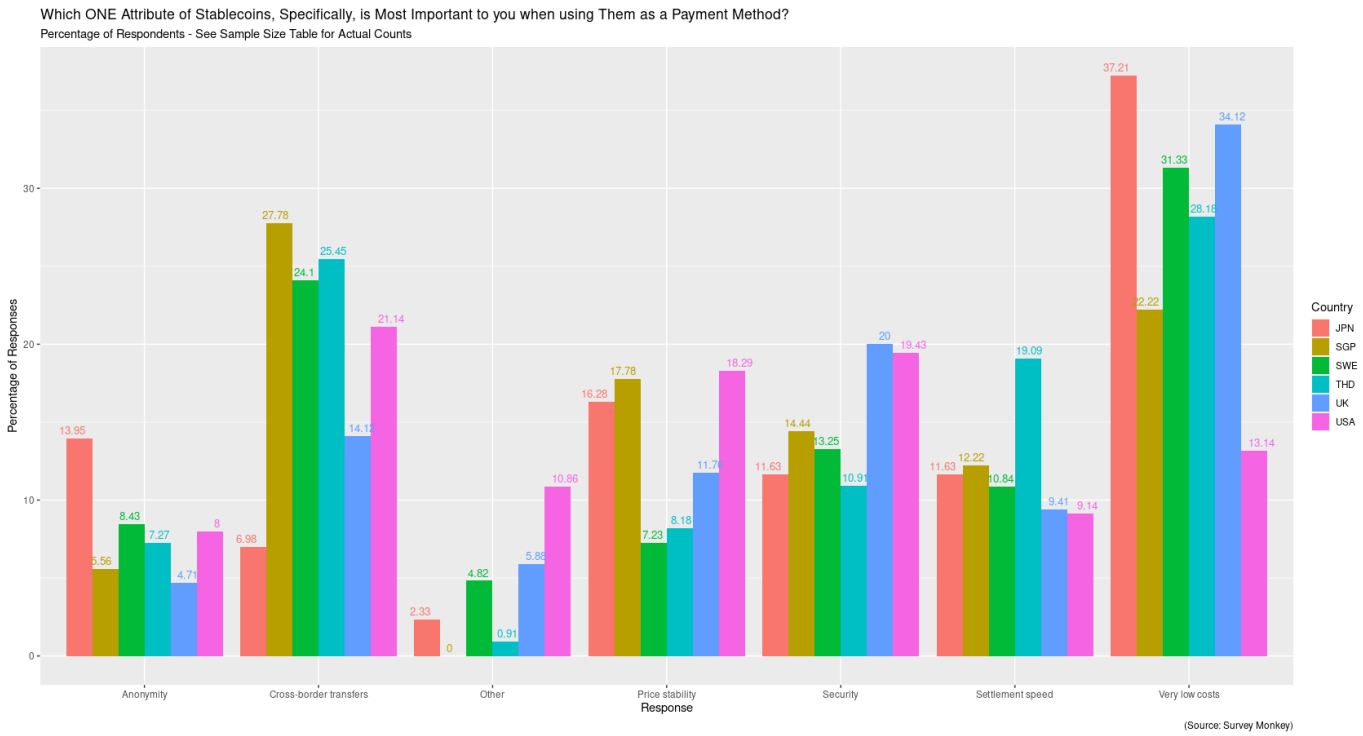

Figure 40 SM: Most Important Attribute of SaaPM Among Respondents

The value of stablecoins lies in their cost competitiveness relative to other payment methods, the ability to send money overseas, and the security of the underlying technology. Figure 40 shows that low costs are most important in Japan, while cross-border transfers are most important in Singapore. Interestingly, US consumers do not regard the low costs of stablecoins as particularly important – security and cross-border transferability are more important.

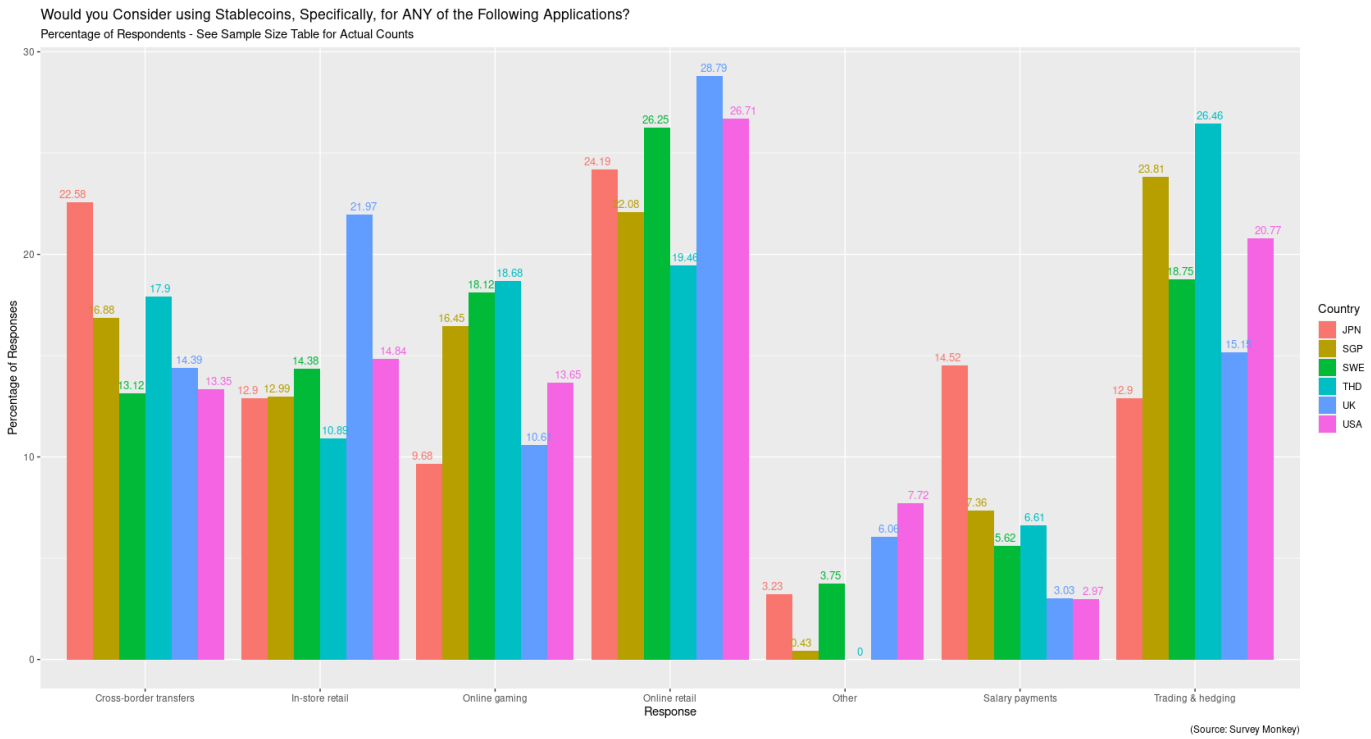

Figure 41 SM: Most Likely Use Cases for SaaPM

When we asked respondents for their opinions of SaaPM with respect to use cases, we found that, outside of trading and hedging, online retail and cross-border transfers are the two most important potential use cases to consumers across countries surveyed (Figure 41). Online retail is of greatest interest to UK and US consumers, while Japanese consumers value online retail and cross-border transfers almost equally.

Online gaming is a high-interest use case for customers in Singapore, Sweden, and Thailand, but consumers in the USA, UK, and Japan are more interested in online retail.

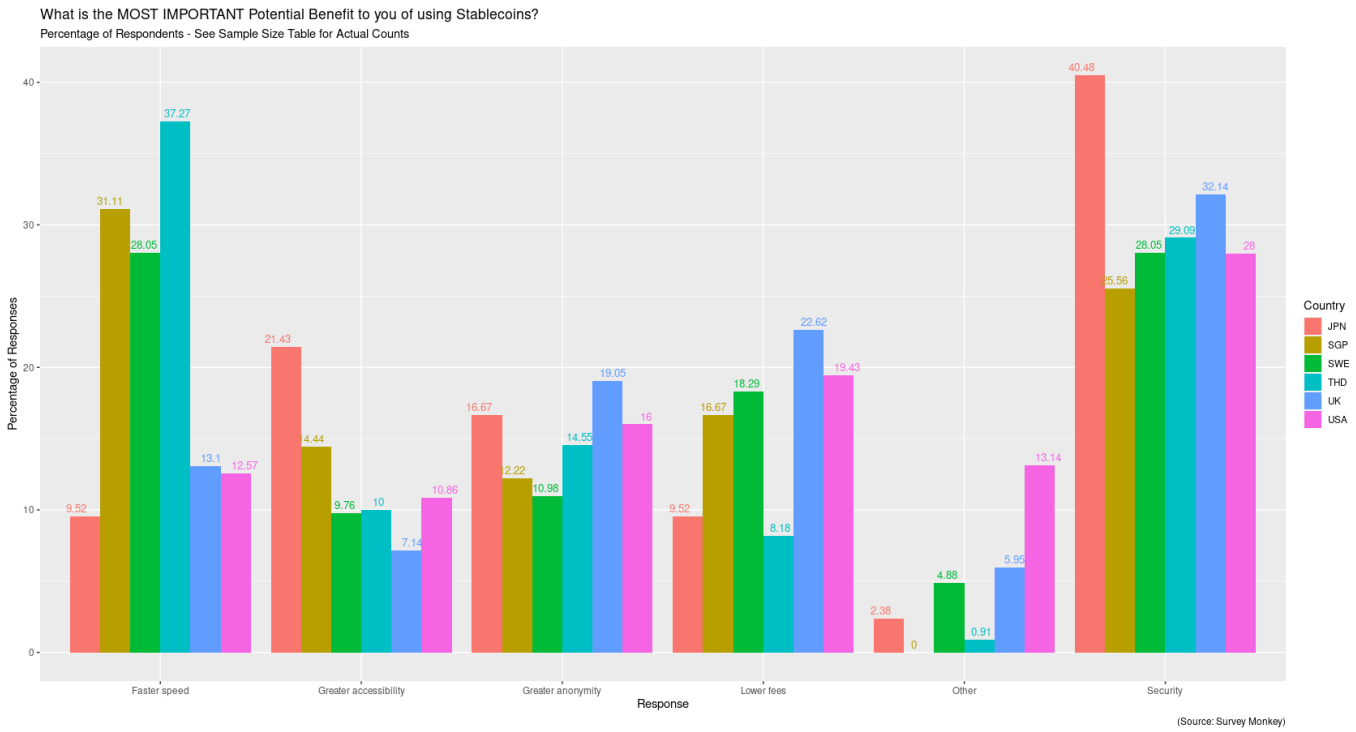

Figure 42 SM: Most Important Benefit of SaaPM for Respondents

Unlike our Qualtrics results, our general results show that security and speed, not cost, are the most important attributes of SaaPM for consumers (Figure 42). Sample sizes for this question are large enough to provide robust inferences across all countries under consideration.

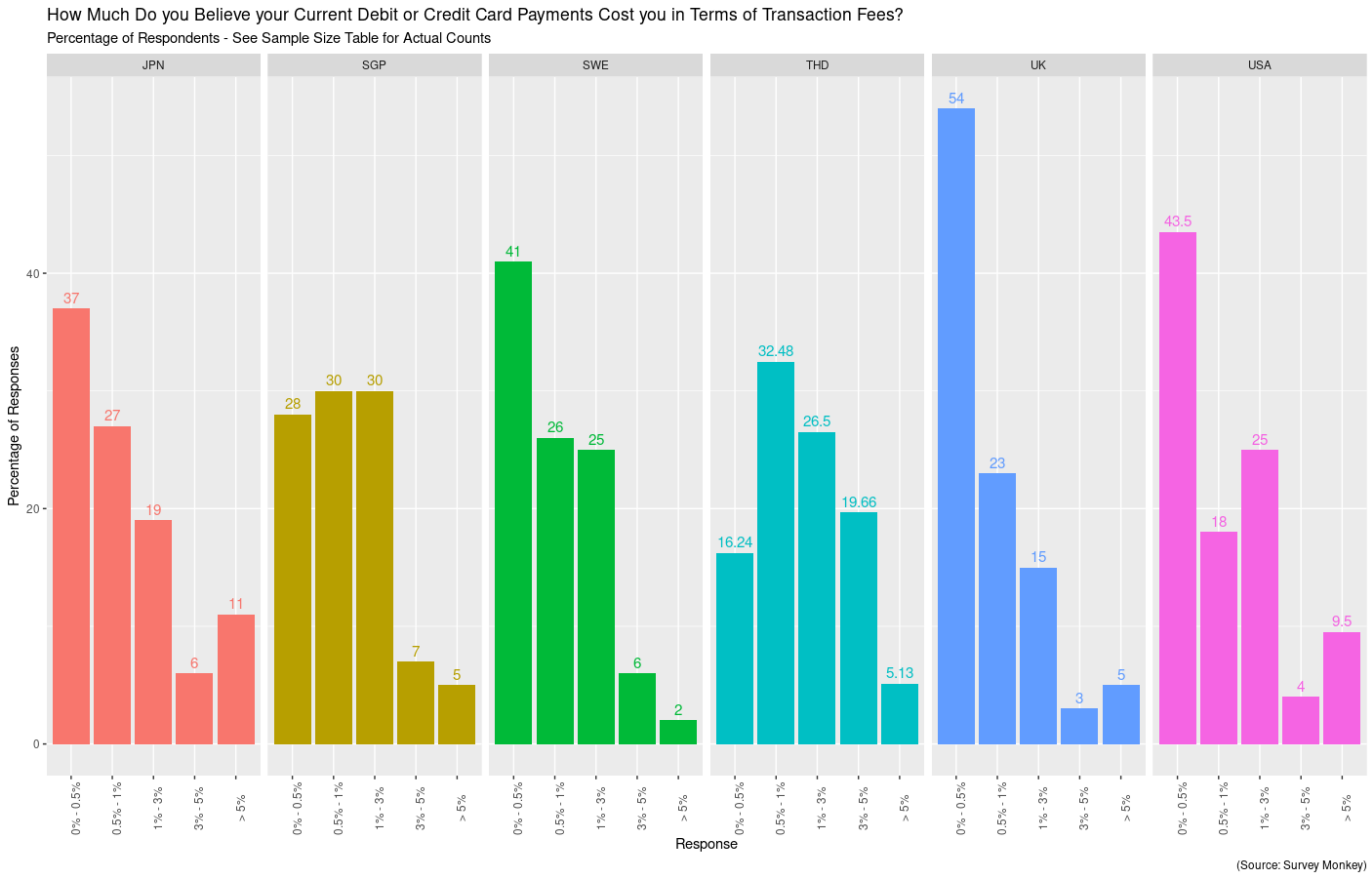

Figure 43 SM: Respondent Views on Current Debit/Credit Transaction Fees

Our Qualtrics data indicated that most consumers evaluate their current cost of using credit/debit cards at between 0 and 50bps, and the Survey Monkey data bear this out (Figure 43), across multiple countries. This conclusively establishes the "cost hurdle" that stablecoins must overcome in order to be competitive against existing methods of payments. Given that the bulk of respondents spend below £500 on discretionary weekly spending, on average (Figure 83), this implies that SaaPM must provide substantial incentives to consumers in order for them to switch over from existing payment methods to using stablecoins.

We observe a wide variety of payment methods used by respondents in general (Figure 82), but the surprising finding here is that Thailand appears to have an unusually high number of crypto wallet users, relative to other countries. (This may well be due to selection bias, given that the BoT has banned cryptoassets for payments in general, and implies that our population of respondents from Thailand are not representative of the overall population of consumers.)

Further, we observe that payment app usage is on the rise in most of the countries under consideration, especially in Thailand and Singapore. Surprisingly, given the UK's status as one of the world's most advanced cashless payments markets (Nag 2018), payment app usage in the UK is actually quite low among our respondents.

4.10 Market Sizing and Segmentation for Stablecoin Payments

4.10.1 Overall Size of the Market for Stablecoin Payments

The current market for stablecoin payments represents a tiny fraction of overall global transaction volumes. Information on the target available market is quite difficult to find at this time, due to the fact that the stablecoin payments market is still maturing and growing. The best estimates given by our experts indicate that the total market for stablecoin payments will be "fractions of 1%" (direct quote from two payment processing experts) of global transaction volumes, and at absolute best, perhaps 1% of total online and retail payments (according to another payment processing expert), in the next 3-5 years. Please see Section 5.1.3 for our analysis and estimation of market size.

4.10.2 Cross-Border Remittances as a Growth Opportunity

With respect to specific use cases, the market for cross-border remittances is one of the major potential growth areas for stablecoin payments. Total remittances to low- and middle-income countries reached US$589B in 2021, growing 7.3% from the previous year (The World Bank 2021a). As Figure 44 shows, the total size of the market for digital cross-border remittances and transfers shows robust growth, with a CAGR of 15.83% from 2017 to 2023 (estimated).

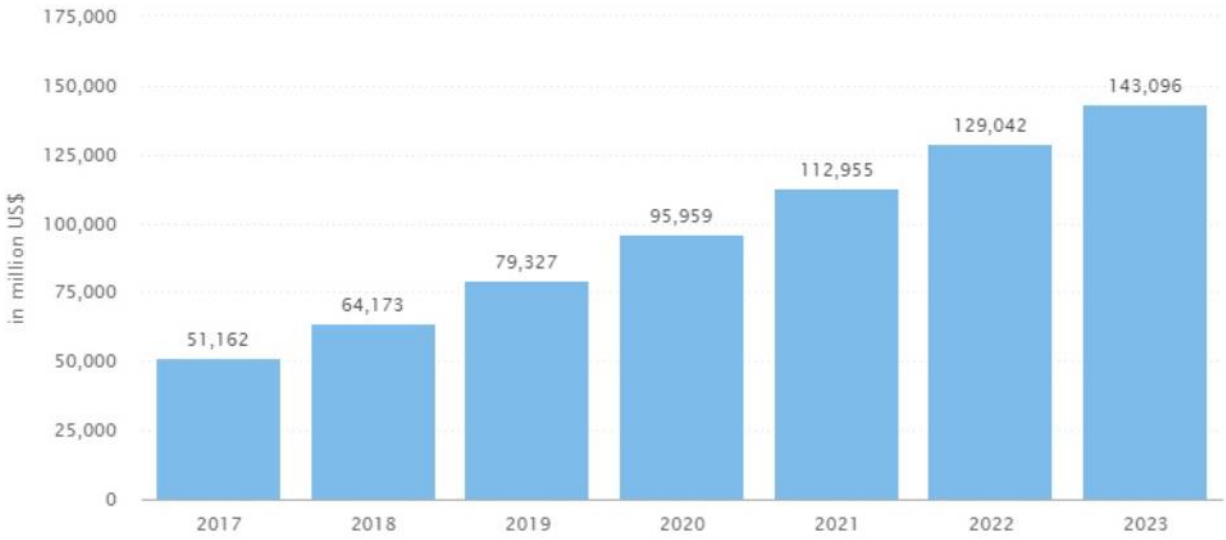

Figure 44 Total Transaction Value of Digital Cross-Border Remittances (Tassev 2020)

As of September 2021, the global average remittance cost is approximately 6.30% of the amount sent, with South Asia exhibiting the lowest transaction cost at 4.49%, and Sub-Saharan Africa exhibiting the highest cost at 8.27% (The World Bank 2021b). This is a significant source of competitive advantage for stablecoins, as transactions using cryptocurrencies can cost as little as $0.005 to send money across borders to digital wallets.

Figure 45 and Figure 46 break down these costs and show that digital remittances offer very clear cost benefits and advantages relative to cash remittances. Parenthetically, we note that the cost of sending to Russia is substantially lower than other countries due to some of the unique features of the market, specifically due to the fact that Russia has a large number of expatriates from former Soviet

Union (FSU) and Commonwealth of Independent States (CIS) countries working there, and so outflows from Russia to neighbouring countries are much larger than inflow to Russia itself (Ken Research 2018). However, we also stress that these data are all prior to the Russian special military operation in Ukraine in 2022, and so these data may be outdated, as sanctions against Russia have had severely disruptive effects on remittance costs worldwide (Research and Markets ltd 2022).

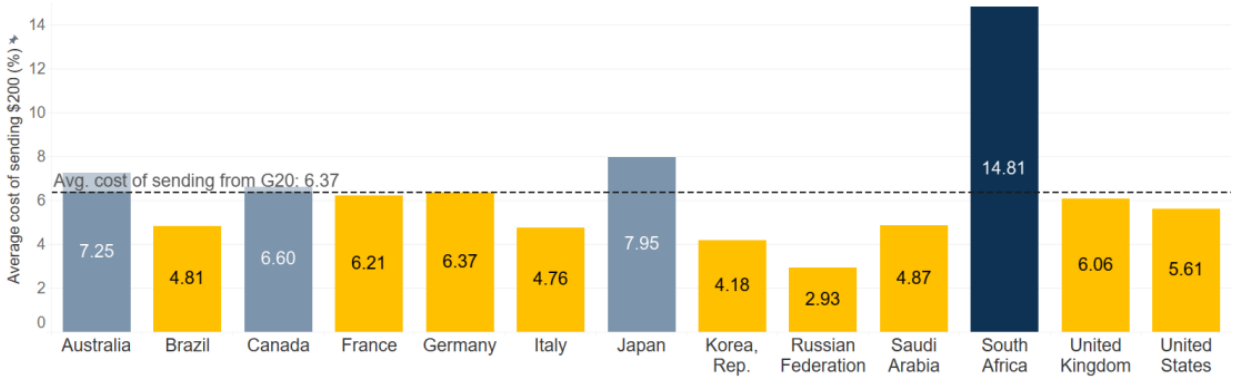

Figure 45 Average Cost of Remittances Worldwide (The World Bank 2021b)

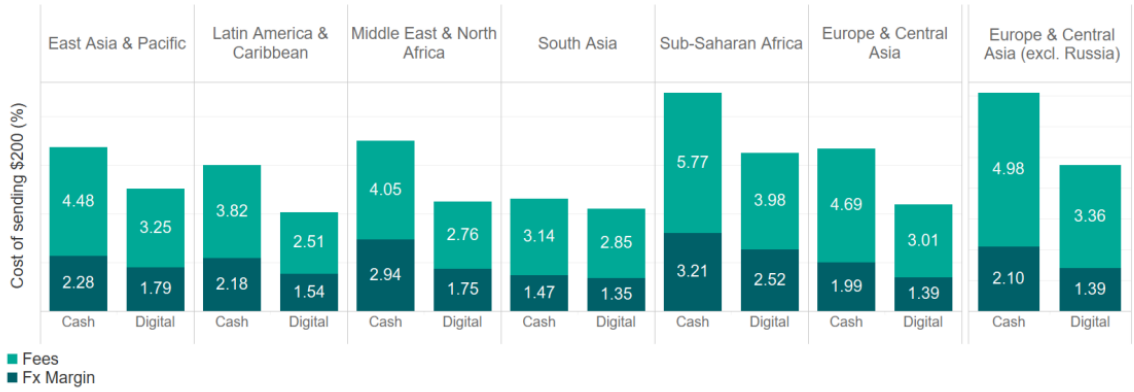

Figure 46 Average Cost by Region of Remittances – Cash vs Digital (The World Bank 2021b)

4.10.3 E-Commerce, NFTs, and Gaming

Our experts (4 out of 33) also note that e-commerce, non-fungible tokens (NFTs), and online gaming represent the biggest potential opportunities for stablecoin usage.

Figure 47 indicates that the global market for cryptocurrency payments in e-commerce will reach a value of approximately US$6B in 2022, though this is a tiny fraction (0.06%) of the overall US$10.4T e-commerce market (Nuvei 2022). Figure 49 and Figure 50 show the rapid growth in global sales of NFTs, which reached sales of over US$1.7B in 2021.

There does appear to be a market for stablecoin payments in the area of NFTs. For example, OpenSea is the largest NFT marketplace globally and processed over US$1.25B in NFT transactions in 2021, or 88% of the global total (Vardai 2022), and accepts DAI, USDC, and other stablecoins for transactions. (We are unable to determine how much of OpenSea's overall NFT sales volume comes from stablecoins.)

As for gaming, revenue from crypto-based sales in gaming reached US$321M in 2020 (Nuvei 2022) with approximately 41.9M gamers owning cryptos globally. This is more than 12% of the total percentage of people worldwide who own cryptocurrencies in general (Figure 16). At present, about 80% of gamers who own cryptos, are keen to use them for in-game purchases (TripleA 2021).

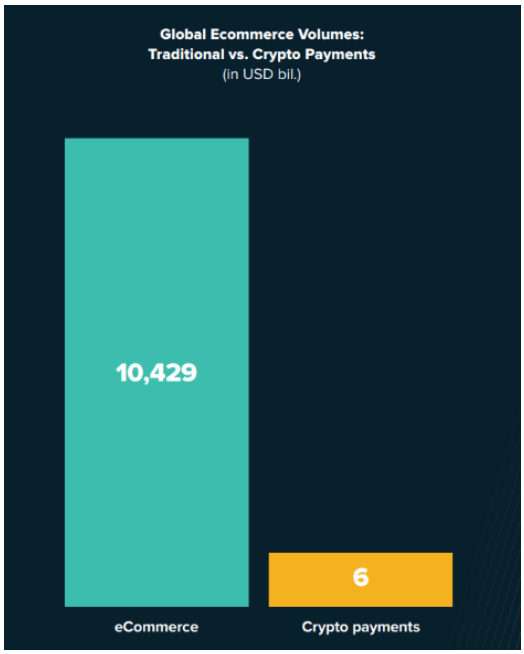

Figure 47 Projected Global E-Commerce Transaction Volumes in 2022 (Nuvei 2022)

Figure 48 Global Crypto Payments Turnover by Vertical in 2022 (Nuvei 2022)

There is a real movement within the online gaming and esports industries to utilise stablecoins for a variety of applications (Koffman 2020). Microsoft has announced plans to implement a blockchain-

based platform for royalty payments to gaming partners and content creators (ibid); Circle, the issuer of USDC, is working to settle debit and credit card payments for gamers in its own USD Coin currency (ibid); and FinTech company Zytara will look to manage payments for gamers and esports challenge winners through its own natively issued stablecoin, in partnership with Prime Trust (ibid). These point to a burgeoning interest in using stablecoins to facilitate payments to gamers that can then be easily translated into fiat currency.

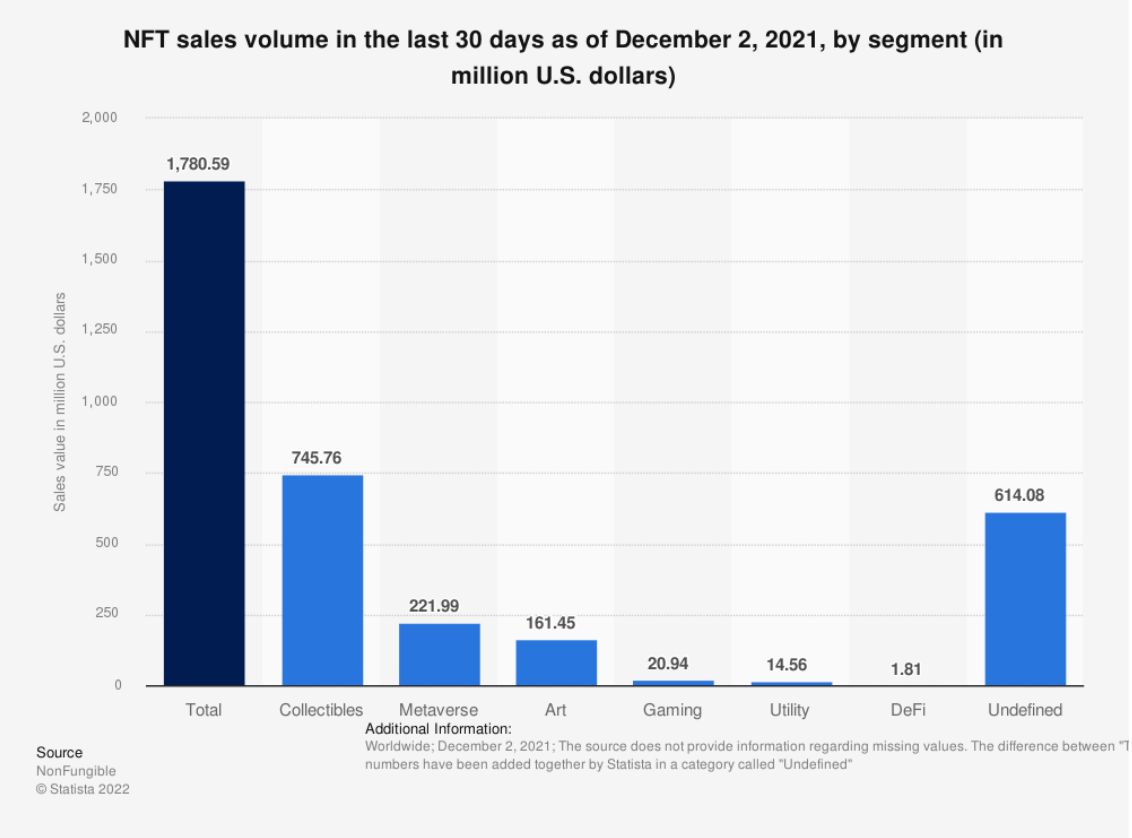

Figure 49 NFT Sales in Nov 2021 by Segment (Norrestad 2021)

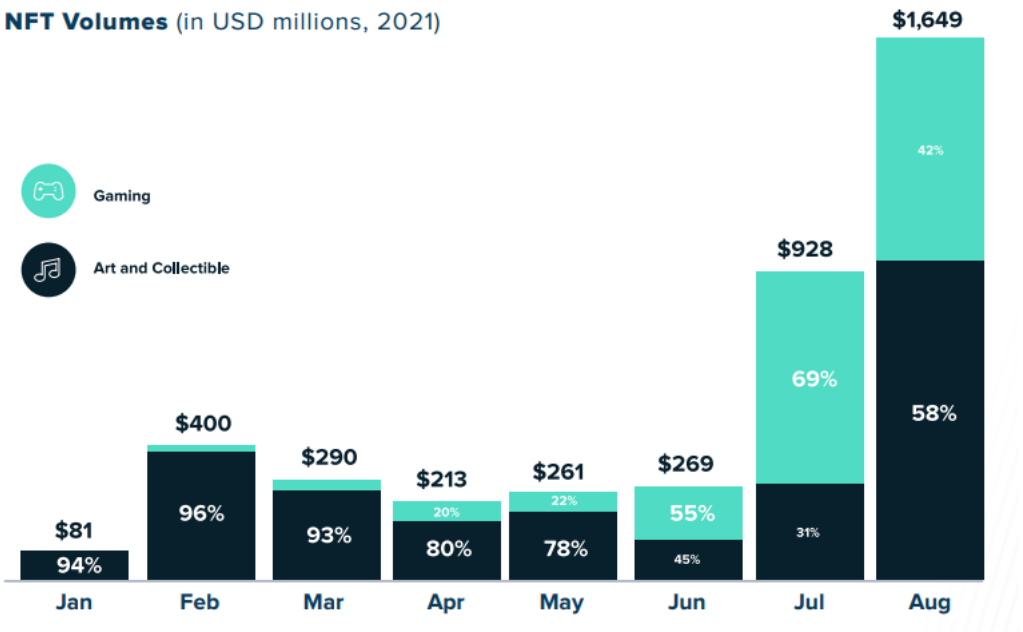

Figure 50 NFT Sales Volumes by Category in 2021 (Nuvei 2022)

4.11 Merchant Views of Stablecoin Payments

Mass adoption of stablecoins for B2C applications requires both demand from consumers, *and* acceptance from merchants. As noted (Figure 18), there is a significant disconnect between merchant and customer attitudes toward cryptocurrency payments in general, and therefore to stablecoins in particular.

Our experts and the current market literature indicate that broader acceptance of cryptocurrencies, therefore stablecoins, for payments, comes from the following issues (Nuvei 2022):

- Lack of regulatory clarity in many jurisdictions with respect to taxation and legality of cryptocurrency transactions;
- Poor user experience with stablecoins, relative to other payment methods – users have to manage their public and private keys carefully, and often have to manually exchange their stablecoin holdings back into crypto, before making payments through their wallet apps;
- Crypto infrastructure is still very much in its infancy, especially when compared with other mainstream payments solutions;
- AML/KYC capabilities within cryptocurrency industry is still quite poor relative to existing payment methods;

However, the impending implementation of CBDCs in real-world situations, within high-tech economies such as Singapore, Switzerland, and potentially Sweden, *may* help overcome these trust challenges in coming years.

The fact that the major payment and acquirer networks are investing heavily in cryptocurrency payments within their own platforms, has also increased awareness of, and interest in, merchants and other key payments ecosystem players (Nuvei 2022).

As Figure 48 shows, anonymity, cost, and digital awareness among users are the major drivers of crypto payments in e-commerce. Companies that permit cryptocurrency payments for their customers often provide incentives for doing so – for example, BetOnline AG allows customers to make deposits with Bitcoin as well as a wide range of altcoins, including stablecoins, often (though not always) with lower minimum deposits required than when using debit or credit cards (BetOnline AG 2022).

Other companies, such as Overstock, Square, and NameCheap, offer cryptocurrency-based payments to customers for online purchases. However, our payment processing experts believe that crypto payments are generally a loss-leader for most companies, used more as a marketing exercise to drive sales among a newer and younger customer base, to position themselves as innovative and expand their marginal sales among tech-savvy buyers.

4.12 Case Studies of Real-World Stablecoin Payments

In the course of our analysis and investigation, we have come across a number of examples of real-world stablecoin payments. We present a sample of the most relevant use cases here.

4.12.1 Salary Payments: The Nippon Yusen Kaisha Case

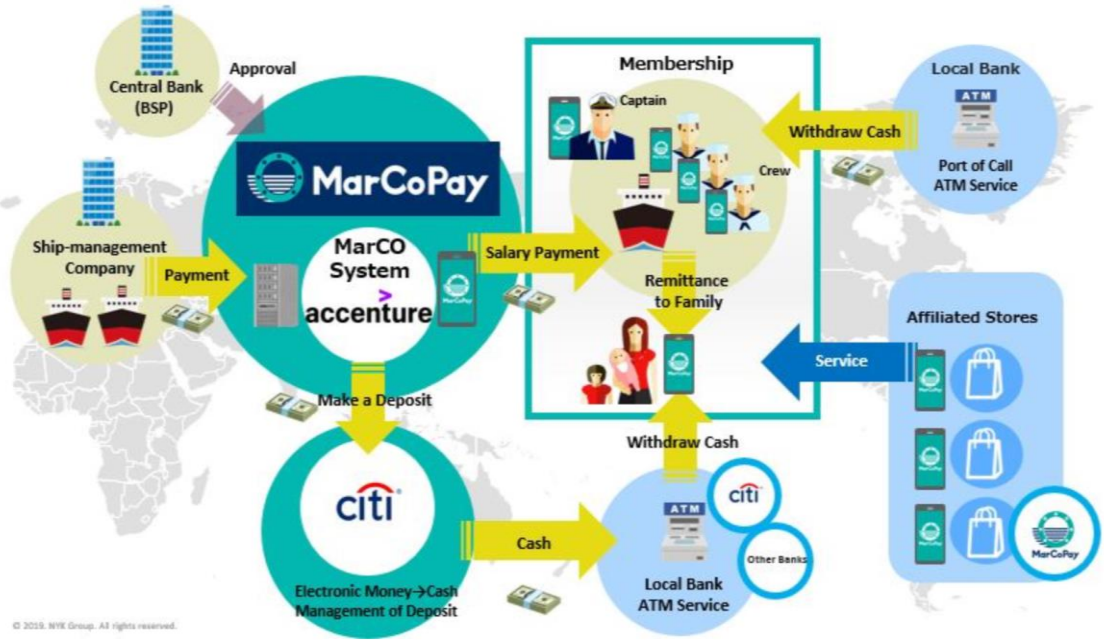

Figure 51 NYK Line-MarCoPay Stablecoin Salary Payments Loop (NYK Line 2021c)

Nippon Yusen Kabushiki Kaisha (TSE: 9101.T) is the largest shipping company in Japan, and one of the largest in the world, with 685 vessels serving 350 ports and over 35,000 employees as of April 2021 (NYK Line 2022). Approximately 93% of the sailors serving aboard NYK Line ships are non-Japanese (NYK Line 2021a). Globally, transport ships have historically carried sailors' salaries in cash aboard ship, up to US$700M worth (NYK Line 2021b), which poses a considerable operational and financial risk in the event of piracy or catastrophic weather.

To mitigate this risk, NYK Line entered into a partnership with Marubeni, Citigroup and Transnational Diversified Group to create and run **MarCoPay**, an electronic payments platform, for

the express purpose of paying non-Japanese sailors automatically in USD-linked stablecoins that could then be remitted instantly from the crews to their families.

The closed-loop system established by MarCoPay poses significant benefits to NYK Line and its employees alike. NYK Line reduces its operational risk exposures by eliminating the need to keep cash aboard ship, and also reduces the time and attention required by ship captains for matters related to security issues and inventory tracking.

Sailors can send their salaries to their families at a very low cost, and can also obtain access to financial products and services, such as insurance, which would normally be off-limits to them due to their inability to produce cash collateral.

4.12.2 Cross-Border Remittances: OKCoin and Stellar

OKCoin, a cryptocurrency trading platform, recently announced a partnership with the Stellar Development Foundation to permit US retail and institutional customers to use Circle's USDC for cross-border remittances and settlements (The Stellar Development Foundation 2022). This establishes a method of cross-border payments that competes directly with Ripple, which a large number of global financial institutions use for cross-border settlements.

While Ripple has substantial advantages over USDC in terms of the number of currency pairs offered for settlements, XRP is a volatile cryptocurrency with no convenient *on/off-ramp* (method for translating fiat into crypto and vice versa) for users. Using USDC resolves this by ensuring that stablecoins can be redeemed directly into fiat held by Circle and deposited into customer accounts.

With settlement speeds and fees comparable to XRP (Table 5), the Stellar-OKCoin partnership also offers access to USDC remittances for US-based clients for the first time.

4.12.3 BitPay and Stablecoins

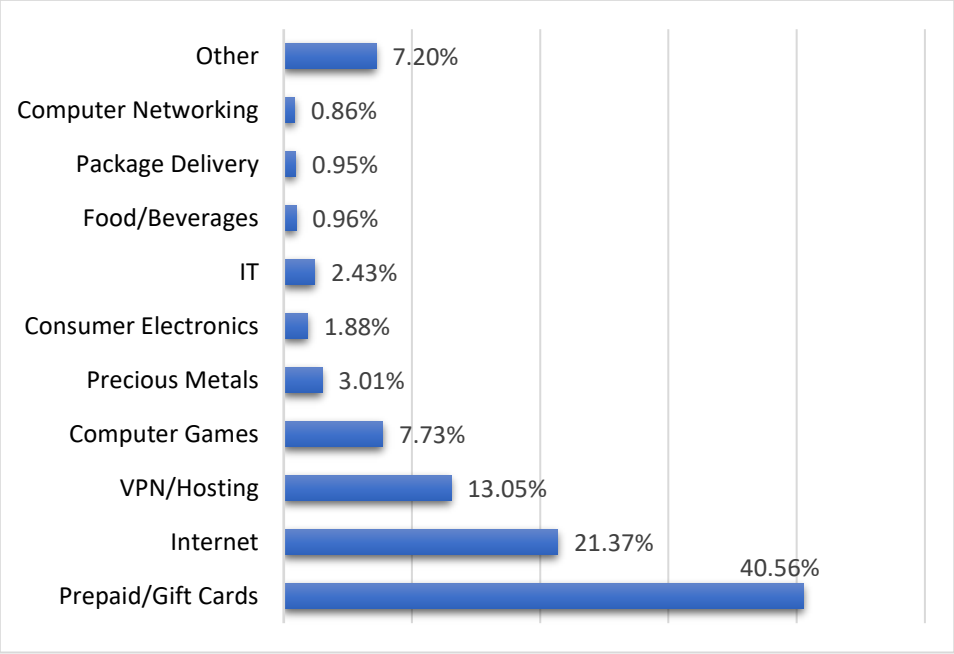

Figure 52 BitPay Crypto Transaction Data for Jan 2022 (BitPay 2022)

BitPay, a cryptocurrency payment solutions provider headquartered in Atlanta, Georgia, founded in 2011, has data tracking payments by cryptocurrency, and shows that in January 2022 alone, stablecoins accounted for approximately 2.7% of all transactions on its platform (BitPay 2022). Out of 66,196 transactions for the month, USDC accounted for 1,773 transactions (2.60%), and BUSD for 112 transactions (0.17%). We observed similar percentages of transactions using stablecoins for previous months, going back to August 2021 (ibid).

4.12.4 Online Gaming: Axie and DAI

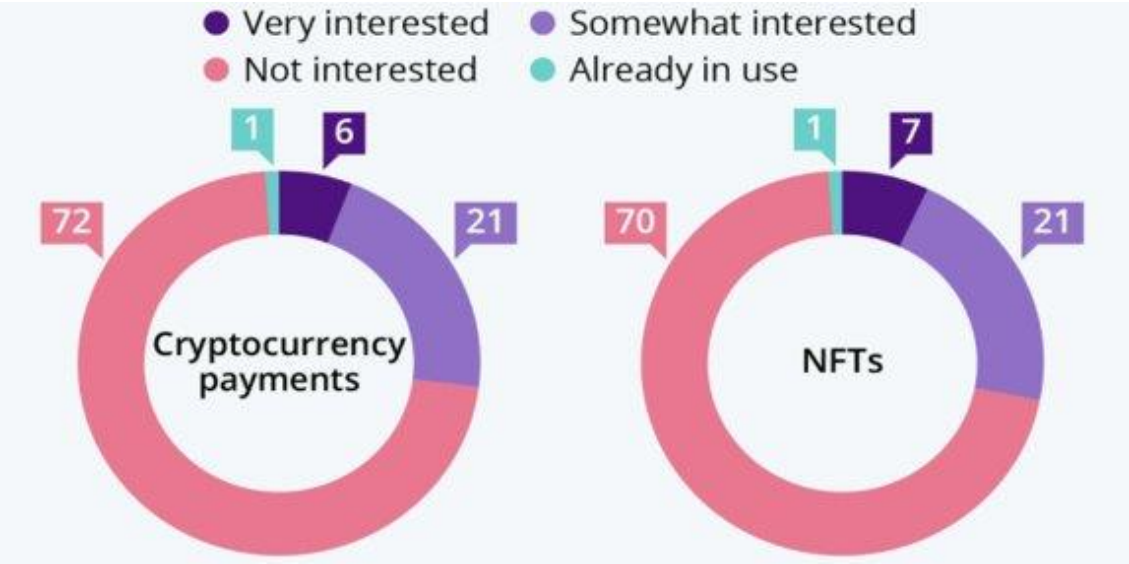

Figure 53 Developer Appetite for Crypto Payments Implementation (Zandt 2022)

As noted (Section 4.10.3), online gaming is a major current and potential use case for cryptocurrency payments. As Figure 53 shows, over 25% of 2,700 game developers surveyed are interested in implementing crypto payments for in-game transactions and NFTs.

The online gaming company **Axie**, based in Vietnam, provides a real-world example of stablecoin usage for in-game payments. Axie is the world's second largest NFT marketplace (de Best 2022a), with over US$3.6B traded in its in-house market, across 2.8M active daily players, with the most expensive Axie ever sold for US$820K. Most transactions are around US$1,000, and the first 100 transactions are free (Thurman 2022). At present, Axie allows users to perform transactions with DAI (MakerDAO 2020).

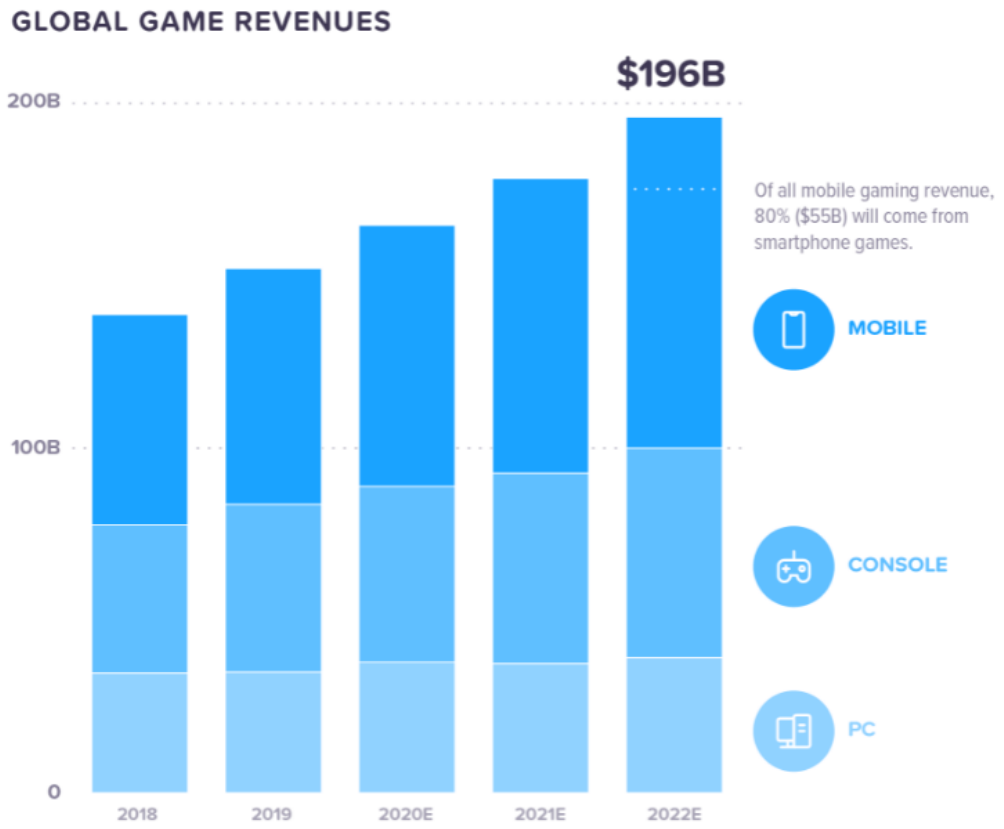

Figure 54 Global Gaming Revenues by Platform 2018-2022E (Circle.com 2021)

This example, among others, demonstrates how stablecoins fit within the world of online gaming, as a transactions tool. Stablecoins can be used for monetisation of in-game currency into real-world fiat, creating in-game payment infrastructures, and building new revenue streams for gamers and developers alike (Circle.com 2021).

4.12.5 Stablecoins for Secure ACH Payments: Plaid and Circle

Figure 55 Plaid-Circle Partnership Flow

Circle, the issuer of USDC, recently entered into a partnership with payment solutions provider **Plaid** to provide full authentication and onboarding of users who wish to use USDC to make Automated Clearing House (ACH) payments (Behrens 2021). Plaid provides all of the necessary tools to ensure a smooth onboarding experience for users, and Circle provides the payments infrastructure to ensure seamless settlements between customers and merchants. Analysts consider this partnership as a potential driver for adoption of USDC by Plaid's customer base (ibid).

4.12.6 Stablecoins in a Closed Loop: The GreenBox POS Case

GreenBox PoS (NASDAQ: GBOX) is a payment processor with an estimated US$75M revenues and US$30M of EBITDA in 20201, that runs its own closed-loop blockchain-based token payments system. It specialises in dealing with merchants that have a 1% or higher rate of chargebacks – such merchants are generally seen as "high risk" by standard payment networks such as AMEX, VISA and MA, and as such cannot run transactions through those networks. GBOX has also entered into partnerships with Amazon and Uber (Secular Growth Stories 2021).

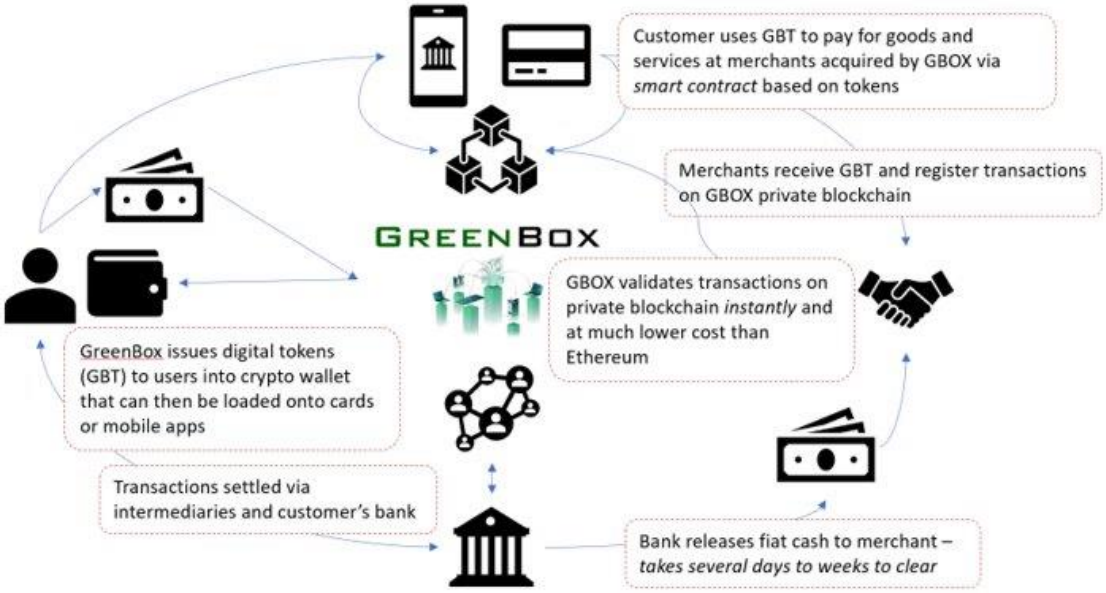

Figure 56 GreenBox PoS Payments Loop

GBOX uses its own proprietary GreenBox Token (GBT), tied to USD, to provide reversible transactions that it then settles into fiat currency (ibid). Merchants release goods and services instantly to customers, while actual settlement can take several days to weeks (ibid). GreenBox is planning to roll out its own proprietary novel stablecoin, *Coyni*, to reduce the lag in settlement times (ibid). GBOX's model depends on using its own proprietary token and blockchain to ensure that transactions authenticate and process quickly.

This example demonstrates that stable tokens can be used for retail payments beyond high-risk industries, and can facilitate rapid transactions between merchants and customers.

4.12.7 Stablecoins for Airline Payments: airBaltic and Alternative Airlines

Figure 57 Airlines Accepting Cryptocurrency Payments (Helms 2021)

As Figure 18 showed, merchants servicing the travel industry are willing to accept cryptocurrency payments to some degree. Data from the airline subsector of that industry, in particular, show that a wide variety of airlines are willing to accept cryptocurrencies in general for payments via the Universal Air Travel Plan (UATP) network (Helms 2021). airBaltic, a regional and international airline based in Latvia, currently accepts payments in a variety of cryptocurrencies, including stablecoins such as USDC and GUSD (airBaltic 2021), though we are unable to discover how much of their bookings revenue comes from this payments method. Alternative Airlines, a booking company based in Surrey, UK, generated 1.5% of its revenues in 2021 (about £400K) from cryptocurrency payments (DeLuca 2022).

The airlines industry in general seems to be among those more willing to adopt cryptocurrency payments, but, again, our expert interviewers regard this as more of a loss-leader to open up new payment avenues. There appears to be a correlation between frequency of travel and ownership of Bitcoin – 33% of those who travel 5 times or more annually, own Bitcoin (DeLuca 2022), so airlines may be attempting to provide frequent travellers with additional payment options to encourage travel.

4.12.8 Stablecoin On/Off-Ramps

A **cryptocurrency on-ramp** refers to any exchange, or similar service, that allows for fiat currency to be used to purchase cryptocurrency (Blockchain Arena 2020). Examples of on-ramps include:

- Centralised exchanges (e.g., Binance, Coinbase, FTX, Kraken, Bitfinex);
- OTC brokers for large trades (e.g., BitStocks, JumpTrading, IBC Group) (Smith 2018);
- Cryptocurrency ATMs, which allow users to make cash deposits and provide crypto in return;

- Cryptocurrency off-ramps allow users to shift back from cryptocurrency into fiat currency;

Most, but not all, on-ramps can also be used as off-ramps. On/off-ramps provide key access points to cryptocurrency to general public and large traders alike, and provide bridges to more traditional financial products and services. Debit/credit cards linked to cryptocurrency wallets can serve as on/off-ramps.

The primary challenge is regulatory in nature – in theory, anyone can use on/off-ramps, including bad actors. The regulation is still developing in most jurisdictions for on/off-ramps. There appears to be a strong need in the market for comprehensive AML/KYC/CFT policies at most crypto exchanges to ensure regulatory compliance. At minimum, users need to provide basic personal identification (e.g., passport, driver's license, etc.) before being permitted to trade on centralised exchanges.

This issue of on/off-ramps is of particular relevance to stablecoins, because they are designed by definition to provide greater convertibility from crypto to fiat. In order to use stablecoins, customers need to be able to buy and sell stable tokens with and for fiat. To do so, customers have to be onboarded into a centralised exchange.

Most cryptocurrency exchanges, such as Coinbase, currently provide on/off-ramp services, but require additional layers of authentical protocols to ensure that the onboarding process is smooth.

5 Analysis

5.1 Current State of Stablecoin Payments

5.1.1 First Pass at Target Available Market

The current size of the stablecoin market for payments is very difficult to assess, due to the lack of transparently available data. Based on the data we do have available from Section 4.10, all that we can say for certain is that the overall size of the market for stablecoin-based payments *at present* is significantly less than 1% of any payments market, regardless of sub-sector or size.

The total size of the entire cryptocurrency market is approximately **US$1,726B** (CoinMarketCap 2022). The total market capitalisation of all stablecoins, regardless of type, is approximately **US$179B**, or **10.37%** of the total cryptocurrency market. Of this US$179B, the top 10 stablecoins (regardless of type) account for **99.14%** of all stablecoins in circulation (Table 4). And of these, the 5 fiat-backed stablecoins account for **US$153B**, or 85.54% of the total stablecoin market, and therefore **8.87%** of the total market capitalisation of all cryptocurrencies.

To the best of our understanding, about 80% of the stablecoin volume currently in circulation is used on a daily basis for trading and hedging – this is the most prevalent use case for stablecoins, by far, according to our expert interviewees and the available market data on speed of circulation (CoinMarketCap 2022). While the percentage used for trading and hedging can be as low as 60%, the demand for stablecoin hedges is in direct proportion to volatile crypto volumes, and those have been rising in recent years. This leaves only about 20%, at best, available for other uses – that is to say, about **US$45.9B**.

This is the absolute maximum possible size of the market for stablecoin payments, as of this writing.

In reality, the true market size is a small fraction of this, as stablecoin payments is still such a new field and there remain a number of significant blockers to adoption.

5.1.2 Maximum Market Sizes by Sub-Industry

We have data for several different sub-sectors, and can establish certain upper bounds on the gross dollar volume (GDV) as a percentage of overall sales:

- **Cross-Border Remittances:** Total digital cross-border remittances are expected to reach **US$129B** in 2022 (Figure 44). Our best estimates from expert interviews and market data indicate that at most 10% of the market for digital cross-border remittances will use stablecoins for sending and receiving money. This translates into a maximum market size of **US$12.9B**, though we stress that this is an extremely optimistic outcome.
- **E-commerce and Online Retail**: Given that BitPay registered 2.7% of its revenue from January 2022 in stablecoins (Section 4.12.3), and given that crypto payments in e-commerce amounted to 0.06% of the entire global e-commerce market (Section 4.10.3), the maximum size of stablecoin payments in e-commerce is likely to be 2.7% of 0.06% of US$10.4T, that is to say, **0.0016% of the market**, or **US$169M**, in 2022.

- **Online Gaming**: Analysts estimate that the market for online games will reach a market size of US$200B in sales in 2022. Of this, the most realistic estimate that we can make, given current data, is that perhaps 0.3% of total sales will be paid for with stablecoins of any kind. This leads to a maximum likely market size of **US$60M**.
- **Airlines & Travel**: Our best estimate for the total size of the airline industry's revenue is **US$471.8B** in 2021 (Flynn 2021), after recovery from the 2020 pandemic. The maximum amount of revenue from bookings in cryptocurrency in general is 1.5%, based on data from Alternative Airlines (Section 4.12.7). Given that fiat-backed stablecoins account for 8.87% of all cryptocurrencies in circulation, we believe it reasonable to assume that perhaps 5% of that 1.5% in revenues will come from stablecoins – and, again, this is surely a very high estimate. This leaves **US$353.85M** in stablecoin GDV worldwide for all airline bookings.

5.1.3 Estimated Maximum Market Size for SaaPM

Taken together, these numbers in 4 separate industries add up to **US$13.5B**, and again, that is surely a very generous estimate, mostly concentrated in cross-border remittances, where consumer-driven use cases are likely quite limited. That is our assessment of the maximum possible size of the market over the next 24 months.

Based on the data that we have assembled, and given the lack of visibility and the fact that we have to make a number of assumptions to arrive at this figure, we prefer to err on the side of caution and scale down the maximum market size. In particular, we argue that the possibility of a 10% market share of cross-border remittances, done via stablecoins, is probably too high, and we prefer to assign a weight of no more than **3%**. This reduces the likely size of the cross-border remittances market with stablecoins to **US$3.87B**.

That reduces the total likely market size to a more reasonable market estimate for the *maximum* total size of stablecoin payments of all kinds (excluding trading and hedging) of **US$4.45 B** in 2022-23.

5.1.4 Potential Future Market Size

It is very difficult to ascertain any kind of reasonable estimate for future growth of the stablecoin market by volume beyond that point. The triple-digit levels of growth seen over the past 3 years are simply not sustainable long-term, yet the stablecoin market grew by 388% year-over-year from 2020 to 2021 (Chaparro 2021). We note that prominent industry figures, such as Circle CEO Jeremy Allaire, believe that 2022 will be the year in which stablecoins begin to be used to address gaps in the payments industry, and will also come into use for DeFi applications (ibid). There is considerable evidence to support the view that this is already happening, as shown earlier.

Even so, we are simply unable at this point to make reasonable predictions about future growth rates, due to the very high degree of uncertainty involved. Our available data provide a year-on-year growth range from 80% to 200% in stablecoin market volumes in the next 12 months, which makes predictions about future market size extremely difficult.

All that we can state for certain about the likely future size of the market is that stablecoins will continue to grow in tandem with the appetite for volatile cryptocurrencies. As noted, the single largest use case for stablecoins is in trading and hedging of volatile cryptoasset performance, and this is set to continue as Bitcoin and other volatile assets mature and enter mainstream adoption. Given the

historical correlation of 84% between Bitcoin volume and the total volume of the top 5 stablecoins in the market (Figure 5), Bitcoin usage and growth remains the best predictor of likely market size in the future – though, even there, given the regulatory challenges with Bitcoin and the constantly evolving state of regulations around cryptoassets globally, it is not possible for us to make a confident prediction about market sizes.

5.2 Assessing Market Growth Potential

Consumer survey data show a significant level of awareness of cryptocurrencies in general, and a strong willingness among respondents to use stablecoins for online and retail payments (Section 4.9). However, our combined Qualtrics and Survey Monkey data indicate that perhaps 25%, at best, of all respondents are aware of what stablecoins are and how they can be used.

This lack of awareness, combined with current regulatory uncertainty with respect to how central banks and tax authorities will treat stablecoin transactions, are strong disincentives for adoption from both the consumer and merchant perspectives.

5.2.1 Consumer and Merchant Sentiments

This is not true in all industries. There is a significant mismatch between consumer views of cryptocurrency payments in general, against merchant willingness to accept cryptocurrencies (Figure 18).

Looking at a country-specific level, our survey data indicate that the US and UK markets show a strong interest in using stablecoins for online retail, while Asian markets (Japan, Thailand, Singapore) show interest in cross-border remittances. The strength of the responses in Section 4.9.3 indicates that SaaPM is of real interest to a significant minority of consumers across geographies, particularly within the younger demographic (25-45), who already use cryptocurrencies in some form.

The Asia-Pacific region represents a significant source of growth opportunity for stablecoin payments. The APAC gaming industry generated US$157.3M in 2020, which represents 49% of total global gaming industry crypto payments revenue (TripleA 2021).

Certain payment providers have already launched their own stablecoins to facilitate cross-border remittances. In 2019, Paysend, a London-based FinTech company specialising in sending money in a P2P fashion between debit and credit cards used on Western networks such as VISA, and MA, as well as others such as Russia's MIR and China's UnionPay, launched its own stablecoin hosted on the Stellar network (Paysend 2019).

However, general merchant interest in stablecoin payments does not yet reflect this view among consumers. In specific industries, such as online gaming, we see that 28% of developers show interest in enabling cryptocurrency payments within their games (Section 4.12.4, Figure 53). But beyond gaming, cryptocurrency payments in general, and therefore stablecoin payments in particular, remain a relatively specialised area of investment for most merchants.

5.2.2 Assessing Growth of Stablecoins in Cross-Border Remittances

Both the data and our experts view cross-border remittances as the next major growth industry for SaaPM. The problem is that the unclear picture around CBDCs, makes predictions about potential market size of stablecoin-based remittances very unreliable. On the one hand, the introduction of

CBDCs would likely eliminate the need for stablecoins for the specific purpose of sending money across borders, even though, in general, stablecoins and CBDCs are likely to coexist as methods of payment. On the other hand, most countries currently experimenting with, or researching, CBDCs are still in the PoC or research stage only, and are years away from actual implementation.

Therefore, we believe that over the next 12-36 months, stablecoins will emerge as a viable competitor in digital cross-border remittances. We assume conservatively that stablecoins may capture up to 10% of the market from Ripple and other existing alternatives and competitors.

Assuming a starting point of USD$129B for digital cross-border remittances (Figure 44) and a CAGR of 15.83% (Section 4.10.2) over 3 years, this leads to a total potential market size for digital cross-border remittances of **US$200.47B**. If stablecoins, in general, capture 10% share of this market, the total size of the market for stablecoin-based remittances is therefore **US$20B** by 2025.

Note that this scenario is far from assured, as it assumes linear growth at a fairly high rate. This estimate will vary significantly depending on the regulations and market practices with respect to cross-border digital remittances. The lack of a universally adopted international framework for digital remittances means that there is very little transparency around regulations, so the actual market size of cross-border remittances could be substantially smaller.

Furthermore, the estimate of a 10% share of the market captured by stablecoins depends entirely on whether stablecoin technology can reach the scale and speed necessary to compete with Ripple and other cross-border payments mechanisms. This is already happening, as we have pointed out (Section 4.7), but our experts estimate that blockchain-based technologies are still too small in scale to compete with SWIFT, by at least one order of magnitude.

5.2.3 Moving Along the Adoption Curve

There is a view amongst market experts whom we directly interviewed – particularly among FinTech/Crypto SMEs – that stablecoins will follow Bitcoin's adoption rate. The fact that the market cap for the top 5 stablecoins in circulation correlates at about +84% with the market cap of Bitcoin (Figure 5), supports this view. One expert practitioner specialising in crypto regulation notes that Bitcoin's growth in volume, price, and market focus is a likely model for stablecoins. We caution that this is not a perfect model – there is no perfect measurement of Bitcoin's adoption rate, due to the decentralised nature of the currency (Craig 2021). By contrast, fiat-backed stablecoins are *not* decentralised, they have a central point of potential failure.

Bitcoin itself is very much in the earliest stages of adoption and is still quite an immature technology and currency (Craig 2021). Since stablecoins originated as a method of hedging against the price volatility of BTC and other cryptocurrencies, and since stablecoins are themselves still very much in their infancy, it is reasonable to argue that we are even earlier in the adoption curve than BTC.

Data from our consumer surveys strongly support this view**.** Our general Qualtrics survey data show that a clear majority of respondents would prefer to wait until the technology behind stablecoins is more mature before using them for online and retail payments (Figure 26) – that is, they have no fixed timeline for adoption. However, our sample sizes for Qualtrics data are limited, and we cannot be confident in this result. The broader sampling of users across multiple geographies shows that the

majority of consumers surveyed, who know about cryptocurrencies, and are interested in using stablecoins for online retail payments, are keen to do so within the next 12 months (Figure 39).

The problem here is that stablecoins themselves are still an immature and rapidly developing technology. The state of cryptocurrency technology is nowhere near mature yet, and stablecoins have a long way to go before they become a mainstream method of payment.

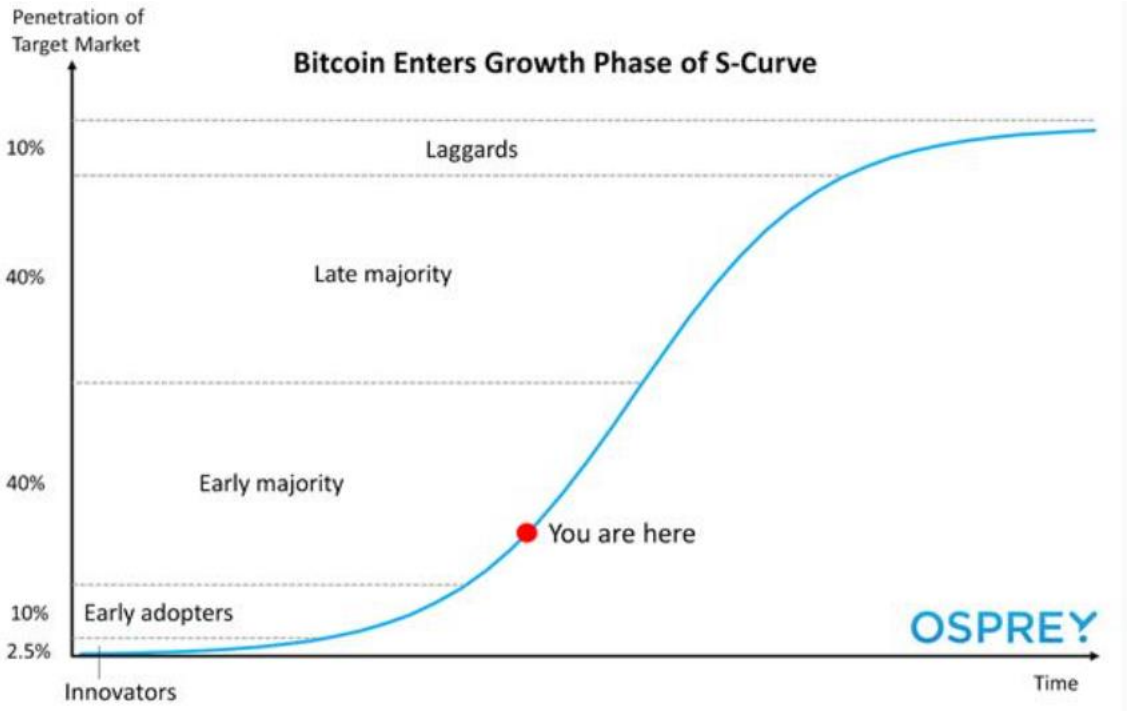

Figure 58 BTC's Position on the Adoption S-Curve (Craig 2021)

As Figure 58 shows, we are still barely into the lower stages of early majority adoption of BTC, across all populations and use cases. This implies that stablecoin adoption is further behind still, in the early adopter stage, and it will be at least 12-24 months before we see substantial uptake of stablecoins among mainstream users. This means that our survey respondents are likely more enthusiastic about the possibility of cryptocurrencies for payments than the general market is.

5.3 Prerequisites for Mass Stablecoin Payments Adoption

Our interviews with experts, combined with our background data, indicate that there are 4 key factors driving the viability of SaaPM on a mass scale:

1. **Regulatory clarity with respect to stablecoins;**
2. **Elimination of technological barriers to processing and managing stablecoin payments;**
3. **Customer willingness to pay with stablecoins;**
4. **Merchant willingness to accept stablecoins for payments;**

Factors 3 and 4 depend heavily on factors 1 and 2, and all four factors are interlinked. It is impossible to enable mass stablecoin adoption without clear regulatory frameworks in place to give both

merchants and consumers the predictability and certainty that they need in order to make long-term decisions with respect to stablecoin payments. And consumers, merchants, and payment processors will not use stablecoins for payments until and unless the technological barriers and costs associated with them are substantially reduced.

5.4 Regulatory Trends for Stablecoins

Both market participants and regulators understand that current cryptocurrency regulations are generally inadequate for the state of the market. Cryptocurrencies in general, and stablecoins in particular, are developing far faster than the existing body of regulation can keep up with them. One of the major concerns is how to audit credibility of pegs and real source of stablecoin collateral, how to avoid systemic risk.

Regulators need to issue clear directives and guidelines around what form of regulatory regime they will consider to be acceptable – whether narrow banks, as proposed in the USA, or more nuanced regulation of the form found in Europe and the UK. Either approach would provide very clear guidance to firms in the market – at present, no such real clarity exists.

This is now happening, and will continue into the foreseeable future (Section 4.5). Globally, the trend appears to be toward greater flexibility with respect to stablecoins, as regulators recognise that these cryptoassets offer value to the market. The exceptions to this trend appear to be the USA and Canada, where governments have begun attacking holders of cryptoassets for a variety of political reasons (PYMNTS 2022; Kilpatrick 2022; INVESTING 2022), and China, where private cryptocurrencies have been outright banned. Thailand has also reversed course recently with its announced ban on cryptoassets for payments (Associated Press 2022; Bank of Thailand 2022).

Regulators in the EU have issued clear directives through the MiCA and RICA frameworks to define how the EU will react to stablecoin payments. In the UK, the FCA/PRA joint statement on cryptoasset regulation has clarified the British government's existing laws, and has sharply defined the legitimate and acceptable use cases for cryptoasset payments. The UK has also very recently endorsed stablecoins for payments, in a sharp break with other countries in Europe and the USA.

Elsewhere, regulators in Asia have established clearly differentiated regulatory regimes, and either banned cryptoasset payments, or permitted them, as appropriate.

Notwithstanding the cryptoasset payments ban put in place by the Bank of Thailand, as noted previously, there is growing clarity in the market with respect to regulation of cryptocurrencies in general, and of stablecoins in particular. We anticipate that this trend will strengthen substantially once the USA settles on its own regulatory regime for stablecoins.

As Figure 7 shows, some countries are deeply hostile to stablecoins at the moment, but this may well change over time, such as the possibility of turning issuers into narrow banks in the USA (Section 4.5.2).

Also, regulators clearly now understand the need to scrutinise the asset base of issuers. While stablecoins themselves are, by definition, pegged against the value of a specific asset, the reserves held against the issued digital coins may well be volatile, as is the case with much of USDT's reserve base. Therefore, regulators will need strong assurance from issuers that their reserves can be trusted and validated.

5.5 Technological Trends in Stablecoin Markets

As noted in Section 4.7, there is very rapid technological development underway at this time to address the central issues of lack of blockchain scalability, slow transaction speeds, and lack of transparency with respect to AML/KYC/CTF issues.

Layer-1 and Layer-2 solutions already exist in the market that will allow blockchain-based technologies to rival existing payments networks at VISA and MA in terms of both speed and scale. We note that, despite some scepticism as to whether blockchains can actually perform 10-12K TPS, as MA and VISA networks currently can, we believe these claims to be credible, as at least 7 of our 33 experts have already tested transactions on the faster blockchain networks. They have confirmed, through real-world experience, that transactions can be executed in *seconds*, and at a cost of perhaps US$0.0005.

We note also that partnerships, such as that between Plaid and Circle, discussed in Section 4.12.5, show that market participants are aware of the need to observe AML/KYC/CFT regulations more closely, and are doing so in ways that bring direct benefits to customers as well as transparency to regulators.

Therefore, we believe that the technological issues that we have discussed in detail in Section 4.6 can and will be overcome over the next 12-36 months.

5.6 Probability of Mass Customer Adoption

5.6.1 Current Consumer Sentiments Regarding SaaPM Adoption

Our consumer surveys show strong interest in adopting SaaPM. Based on the data that we have received, we believe that **no more than 10%** of the general population would be willing to adopt SaaPM for online and retail payments over the next 1-3 years, for all 6 countries surveyed (US, UK, Japan, Thailand, Singapore, Sweden). We believe that consumer adoption will remain a relatively niche area for the next year or so, but will begin to accelerate as the technology, regulation, and merchant acceptance all catch up to consumer demand.

We base this on the level of enthusiasm seen in our customer survey data (Section 4.9), which show that between 10% and 80% of all consumers surveyed would be willing to use SaaPM, and many would do so within 3-6 months, IF the technology were more widely accepted by merchants, for a wide variety of retail use cases. We use the lower bound of these estimates in the interest of conservatism, given the lack of conclusive and clear data from the merchant side as to their willingness to accept stablecoin payments.

The key drivers of adoption for consumer markets are cost and cross-border settlement utility. However, given the nascent and highly experimental status of stablecoin development, it is not enough for stablecoins to be lower in cost than existing payment methods – they must be *substantially* so. Two of the payment processing experts whom we interviewed indicated that stablecoins must be a full order of magnitude (10x) faster, or cheaper, or more secure, than existing payments methods in order to be competitive. (These were the only experts who expressed this opinion – others offered no explicit opinion on the benefits multiplier needed to drive mass adoption.)

5.6.2 Root Causes of Slow Consumer Adoption

At present, stablecoins are just too expensive to use for the average consumer – in order to get the absolute best rates, a user must know which blockchain protocol to use, which wallet to use, and which particular coin to use. This all leads to a challenging user experience, and other existing methods in the market are much more straightforward and user-friendly at this time.

Adoption rates will be higher or lower in specific subsectors of the population. Among avid gamers, who skew predominantly male and younger, for instance, the adoption rate may be as high as 30%, based on our survey data and other background data (Section 4.10.3), but this represents a relatively small percentage of the overall population.

Among working women and non-urban dwellers, however, adoption rates are likely to be much lower, perhaps at most 5%. Our survey data tell us that, for these users, there is no particularly compelling reason to use stablecoins when other payment methods are just as fast, convenient, and cheap to use. Cryptocurrency payments are still simply too difficult to use for the average consumer, as both our survey data and expert analysis tell us.

5.6.3 No Significant Net Benefits to Consumers

The major problem for SaaPM is that it presents no particularly compelling or outstanding benefit to consumers, that cannot be provided by other payment methods *at this moment*. SaaPM is a rather niche area with a limited range of applications *at present*, though this is likely to change very soon.

As our survey data show (Section 4.9), the majority of consumers believe that their current debit and credit card payment methods cost them, directly, between 0 and 100bps in terms of discount margin passed on by the merchant to them. If stablecoins cannot *substantially* undercut this cost basis, and cost them perhaps 10bps of the overall purchase price of any good or service, then SaaPM adds little value or utility.

Recall also that most consumers across the countries surveyed have zero to basic understanding of cryptocurrency technology in general. This means that stablecoins have a substantial hurdle to overcome in terms of user friendliness. At present, in order to execute a stablecoin transaction, a user often has to go through several extra validation and authentication steps to allow funds to be transferred from a crypto wallet, into a blockchain transaction, and then passed through a payments network.

Exchanges and payments companies such as Bitpay are actively working with payments processors to reduce or eliminate this problem, by entering into partnerships to issue branded cards that handle these transactions seamlessly. There is still much work to do in this area.

As a result of the relatively high costs and slow transaction times, we see no substantial net benefit to consumers from using stablecoin payments *at this time* – though, again, we stress that the field is developing so quickly that this view will likely be obsolete in as little as 6 months' time.

5.6.4 Drivers of Consumer Adoption

The two key drivers of adoption are a seamless user experience, and the willingness of merchants to accept stablecoin payments. Our experts are definitive on this subject. If the payment experience with

stablecoins is truly seamless, then consumers will be willing to pay with cryptowallets – but there will be no utility to this if merchants will not accept stablecoin payments.

Merchants can also provide incentives to use stablecoins for payments, such as extra rewards points, cash bonuses, or lower minimum spending thresholds. If merchants adopt these practices, they will receive fungible tokens that can be instantly redeemed, while customers will become much more likely to adopt SaaPM. Under this scenario, we believe that customer adoption of SaaPM could be as high as **15% or more**. Merchants may do this to capture new customer segments among younger digitally savvy customer segments.

5.6.5 Testing Consumer Adoption Likelihood

The consumer survey data from Section 4.9 need to be combined with the regulatory maps from Section 4.5, the technological barriers to adoption noted in Sections 4.6 and 4.7, and the case studies in Section 4.12, to understand where adoption is most likely. The view presented above that only about 10% of consumers are likely to adopt SaaPM needs further testing. This presents a dilemma. There are only a relatively small number of countries where stablecoin payments are currently technically or legally viable on the one hand. On the other, the largest consumer payment markets in the world (USA, China, Japan, UK) either tend to be hostile to cryptocurrency payments (as is the case with the USA and China), or have relatively low levels of consumer understanding of the technology (such as Japan and the UK).

The exception appears to be Singapore, where the survey data reveal a well-informed population comfortable with using digital payments. The Singaporean MAS has an accommodative stance, at this time, toward stablecoin payments. Technologically speaking, according to a FinTech/Crypto SME based in the region, Singapore is already capable of enabling its own CBDC and therefore has much of the infrastructure required to support stablecoin payments as well as broader CBDCs. And Singapore presents a diverse set of possible use cases for online retail, e-gaming, and cross-border remittances.

Furthermore, Singapore already has an advanced payments infrastructure with a stable and well-developed retail banking system that has already invested heavily in digital and online banking, with non-bank players now entering the market to provide digital-only banking services (Forrester 2020).

These factors indicate that Singapore is a good place to start in evaluating the viability of stablecoin payments in an advanced payments market. Lessons learned from the Singapore market can then be used to test stablecoin adoption in other advanced payments markets, such as Sweden and the UK, when the necessary regulatory clarity and technological innovations are in place to make stablecoin payments more viable.

We believe that recent developments in the UK market also provide compelling reasons to assess both consumer demand for, and merchant acceptance of, stablecoin payments in the second half of 2022. In line with the UK Chancellor's recent announcement that it will permit stablecoins to be recognised as a payment method (Sephton 2022), there is now real reason to believe that the UK market for stablecoin-based payments will rapidly evolve in the near future.

However, there is as yet very little clarity as to which types of stablecoins will be accepted for payments in the UK. The Government will seek opinions in May 2022 from the industry during a

weeklong consultation (ibid), to formulate policy and regulatory frameworks around stablecoin payments. For this reason, it makes sense to lay the groundwork for assessing consumer and merchant demand for stablecoin payments during the second half of the year, once there is more clarity with respect to regulations.

The major problem confronting the UK market at present is the lack of a GBP stablecoin with substantial presence. At the time of writing, there is no GBP stablecoin of any significant size or liquidity in the market. However, with the very recent changes in regulations and the accommodative stance adopted by the Chancellor of the Exchequer, this is likely to change rapidly.

Given the speed at which this market is developing, we believe that these two central pillars – regulatory clarity, and technological solutions to known problems – will be in place within 24 months.

5.7 Drivers of Merchant Adoption

The majority of our experts suggest that merchants will drive SaaPM. The available literature suggests a few likely scenarios for merchant adoption of SaaPM, and we present them here with our analysis. Note that these scenarios are specifically aimed toward online retail merchants, as the Nuvei report points out.

5.7.1 Optimistic Scenario: 60% Adoption Rate in 10 Years

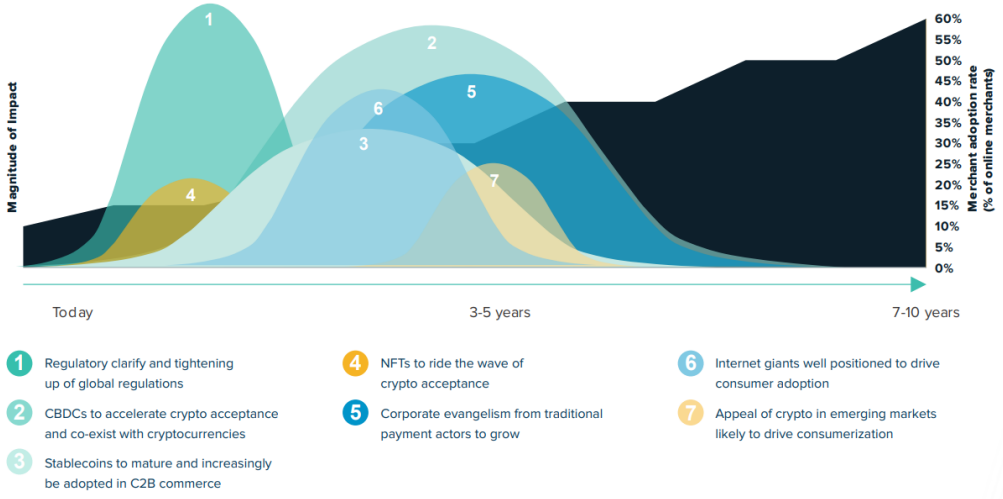

Figure 59 Optimistic Scenario of Merchant Cryptocurrency Payments Adoption (Nuvei 2022)

Under the optimistic scenario (Figure 59), a combination of clear regulatory guidance and the growth of the NFT market will generate substantial acceptance of cryptocurrencies as a payments method, to the point where at least 10% of online merchants will accept cryptos in general, and therefore stablecoins, as a payment method. The true catalyst for stablecoin acceptance will be the implementation of CBDCs on a broad scale, which will result in a 25% merchant acceptance rate of cryptocurrencies for payments, and will push stablecoins to the forefront of the payments world due to the price stability and fungibility inherently offered by stablecoins. The projection peaks at around 60% of all merchants accepting cryptocurrencies, therefore stablecoins, for payments in 7-10 years.

Based on the evidence that we have at present, digital payments will not necessarily be an outright substitute for more traditional payments, and therefore will not cannibalise payments volumes made using fiat currency (either via cards or phone apps). This is because, at present, cryptocurrencies have to be translated into fiat for settlements.

If, however, merchants and acquirers are willing to settle natively in cryptocurrency, then this will significantly alter the landscape. ***We have no firm data on when this will occur, and cannot speculate based on the current available body of evidence.***

5.7.2 Pessimistic Scenario: 12% Acceptance in 7-10 Years

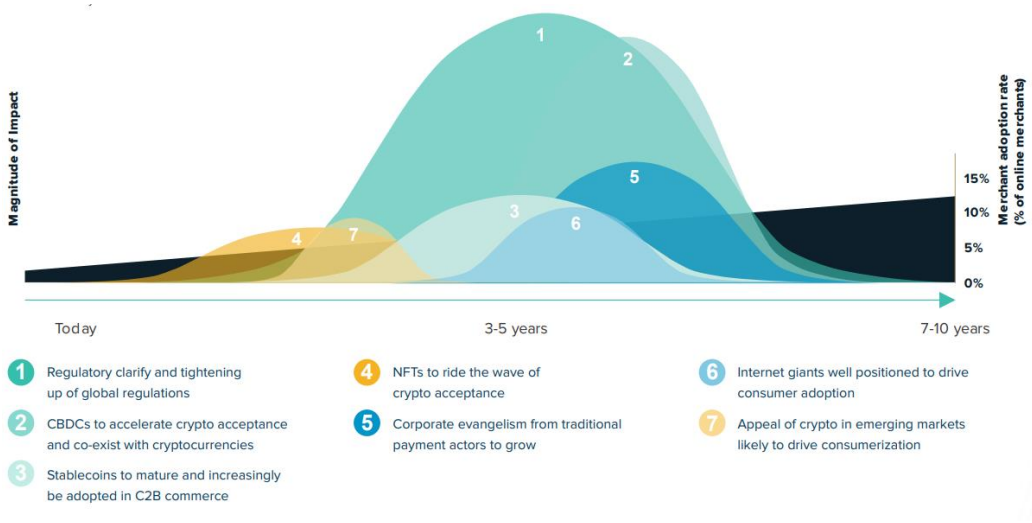

Figure 60 Pessimistic Scenario of Merchant Cryptocurrency Payments Adoption (Nuvei 2022)

Under this scenario, regulatory clarity with respect to stablecoins arrives quite late, and CBDCs do not develop into viable methods of payment for more than 5 years from the present time. The NFT trend turns out to be a bubble, and deflates quickly. Due to these failures and barriers, online merchants generally are slow to accept cryptocurrency payments, and uptake peaks at about 12%.

5.7.3 Most Likely Scenario: Our Assessment

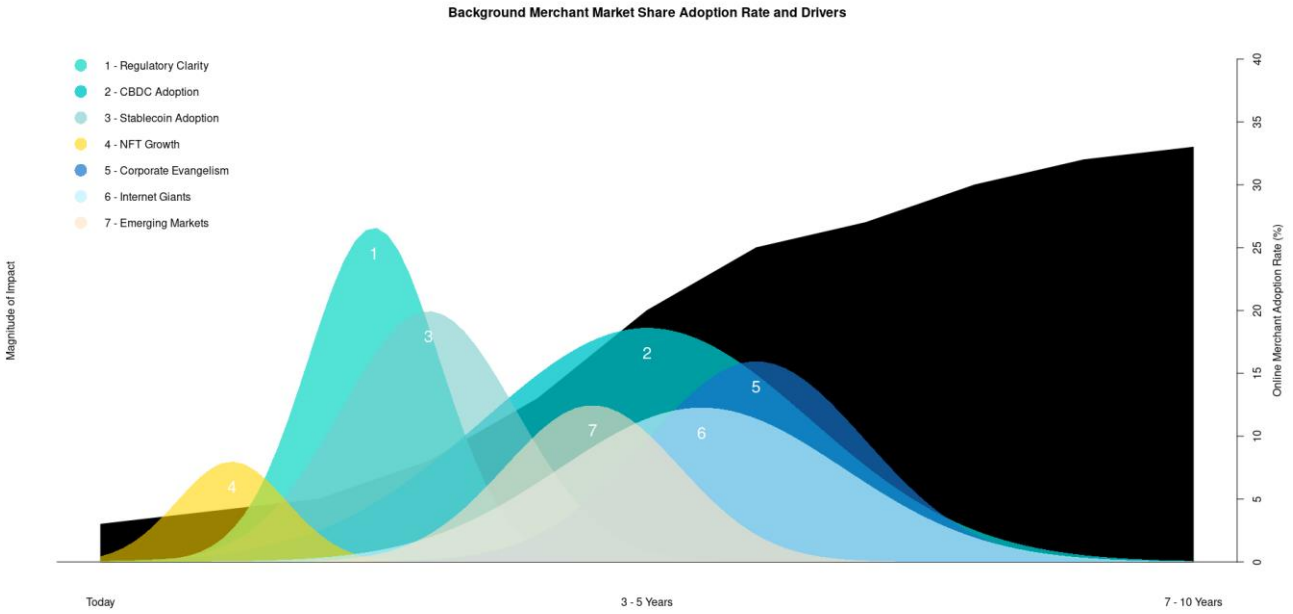

Figure 61 Assessed Realistic Projected Scenario for Crypto Payment Adoption

The two scenarios presented above are market extremes – the reality will most likely lie somewhere in between. These scenarios rely on certain projections about the values of particular variables, and those projections need to be critically analysed.

For one, it is difficult to escape the conclusion that NFTs are a serious bubble. The explosive growth rate of NFTs, combined with the fact that defining what an NFT actually *is*, tends to be quite difficult (Figure 49), underscores our view that NFTs are yet another iteration of "Dutch tulip mania", where mass hype and demand drive up the value of items with little to zero intrinsic value to entirely unreasonable levels.

Therefore, we believe that NFTs will begin to peter out as a driver of market growth in SaaPM after the next 14 months or so.

For another, CBDCs are actually very challenging to implement, and very few countries are truly looking to do so actively (Figure 15). The few that are, tend to be small, wealthy economies with highly digital-savvy populations – or, are interested in leapfrogging the retail banking system entirely and going straight to digital banking.

Several CBDC experiments have ended in failure, because the cost and complexity involved is out of all proportion to the benefit. Other nations with advanced payments infrastructures that have examined CBDCs, such as the UK, have found that they yield only incremental benefits associated with non-conventional monetary policy and digital innovation, and that other solutions can tackle the exact same problems that CBDCs are designed to address, at lower cost (Economic Affairs Committee 2022).

Therefore, we believe that CBDCs will have a relatively minimal impact on the development and growth of SaaPM, and will only begin to take off in 2-3 years' time, not immediately, as the optimistic

scenario projects, and their impact on crypto payment acceptance among merchants will be more muted.

On the plus side, there is rapidly evolving clarity with respect to stablecoin treatment, both in terms of regulations and taxation. We argue that regulatory clarity is the single most important driver of stablecoin adoption in particular, and crypto payment adoption in general.

The EU's MiCA framework explicitly treats single-currency fiat-backed stablecoins as effectively a form of e-money. The UK is likely to adopt rules that encourage innovation and provide flexibility with respect to stablecoin payments. The US remains problematic in terms of regulation, yet both Circle and Paxos have been able to establish credible and thriving stablecoins even under relatively onerous regulatory regimes. And, as mentioned repeatedly, Southeast and East Asia, particularly Singapore and Japan, have rather more accommodative stances toward transactions in fiat-backed stablecoins.

As a result of these projections, we believe that a realistic assessment of merchant acceptance of cryptocurrency payments, including stablecoins, is as follows:

- 0-12 months: **Less than 5% of online retail merchants** will accept cryptocurrencies for payments;
- 12-24 months: **Between 5% and 10% of online retail merchants** will accept cryptocurrencies for payments;
- 24-60 months: Network effects from uptake in e-commerce, online gaming and cross-border remittances will accelerate acceptance and growth of cryptocurrency payments, **approximately 20% of online retail merchants** will accept cryptocurrencies and stablecoins;
- 60 months and beyond: Uptake by internet giants, search providers, and payments networks, will drive general acceptance of crypto payments, therefore of stablecoin payments, to about 33% of online retail merchants over time;

We map out this scenario, using our own projections, in Figure 61. Given the strong correlation between volatile cryptocurrency and stablecoin usage and volumes, we believe that the same acceptance rates will therefore apply for stablecoins, specifically.

5.8 Potential Stablecoin Market Entrants

5.8.1 Companies Considering Stablecoin Launches

Of late, a number of firms have explored the possibility of launching their own stablecoins. PayPal is considering doing so (The Paypers 2022). Walmart applied for a patent for its own cryptocurrency in 2019 (Deka 2019; Newberry 2021). Both Amazon and Tesla have shown interest in launching their own stablecoins as well (Steves 2021).

There are a number of reasons for doing so. Our experts in the payments processing industry note that, from a settlements perspective, it makes sense for a payment processor to control the settlement process into and out of fiat currency, as this greatly reduces frictional and transaction costs and allows for much cheaper cross-border movements of currency.

Furthermore, the USDT and USDC examples shows how stablecoin issuers can potentially make money. Tether's well-known issues with its asset base notwithstanding, according to one of our academic experts, there is a good argument to be made for permitting Tether to take in risky assets and issue safe ones. Tether receives coupons, interest payments, and dividends from the Treasuries, corporate debt, commercial paper, money market funds, and mutual funds that form its asset base. Using these revenues, Tether then funds the issuance of stable tokens that can be redeemed 1:1 for USD. This business model provides steady, reliable cash flow at relatively low risk to Bitfinex, the parent company of Tether, and this in turn provides a model for other stablecoin issuers.

That is not to say that a Tether-like model is necessarily desirable, especially in light of strong regulatory scrutiny against Tether. Circle offers an alternative model, wherein it issues attestations of its deposit base to US regulators to show that it holds fully liquid safe deposits against issued stablecoins. In return, Circle is able to offer high-yield financial products to the market (Song 2022).

Those same yields can be used by those who own fiat-backed stablecoins, as well. Holders of scarce, in-demand, fiat-backed stablecoins, such as USDC, can earn 5-7% yields on short-maturity loans to institutional investors by lending out their stablecoin balances to those investors for their own uses in hedging.

In essence, issuing one's own stablecoin allows the issuer to control cash flow volatility, smooth out operational expenses, and make money on assets held against issued stable tokens.

5.8.2 Operational Reasons for In-House Stablecoins

From an operational perspective, it also makes sense for certain large corporations with globally distributed subsidiaries that settle inter-entity payments in a specific base currency, to issue their own stablecoin. This is because doing so allows for rapid facilitation of cash transfers between entities, and allows large merchants to eliminate intermediaries in the settlements process. Our experts speculate that this could be particularly valuable for large energy and mining companies, where the costs of paying intermediaries in local currencies can add as much as 9-10% to overall costs. For mining companies operating on thin margins, the ability to save this level of profit is a substantial benefit, and may compel such companies to adopt private stablecoins for payments.

For merchants, the benefit of using stablecoins and stable tokens is clear from the GreenBox PoS example (Figure 56), and from our expert interviews with payment processors. Merchants benefit from instantly receiving fungible tokens that they can then use elsewhere within the payments ecosystem. With more traditional payment methods, they would have to wait until the actual physical cash settles in their bank accounts, and this can take from several days to several weeks. By using stablecoins, merchants have immediate access to cash-like tokens that can be quickly and efficiently redeemed for actual fiat.

All of these factors are driving interest among large online and box-store retailers in using stablecoins.

We note further that global retail, commercial, and investment banking giant JPMorgan had implemented an in-house stable *token* in 2019 in order to reduce internal payment processing times from days to *seconds* (Hamilton 2019; BANKUS 2019). This was successful enough that JPM then sought to commercialise this for the purpose of use as a transaction method (DeLong 2020).

(The key difference between a stable *token* and a stable *coin* lies in the fact that the former requires no reserves to be held on the books against issued tokens, while the latter requires actual cash held in reserve on the balance sheet.)

This was so successful that JPM then moved to implementing a full-fledged stablecoin, traded in the open market, and which the Central Bank of Bahrain then used in conjunction with the country's Bank ABC to settle real-time payments with Aluminium Bahrain (Alba) in order to transfer USD held rapidly from accounts held at JPM (Finextra 2022).

The JPM example is an important one that demonstrates the utility of stablecoins above and beyond consumer payments. This specific banking example shows that operational improvements in cash flows, settlements, and internal transaction speeds are sufficiently compelling for large companies, as to provide impetus for the creation and adoption of an internal stable token, and eventually a currency-pegged and fully-backed digital coin.

5.8.3 The Value of First Mover Advantage

As seen first with BTC and then with USDT, the first entrant into a market for cryptocurrency, stays the market leader, by a substantial margin, for years to come, even as newer and better technologies rapidly emerge to challenge the market leader. We speculate that this is because the digital currencies market is so new, and developing so quickly, that new users and market entrants typically stick with what is best known and most popular until they become more accustomed to the market, and only then branch out to look at other alternatives.

This process appears to take years; note that, even though Ethereum is substantially more advanced in terms of a protocol than Bitcoin, the latter remains by far and away the market leader in cryptocurrency market capitalisation.

The same holds true for USDT. Despite the well-known issues with USDT's market credibility, it is still the absolutely dominant market leader in stablecoin volumes, at nearly twice the market capitalisation of its nearest competitor, USDC.

The implication for companies that launch their own stablecoins, whether within their own industry or beyond it, is that doing so confers upon them a substantial first-mover advantage

Doing so is not easy and is fraught with regulatory challenges. This course of action would also require any financial institution interested in launching its own stablecoin to hold substantial liquid reserves on its balance sheet, or create a subsidiary that could accomplish the same end. Nonetheless, the success of Circle, in particular, in staking out a market presence as a provider of payment services, a creator of financial products (such as the Circle Yield CD-like product for treasury liquidity management), and a stablecoin issuer, is instructive in this regard.

5.9 The Next Phase of Stablecoin Evolution

The explosive recent growth of stablecoins mirrors intense and growing interest in these products for the purpose of DeFi. One of our payment processing experts refers to DeFi as "not *decentralised* finance, but *personalised* finance" – that is to say, financial products and services tailored directly to the preferences of individual customers, rather than packaged by banks and financial firms for broad appeal.

As noted in Sections 4.4.3 and 4.4.4, stablecoins fit naturally into the payment mechanisms for smart contracts and DeFi applications. There is a very clear application for stablecoins in the lending market as well, because they are for all intents and purposes fully liquid currency-like assets.

There is an established and growing market for decentralised lending, in which borrowers use stablecoins as collateral to borrow against risky or volatile cryptocurrencies (Serg 2021). This form of *full-reserve lending* is likely to branch out into other lending arenas, such as for personalised loans and credit products. Under this scenario, borrowers provide collateral in stablecoins and, because they provide 100% of the collateral for the loan in a non-volatile asset, can borrow at much lower rates than in the open market.

We assess this "democratisation of finance" as a major potential change in the financial services market. Holders of stablecoins are likely to be able to qualify for credit at substantially lower rates of interest than are currently possible through existing credit card and lending products. For example, CoinRabbit offers a fixed 10% APY loan with *no* KYC requirements, in exchange for full collateral in cryptocurrencies, including stablecoins (Steenhuis 2021).

We believe that the evolution of DeFi will have significant implications for the credit and charge card markets, which may experience disruption as fully collateralised, stablecoin-backed, personalised credit products become more widespread.

6 Conclusions and Recommendations

6.1 Decision on Enabling Stablecoin-Based Payments

In our assessment, there is currently **no large-scale consumer-driven demand** for SaaPM *at this time*. The market for stablecoin-based retail and online payments in 2022-23 is likely to be less than US$4.45B in size – we believe it will be substantially smaller than this.

Our payment processing experts note that, in order for stablecoins to become competitive against existing payment solutions, they would need a "10X advantage". That is, they need to be either 10 times faster, or 10 times cheaper, or 10 times easier to use, than any of the existing solutions. At present, no stablecoin in the market holds anything like these advantages, which is a major reason why there is no compelling reason to adopt SaaPM at the mass-consumer level at this time.

We find that, at present, stablecoins cannot compete with the technological advantages and speeds of currently available methods of processing payments. Nor do stablecoins presently show a compelling reason to switch away from existing payment methods entirely – they simply complement those methods and present another way to provide payments access to younger, digitally aware consumers.

However, the situation is fluid. Blockchain technology is rapidly catching up with existing payment methods – and already has done so in some cases – and growth opportunities do exist. Consumer interest in using SaaPM is strong, as our survey data show. There are several sub-sectors of interest that will drive broader adoption of stablecoin payments. These include online gaming, e-commerce and retail, cross-border remittances, and potentially the airline travel industry. At present, the value of stablecoin payments in these industries is minimal, at best, but they all exhibit substantial growth potential over the next 1-5 years.

This means that, although SaaPM is not viable *now*, it is likely to be so in 3-5 years. **We *strongly* recommend re-examining the points raised in this report about stablecoin regulatory regimes and technological barriers in as little as 6 months' time**. This is because the market situation is evolving extremely rapidly. Already, during the duration of this project, we saw that the Thai regulatory authorities clamped down very hard on cryptoasset payments, which significantly disrupted the market and invalidated key consumer sentiments expressed in our surveys.

6.2 Testing the Market for Future Enablement

To test the market for SaaPM in a relatively stable regulatory environment with an advanced technological infrastructure for crypto payments, **we recommend that readers with interest in stablecoin payments, and with the means and willingness to test the possibility of adoption, should attempt to create test cases in Singapore**. We recommend inviting cryptocurrency users to participate in a trial involving stablecoin payments through fiat-backed stablecoins only, such as USDT, USDC, and BUSD. **Such a trial should involve at least 1,000 participants to ensure robust results**, and will yield valuable information about issues encountered, costs involved, use cases, and transaction speeds.

An initial sample size of 1,000 should be possible to achieve, given Singapore's current population of over 5.8 million (Worldometer 2022), over 4.8 million active internet users (Muller 2021), and the

fact that over 15% of active internet users in Singapore own and use cryptocurrencies (Figure 17). These combined statistics yield a potential sample size of nearly 760,000 possible users.

The data gathered from this trial can then be used to setup similar test cases in other markets, such as the UK and Sweden, at a later date when the regulatory and technological environments become more favourable.

Indeed, given the UK's recent granting of permissions for stablecoins to be used for payments, we believe that the second-best market to test the viability of SaaPM is the UK, and we believe that this proposition should be rigorously tested with surveys, focus groups, and potentially even PoC trials by payment providers in the UK market in H2 2022.

The USA and Canada, however, present quite hostile environments for SaaPM due to regulatory barriers currently in place. US regulators, in particular, have only taken a strong position on USD-backed stablecoins, but have not yet made fully clear how they intend to regulate such issuers. Until the regulatory environment becomes more clear, we cannot recommend testing stablecoin payments in the USA.

6.3 Potential Near-Term Market Growth

The market for stablecoins is still very much in its infancy, and is nearly completely dominated by just a handful of players and use cases at the moment. The technology is still maturing and developing, and it will take time and substantial effort and investment to solve the many regulatory and technological obstacles preventing stablecoins from reaching mass scale and adoption.

These obstacles are rapidly being overcome. We believe it would be wise to keep a careful watch on stablecoins, as they are already turning into a core financial product within the cryptocurrency industry. The rapid development of *Decentralised Finance*, within which stablecoins play a central role as providers of collateral and liquidity, has already disrupted the financial services industry, and will continue to do so as personalised financial products, unbundled from banks, roll out to consumers.

6.4 Creating an Internal Stablecoin

As noted earlier, payment processing competitors and large retailers alike are looking to enter the cryptocurrency arena, potentially with their own stablecoins. There are a substantial number of technological and regulatory challenges that sit in the way of doing so, as outlined above. However, the JPM Coin case illustrates that creating an internal stable token for the purpose of rapid settlements can yield internal operational efficiencies that then translate into broader business opportunities.

The major cost involved with creating an institutional stablecoin involves the capital that must be held on the balance sheet in reserve against issued tokens. This is capital that must, by definition, be essentially equivalent to cash, and must back every issued token 1:1. This capital must also be attested periodically to the relevant regulatory bodies. That is capital that could be productively employed elsewhere, which does impose an opportunity cost.

This cost can be mitigated through the yield offered by borrowers in the market for fiat-backed stablecoins, used for hedging purposes, and paid directly to holders of such coins.

Financial institutions can leverage their own brand reputations to provide safe liquid assets to institutional cryptoasset traders, in return for yield. However, we recommend moving quickly to do so, as the outsize yields of 5-7% for short-term stablecoin borrowing for trading purposes will invite strong competition from new market entrants.

7 References

airBaltic. (2021). airBaltic Bitcoin payments extended by various crypto currencies. [online]. Available from: https://www.airbaltic.com/en/airbaltic-bitcoin-payments-extended-by-various-crypto-currencies [Accessed February 22, 2022].

Alper, T. (2021). LUNA on the Rise as South Korean City Mulls Terra Stablecoin Proposal. [online]. Available from: https://cryptonews.com/news/luna-on-the-rise-as-south-korean-city-mulls-terra-stablecoin-10064.htm [Accessed February 21, 2022].

Associated Press. (2022). Thailand bans cryptocurrency payments for goods and services. *Washington Post*. [online]. Available from: https://www.washingtonpost.com/business/thailand-bans-cryptocurrency-payments-for-goods-and-services/2022/03/23/e8b6391a-aaa1-11ec-8a8e-9c6e9fc7a0de_story.html [Accessed March 29, 2022].

Bank of International Settlements. (2020a). *Central bank digital currencies: foundational principles and core features report no. 1 in a series of collaborations from a group of central banks*. [online]. Available from: https://www.bis.org/publ/othp33.pdf [Accessed March 5, 2022].

Bank of International Settlements. (2020b). Project Helvetia Phase I: Settling tokenised assets in central bank money. [online]. Available from: https://www.bis.org/publ/othp35.htm [Accessed January 17, 2022].

Bank of International Settlements. (2020c). *Project Helvetia: settling tokenised assets in central bank money*. [online]. Available from: https://www.bis.org/publ/othp35.pdf [Accessed January 17, 2022].

Bank of Thailand. (2022). Joint Press Release: BOT, SEC, and MOF to jointly set guidelines on the usage of digital assets as a means of payment for goods and services. [online]. Available from: https://www.bot.or.th:443/English/AboutBOT/Activities/Pages/JointPress_25012022.aspx [Accessed March 23, 2022].

BANKUS. (2019). JP Morgan Creates a Digital Coin. [online]. Available from: https://www.banknovelties.com/article-22.html [Accessed March 23, 2022].

Baydakova, A. (2022). Russia's Finance Ministry Opposes Central Bank Call for Crypto Ban. [online]. Available from: https://www.coindesk.com/policy/2022/01/25/russias-finance-ministry-opposes-central-bank-call-for-crypto-ban/ [Accessed February 20, 2022].

Beck, J. (2021). How Stablecoins Are Driving Decentralized Finance on Ethereum. *ConsenSys*. [online]. Available from: https://consensys.net/blog/blockchain-explained/how-stablecoins-are-driving-decentralized-finance-on-ethereum/ [Accessed March 8, 2022].

Behrens. (2021). Circle Integration with Plaid Brings Speed and Ease to Bank Verifications. [online]. Available from: https://www.circle.com/blog/circle-integration-with-plaid-brings-speed-and-ease-to-bank-verifications-1 [Accessed March 8, 2022].

Bellusci, M. (2021). Payment Services Giants See Crypto as Opportunity, Not Threat: MoffettNathanson. [online]. Available from: https://finance.yahoo.com/news/payment-services-giants-see-crypto-060133089.html [Accessed February 15, 2022].

Berry, N. (2016). The future of smart contracts in insurance | Global law firm | Norton Rose Fulbright. *https://www.nortonrosefulbright.com/en-gb/knowledge/publications/imported/2018/07/18/05*. [online]. Available from: https://www.nortonrosefulbright.com/en-gb/knowledge/publications/88244592/the-future-of-smart-contracts-in-insurance [Accessed March 23, 2022].

de Best, R. (2022a). Biggest NFT marketplaces 2021. *Statista*. [online]. Available from: https://www-statista-com.manchester.idm.oclc.org/statistics/1274843/nft-marketplaces-with-highest-volume/ [Accessed March 8, 2022].

de Best, R. (2022b). Crypto payment interest, by industry 2021. *Statista*. [online]. Available from: https://www-statista-com.manchester.idm.oclc.org/statistics/1290483/crypto-payment-acceptance-by-industry/ [Accessed March 7, 2022].

BetOnline AG. (2022). Sports Betting & Online Betting at BetOnline Sportsbook. [online]. Available from: https://www.betonline.ag/ [Accessed March 8, 2022].

Bhalla, A. (2021). What Is Polygon MATIC? How Does Polygon Work? -. [online]. Available from: https://www.blockchain-council.org/ethereum/what-is-polygon-matic-how-does-polygon-work/ [Accessed March 7, 2022].

bitinfocharts.com. (2022). XRP (XRP) statistics - Price, Blocks Count, Difficulty, Hashrate, Value. *BitInfoCharts*. [online]. Available from: https://bitinfocharts.com/xrp/ [Accessed March 11, 2022].

BitPay. (2022). BitPay: Buy Crypto Without Fees | Store, Swap & Spend Bitcoin. *BitPay*. [online]. Available from: https://bitpay.com/ [Accessed February 16, 2022].

BitRefill. (2022). Buy Gift Cards & Top Up Airtime with Bitcoin, Ethereum, USDT, Litecoin, Dash, Dogecoin. *Bitrefill*. [online]. Available from: https://127.0.0.2/?hl=en [Accessed March 4, 2022].

Blockchain Arena. (2020). Cryptocurrency On-Ramps and Off-Ramps, Explained. *Blockhain Arena*. [online]. Available from: https://blockchain-arena.com/cryptocurrency-on-ramps-and-off-ramps-explained/ [Accessed February 15, 2022].

Buterin, V. (2017). Notes on Blockchain Governance. [online]. Available from: https://vitalik.ca/general/2017/12/17/voting.html [Accessed December 7, 2021].

Buy Bitcoin Worldwide. (2022). #1 Bitcoin Price History Chart (2009, 2010 to 2022). [online]. Available from: https://www.buybitcoinworldwide.com/price/ [Accessed March 4, 2022].

CBDC Tracker. (2022). Central Bank Digital Currency (CBDC) Tracker. *Central Bank Digital Currency (CBDC) Tracker*. [online]. Available from: https://cbdctracker.org/ [Accessed February 21, 2022].

Cermak, L. (2021). The Block Research presents the 2022 Digital Asset Outlook Report. *The Block*. [online]. Available from: https://www.theblockcrypto.com/post/127723/the-block-research-2021-digital-asset-outlook-report [Accessed March 6, 2022].

CFTC. (2021). CFTC Orders Tether and Bitfinex to Pay Fines Totaling $42.5 Million | CFTC. [online]. Available from: https://www.cftc.gov/PressRoom/PressReleases/8450-21 [Accessed February 20, 2022].

Chaparro, F. (2021). Stablecoin supply grew by 388% this year, driven by DeFi and derivatives. *The Block*. [online]. Available from: https://www.theblockcrypto.com/linked/128027/stablecoin-supply-grew-by-388-this-year-driven-by-defi-and-derivatives [Accessed March 24, 2022].

Circle.com. (2021). How Blockchain Gaming Companies Can Use Stablecoins. [online]. Available from: https://www.circle.com/en/digital-dollar-stablecoin-solutions-for-gaming [Accessed March 8, 2022].

Coin98. (2022). Coin98 Insights. [online]. Available from: https://coin98.net [Accessed March 7, 2022].

CoinMarketCap. (2022). Cryptocurrency Prices, Charts And Market Capitalizations. *CoinMarketCap*. [online]. Available from: https://coinmarketcap.com/ [Accessed March 4, 2022].

Coppola, F. (2019). Tether's U.S. Dollar Peg Is No Longer Credible. *Forbes*. [online]. Available from: https://www.forbes.com/sites/francescoppola/2019/03/14/tethers-u-s-dollar-peg-is-no-longer-credible/ [Accessed December 7, 2021].

Craig, J. (2021). Where is Bitcoin in the Adoption Curve (S Curve)? - Phemex Academy. *Phemex*. [online]. Available from: https://phemex.com/blogs/crypto-bitcoin-s-curve-adoption-curve [Accessed March 8, 2022].

Crypto Gurukul. (2020). USD Coin USDC White Paper - CryptoGurukul : An open source, smart contract-based stablecoin. [online]. Available from: https://cryptogurukul.com/white-papers/usd-coin-usdc-white-paper/ [Accessed January 5, 2022].

Daley, S. (2019). 8 Key Companies Using Blockchain in Insurance to Revolutionize the Industry 2022 | Built In. [online]. Available from: https://builtin.com/blockchain/blockchain-insurance-companies [Accessed March 23, 2022].

Deka, C. (2019). Walmart might launch its own stablecoin after Facebook's Libra comes under fire. *AMBCrypto*. [online]. Available from: https://eng.ambcrypto.com/walmart-might-launch-its-own-stablecoin-after-facebooks-libra-comes-under-fire/ [Accessed March 8, 2022].

DeLong, J. (2020). JPMorgan Begins Commercial Use Of Its New Digital Coin; Creates New Unit For Blockchain Projects. [online]. Available from: https://www.digitalmarketnews.com/jpmorgan-begins-commercial-use-of-its-new-digital-coin-creates-new-unit-for-blockchain-projects/ [Accessed March 23, 2022].

DeLuca, J.V. (2022). Are Cryptocurrencies a Viable Payment Option for Airlines? *Kambr Media*. [online]. Available from: https://www.kambr.media/articles/cryptocurrencies-viable-payment-option-for-airlines [Accessed February 14, 2022].

DevelopCoins. (2022). Blockchain Consensus Algorithms & Mechanisms : Startup Guide For Beginners. [online]. Available from: https://www.developcoins.com/blockchain-consensus-algorithms [Accessed March 7, 2022].

Economic Affairs Committee. (2022). Central bank digital currencies: a solution in search of a problem? , p.52.

Edheri. (2022). Meta Is Planning to Create Its Own Cryptocurrency “Zuck Bucks”. [online]. Available from: https://atozmarkets.com/news/meta-planning-to-create-cryptocurrency/ [Accessed April 8, 2022].

Falk, T. (2018). Global crypto regulations - 2022: Where is bitcoin illegal? *finder.com*. [online]. Available from: https://www.finder.com/global-cryptocurrency-regulations [Accessed March 6, 2022].

FDIC, President’s Working Group on Financial Markets, and Office of the Comptroller of the Currency. (2021). Report on Stablecoins. *President’s Working Group on Financial Markets*, p.26.

Ferguson, K. (2020). Opinion: Wirecard debacle exposes cracks at Germany’s financial regulator | DW | 25.06.2020. *DW.COM*. [online]. Available from: https://www.dw.com/en/opinion-wirecard-debacle-exposes-cracks-at-germanys-financial-regulator/a-53942512 [Accessed March 6, 2022].

Financial Conduct Authority. (2022). Joint statement from UK financial regulatory authorities on sanctions and the cryptoasset sector. *FCA*. [online]. Available from: https://www.fca.org.uk/news/statements/uk-financial-regulatory-authorities-sanctions-cryptoasset-sector [Accessed March 23, 2022].

Finextra. (2022). Bahrain central bank trials JPM Coin. *Finextra Research*. [online]. Available from: https://www.finextra.com/newsarticle/39473/bahrain-central-bank-trials-jpm-coin [Accessed March 29, 2022].

Flynn, J. (2021). Airline Industry Statistics [2022]: 28 Facts To Know Before You Fly – Zippia. [online]. Available from: https://www.zippia.com/advice/airline-industry-statistics/ [Accessed March 8, 2022].

Forrester. (2020). Singapore’s New Digital Banks Will Change The Banking Landscape Forever, Maybe. *Forbes*. [online]. Available from: https://www.forbes.com/sites/forrester/2020/12/11/singapores-new-digital-banks-will-change-the-banking-landscape-forever-maybe/ [Accessed March 29, 2022].

Frankenfield, J., Rasure, E. and Clarine, S. (2021). Ripple. *Investopedia*. [online]. Available from: https://www.investopedia.com/terms/r/ripple-cryptocurrency.asp [Accessed March 13, 2022].

Frost & Sullivan. (2020). Blockchain: Regulating the New Economy.

Hamilton, A. (2019). JP Morgan creates crypto for international settlements » PaymentEye. [online]. Available from: https://www.paymenteye.com/2019/02/15/jp-morgan-creates-crypto-for-international-settlements/ [Accessed March 23, 2022].

Harper, C. (2019). Tether Partly Backed by Bitcoin, Court Transcription Reveals. *Bitcoin Magazine: Bitcoin News, Articles, Charts, and Guides*. [online]. Available from: https://bitcoinmagazine.com/culture/tether-partly-backed-bitcoin-court-transcription-reveals [Accessed December 7, 2021].

Hayes, A., Mansa, J. and Clarine, S. (2022). What Is Stablecoin? *Investopedia*. [online]. Available from: https://www.investopedia.com/terms/s/stablecoin.asp [Accessed March 4, 2022].

Heath, A. (2022). Zuckerberg's dream of launching a cryptocurrency is officially over. *The Verge*. [online]. Available from: https://www.theverge.com/2022/1/31/22911426/meta-diem-cryptocurrency-confirms-sale [Accessed March 4, 2022].

Helms, K. (2021). Many Major Airlines Can Now Accept Cryptocurrencies via UATP Global Payment Network – Featured Bitcoin News. *Bitcoin News*. [online]. Available from: https://news.bitcoin.com/many-major-airlines-can-now-accept-cryptocurrencies-via-uatp-global-payment-network/ [Accessed February 22, 2022].

Herdera Hashgraph LLC. (2022). What is a stablecoin? *Hedera*. [online]. Available from: https://www.hedera.com/learning/what-is-a-stablecoin [Accessed March 4, 2022].

INVESTING. (2022). Trudeau's Government Warns More Accounts Will Be Frozen — Freedom Convoy Truckers Hold Their Ground – Featured Bitcoin News - NewsEverything. [online]. Available from: https://investing.newseverything.in/trudeaus-government-warns-more-accounts-will-be-frozen-freedom-convoy-truckers-hold-their-ground-featured-bitcoin-news-newseverything/ [Accessed March 12, 2022].

Iredale, G. (2021). What are the Different Types of Stablecoins? *101 Blockchains*. [online]. Available from: https://101blockchains.com/types-of-stablecoins/ [Accessed March 4, 2022].

Kelly, J. (2021). Tether says its reserves are backed by cash to the tune of . . . 2.9%. *Financial Times*. [online]. Available from: https://www.ft.com/content/529eb4e6-796a-4e81-8064-5967bbe3b4d9 [Accessed December 7, 2021].

Ken Research. (2018). Russia International Remittance Market is Estimated to Grow With a Projected Increase in the Remittance Flows to USD 68 billion by the Year 2021: Ken Research. [online]. Available from: https://www.prnewswire.com/news-releases/russia-international-remittance-market-is-estimated-to-grow-with-a-projected-increase-in-the-remittance-flows-to-usd-68-billion-by-the-year-2021-ken-research-673771613.html [Accessed March 24, 2022].

Kilpatrick, M. (2022). EU, US trying to ensure Russia can't use cryptocurrencies to avoid sanctions. *Newshub*. [online]. Available from: https://www.newshub.co.nz/home/technology/2022/03/eu-us-trying-to-ensure-russia-can-t-use-cryptocurrencies-to-avoid-sanctions.html [Accessed March 12, 2022].

Koffman, T. (2020). Stablecoins And The Future Of Gaming. *Forbes*. [online]. Available from: https://www.forbes.com/sites/tatianakoffman/2021/12/28/stablecoins-and-the-future-of-gaming/ [Accessed March 14, 2022].

Laycock, R. (2021). Finder Cryptocurrency Adoption Index. *finder.com*. [online]. Available from: https://www.finder.com/finder-cryptocurrency-adoption-index [Accessed March 7, 2022].

Liebkind, J. (2019). What is Plasma and How Will It Strengthen the Ethereum Blockchain? *Investopedia*. [online]. Available from: https://www.investopedia.com/news/what-plasma-and-how-will-it-strengthen-ethereum-blockchain/ [Accessed March 7, 2022].

Lyons, K. (2021). China's central bank bans cryptocurrency transactions to avoid 'risks'. *The Verge*. [online]. Available from: https://www.theverge.com/2021/9/24/22691472/china-central-bank-cryptocurrency-illegal-bitcoin [Accessed March 5, 2022].

MakerDAO. (2020). » Let's Play: Introducing Maker's Dai Gaming Initiative. [online]. Available from: https://blog.makerdao.com/dai-gaming-initiative/ [Accessed March 8, 2022].

McIntyre, D. (2021). The layers of the blockchain industry stack. *Etherplan*. [online]. Available from: https://etherplan.com/gallery/the-layers-of-the-blockchain-industry-stack-2/ [Accessed March 7, 2022].

Mearian, L. (2019). 10 top distributed apps (dApps) for blockchain. *Computerworld*. [online]. Available from: https://www.computerworld.com/article/3510457/10-top-distributed-apps-dapps-for-blockchain.html [Accessed March 23, 2022].

Morris, D.Z. (2022). Reflecting on Facebook's Hilarious, Well-Deserved Crypto Failure. [online]. Available from: https://www.coindesk.com/layer2/2022/01/28/reflecting-on-facebooks-hilarious-well-deserved-crypto-failure/ [Accessed March 4, 2022].

Muller, J. (2021). Topic: Internet usage in Singapore. *Statista*. [online]. Available from: https://www.statista.com/topics/5852/internet-usage-in-singapore/ [Accessed March 29, 2022].

Nag, O.S. (2018). Countries Leading the World in Cashless Transactions. *WorldAtlas*. [online]. Available from: https://www.worldatlas.com/articles/which-are-the-world-s-most-cashless-countries.html [Accessed March 23, 2022].

Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. , p.9.

Newberry, E. (2021). Will Walmart Move Into Crypto? *The Motley Fool*. [online]. Available from: https://www.fool.com/the-ascent/cryptocurrency/articles/will-walmart-move-into-crypto/ [Accessed March 8, 2022].

Newegg. (2021). Using Crypto on Newegg. *Newegg Knowledge Base*. [online]. Available from: https://kb.newegg.com/knowledge-base/using-crypto-on-newegg/ [Accessed March 4, 2022].

Norrestad, F. (2021). NFTs: sales volume by segment last 30 days 2021. *Statista*. [online]. Available from: https://www-statista-com.manchester.idm.oclc.org/statistics/1275871/nft-sales-volume-by-segment-last-30-days/ [Accessed March 7, 2022].

Nuvei. (2022). Nuvei | Payment Technology Partner. [online]. Available from: https://try.nuvei.com/cwp01/?utm_source=The_Paypers&utm_medium=Website_Banner&utm_campaign=Crypto_WP [Accessed March 4, 2022].

NYK Line. (2021a). Diversity & Inclusion. *NYK Line*. [online]. Available from: https://www.nyk.com/english/esg/social/diversity/ [Accessed March 8, 2022].

NYK Line. (2021b). Marubeni, NYK, and TDG Agree on Joint Promotion of Electronic Money Platform Business for Seafarers. *NYK Line*. [online]. Available from: https://www.nyk.com/english/news/2021/20210621_01.html [Accessed March 8, 2022].

NYK Line. (2021c). NYK Begins Payment of Seafarers' Salaries in Digital Currency. *NYK Line*. [online]. Available from: https://www.nyk.com/english/news/2021/20210610_02.html [Accessed March 8, 2022].

NYK Line. (2022). NYK Line. *NYK Line*. [online]. Available from: https://www.nyk.com/english/ [Accessed March 8, 2022].

Ogwu, O. (2020). What is Ethereum 2.0? *Coinspeaker*. [online]. Available from: https://www.coinspeaker.com/guides/what-is-ethereum-2-0/ [Accessed March 7, 2022].

Ononeme, S. (2020). What is Central Bank Digital Currency (CBDC)? Everything You Need to Know. *AtoZ Markets - Forex News & Trading Tools*. [online]. Available from: https://atozmarkets.com/news/what-is-central-bank-digital-currency-cbdc/ [Accessed February 20, 2022].

Paysend. (2019). Paysend launches stablecoin on Stellar Network. *Finextra Research*. [online]. Available from: https://www.finextra.com/pressarticle/78360/paysend-launches-stablecoin-on-stellar-network [Accessed April 8, 2022].

Phan, Q. (2022). Ethereum Ecosystem: The Birth Of A New Financial System. [online]. Available from: https://coin98.net/https:://coin98.net/ethereum-ecosystem [Accessed March 7, 2022].

Prasanna. (2019). Blockchain Trilemma: Explained. *CryptoTicker*. [online]. Available from: https://cryptoticker.io/en/blockchain-trilemma-explained/ [Accessed March 6, 2022].

Prat, J., Dié, N. and Michau, J.-B. (2020). Helicopter Money and CBDCs: Are DLT the perfect infrastructure for monetary policies in time of crisis? , p.5.

PYMNTS. (2022). Fed Chairman, US Reps Call for Crypto Regs. [online]. Available from: https://www.pymnts.com/cryptocurrency/2022/fed-chairman-us-reps-call-for-crypto-regs-to-stop-russia-from-avoiding-sanctions/ [Accessed March 12, 2022].

PYMNTS. (2021). MiCA Framework to Govern EU Stablecoin Issuance. [online]. Available from: https://www.pymnts.com/news/regulation/2021/mica-framework-seeks-to-govern-stablecoin-issuance-in-eu/ [Accessed January 20, 2022].

Reijers, W. et al. (2018). Now the Code Runs Itself: On-Chain and Off-Chain Governance of Blockchain Technologies. *Topoi*, (37), p.23.

Research and Markets ltd. (2022). Remittance - Research and Markets. [online]. Available from: https://www.researchandmarkets.com/issues/remittance-payments-to-ukraine [Accessed March 24, 2022].

Sanchez, L. (2021). Blockchain Layers Explained: What Are They and Why Do We Need Layer Solutions? *ZyCrypto*. [online]. Available from: https://zycrypto.com/blockchain-layers-explained-what-are-they-and-why-do-we-need-layer-solutions/ [Accessed March 7, 2022].

Secular Growth Stories. (2021). GreenBox POS (GBOX): Payment Processing With Blockchain Tech | Seeking Alpha. [online]. Available from: https://seekingalpha.com/article/4416783-greenbox-pos-blockchain-stablecoin-payment-processing-impact, https://seekingalpha.com/article/4416783-greenbox-pos-blockchain-stablecoin-payment-processing-impact [Accessed February 20, 2022].

Sephton, C. (2022). U.K. to Make Stablecoins a Recognized Payment Method, Relax Crypto Rules, and Release NFT | CoinMarketCap. *CoinMarketCap Alexandria*. [online]. Available from: https://coinmarketcap.com/alexandria/article/u-k-to-make-stablecoins-a-recognized-payment-method-relax-crypto-rules-and-release-nft [Accessed April 8, 2022].

Serg. (2021). DeFi Loans, Stablecoins, And A Whole Lot of Cryptocurrency | HackerNoon. [online]. Available from: https://hackernoon.com/defi-loans-stablecoins-and-a-whole-lot-of-cryptocurrency-964o3374 [Accessed March 30, 2022].

Seth, S., Khartit, K. and Jasperson, H.D. (2022). How the SWIFT System Works. *Investopedia*. [online]. Available from: https://www.investopedia.com/articles/personal-finance/050515/how-swift-system-works.asp [Accessed March 11, 2022].

Smith, R. (2018). A Beginners Guide to the OTC Markets of Crypto. *CoinCentral*. [online]. Available from: https://coincentral.com/a-beginners-guide-to-otc-markets-in-crypto/ [Accessed February 15, 2022].

Sokolov, M. (2021). Are Libra, Tether, MakerDAO and Paxos Issuing E-Money? Analysis of 9 Stablecoin Types Under the EU and UK E-Money Frameworks. *SSRN Electronic Journal*. [online]. Available from: https://www.academia.edu/46638039/Are_Libra_Tether_MakerDAO_and_Paxos_issuing_e_money_Analysis_of_9_stablecoin_types_under_the_EU_and_UK_e_money_frameworks [Accessed January 5, 2022].

Song, A. (2022). How Ramp's early adoption of stablecoins increased our Corporate Treasury returns. [online]. Available from: https://ramp.com/blog/how-stablecoins-increased-our-corporate-treasury-returns [Accessed February 12, 2022].

Steenhuis, J. (2021). 12 Best places to stake Stablecoins(Earn Interest). *Create & Release*. [online]. Available from: https://releaseyourdigitaltalent.com/where-to-stake-stablecoins/ [Accessed March 30, 2022].

Steves, R. (2021). Is Amazon About to Announce a Proprietary Cryptocurrency Project? *FinanceFeeds*. [online]. Available from: https://financefeeds.com/is-amazon-about-to-announce-a-proprietary-cryptocurrency-project/ [Accessed March 8, 2022].

Tassev, L. (2020). Digital Remittances Reach Record of $96 Billion YoY, High Fees Open Door for Cryptocurrencies – Fintech Bitcoin News. *Bitcoin News*. [online]. Available from: https://news.bitcoin.com/digital-remittances-reach-96-billion/ [Accessed March 7, 2022].

Team Circle. (2021). How to Earn Yield on USDC: Inside Circle Yield. [online]. Available from: https://www.circle.com/blog/earning-yield-on-usdc-the-complete-guide-to-high-yield-digital-dollar-accounts [Accessed March 23, 2022].

Tether Corp. (2017). Tether whitepaper - whitepaper.io. [online]. Available from: https://whitepaper.io/document/6/tether-whitepaper [Accessed January 5, 2022].

The Block. (2022). Stablecoin Volumes. [online]. Available from: https://www.theblockcrypto.com/data/decentralized-finance/stablecoins [Accessed November 14, 2021].

The Paypers. (2022). PayPal explores launch of own stablecoin. [online]. Available from: https://thepaypers.com/cryptocurrencies/paypal-explores-launch-of-own-stablecoin--1253809 [Accessed January 11, 2022].

The Stellar Development Foundation. (2022). Okcoin Becomes First U.S. Exchange to Integrate Stellar USDC. [online]. Available from: https://www.prnewswire.com/news-releases/okcoin-becomes-first-us-exchange-to-integrate-stellar-usdc-301479320.html [Accessed February 20, 2022].

The World Bank. (2021a). Remittance Flows Register Robust 7.3 Percent Growth in 2021. *World Bank*. [online]. Available from: https://www.worldbank.org/en/news/press-release/2021/11/17/remittance-flows-register-robust-7-3-percent-growth-in-2021 [Accessed March 4, 2022].

The World Bank. (2021b). Remittance Prices Worldwide Quarterly. [online]. Available from: https://remittanceprices.worldbank.org/sites/default/files/rpw_main_report_and_annex_q321.pdf [Accessed March 4, 2022].

Thurman, A. (2022). Axie Infinity's Gaming Sidechain Is Bigger Than Many Major Layer 1s by Volume: Nansen. [online]. Available from: https://www.coindesk.com/tech/2022/01/11/axie-infinitys-gaming-sidechain-is-bigger-than-many-major-l1s-by-volume-nansen-report/ [Accessed March 8, 2022].

Tiwana, A., Konsynski, B. and Bush, A.A. (2010). Research Commentary—Platform Evolution: Coevolution of Platform Architecture, Governance, and Environmental Dynamics. *Information Systems Research*, 21(4), pp.675–687.

TripleA. (2021). Crypto Ownership Data for Gaming Industry 2021. *TripleA*. [online]. Available from: https://triple-a.io/crypto-gaming-industry/ [Accessed March 7, 2022].

Tuttle, R. (2021). Analysis | Passport. [online]. Available from: https://www-portal-euromonitor-com.manchester.idm.oclc.org/portal/Analysis/Tab [Accessed November 15, 2021].

Vardai, tan. (2022). What is OpenSea NFT marketplace and how did it get so big? [online]. Available from: https://forkast.news/what-is-opensea-nft-marketplace/ [Accessed March 14, 2022].

Werbach, K. (2018). Trust, but Verify: Why the Blockchain Needs the Law. [online]. Available from: https://lawcat.berkeley.edu/record/1128548 [Accessed December 4, 2021].

Willett, J.R. (2012). The Second Bitcoin Whitepaper. [online]. Available from: http://cryptochainuni.com/wp-content/uploads/Mastercoin-2nd-Bitcoin-Whitepaper.pdf [Accessed March 4, 2022].

Wirex Team. (2020). 2021: The Year of Crypto? *Crypto-Friendly Currency Accounts*. [online]. Available from: https://wirexapp.com/ [Accessed February 20, 2022].

World Population Review. (2022). Population by Continent 2022. [online]. Available from: https://worldpopulationreview.com/continents [Accessed March 14, 2022].

Worldometer. (2022). Singapore Population (2022) - Worldometer. [online]. Available from: https://www.worldometers.info/world-population/singapore-population/ [Accessed March 29, 2022].

Zachariadis, M., Hileman, G. and Scott, S.V. (2019). Governance and control in distributed ledgers: Understanding the challenges facing blockchain technology in financial services. *Information and Organization*, 29(2), pp.105–117.

Zafar, T. (2021). Here's Why El Salvador Made Bitcoin a Legal Tender. [online]. Available from: https://sg.finance.yahoo.com/news/why-el-salvador-made-bitcoin-042051702.html [Accessed March 13, 2022].

Zandt, F. (2022). Infographic: Game Over for Crypto And NFTs in Games? *Statista Infographics*. [online]. Available from: https://www-statista-com.manchester.idm.oclc.org/chart/26655/interest-of-video-game-studios-in-implementing-crypto-payments-and-nfts/ [Accessed March 8, 2022].

8 Appendices

8.1 Full Details of Thematic Analysis

THEME	DESCRIPTION
Subcategories	*Interview Insights*
Transparency	• Full visibility of transaction on the blockchain
Cost & Time reduction	• Reduction of cost and processing time for international money transfer (see additionally cross-border transactions & remittances in Table 15 TA)
Absence of counterparties	• Elimination of needs for intermediaries
Efficiency	• Stablecoins benefit from cryptocurrencies and blockchain advantage of being more efficient than existing payment solutions
Lack of trust in local fiat currency	• Volatility and inflation of local fiat currencies drive people to use stablecoins (see additionally section other insights in Table 15 TA)
Lack of volatility and ability being easily converted to fiat currencies	• Elimination of cryptocurrencies high volatility and opportunity to being easily translated into fiat currencies are the biggest advantages of stablecoins (see section cryptocurrencies trading, hedging and storing value in Table 15 TA)

Table 9 TA: Drivers for Stablecoins Adoption

THEME	DESCRIPTION
Subcategories	*Interview Insights*
Blockchain trilemma	• "Blockchain trilemma" is related to trade-offs between decentralisation, scalability, and security • Current infrastructure does not permit large-volume transaction. • Blockchain transaction are very slow relative to standard payments network • There is security issue involved • None of blockchain is truly democratised • Solutions to tackle blockchain trilemma is rapidly developing (see additionally Table 12 TA)
Credibility	• Public concern regarding pegs' creditability, liquidity, and accountability
Fees involved	• Fees varies on blockchains and generally depends on amount of executed code, information proceeded and prioritisation of transactions • Fees paid on Ethereum called "gas" fees • Fees are high for mass adoption but beneficial if transaction involves large amount of money
Regulation	• Lack of clarity regarding legal characteristics (money vs assets) and its tax implication prevent mass adoptions • Two-side process: regulation is driven in changes in technology and infrastructure AND vice versa • Difference in regulation development of supply and demand side • There is no consolidated direction among countries (see additionally Table 11 TA)
Merchants' & consumers' perspective	• Lack of awareness, technology, and regulatory understanding • Lack if understandable solutions which make user experience seamless • Lack of blockchain agnostic solutions • In some regions there is problem with accessibility due to capabilities of end-user's devices • Stability of pegs is important factor to successful adoption • There is no useful non-USD stablecoins. Lack of stablecoins' variety • Lack of trust in blockchain • Lack of steps to promote cryptocurrencies from merchants' side

	• Speed problem is not an issue from consumers' and merchants' perspective • Privacy concerns • Lack of centralised organisation which responsible for dealing with consumers' problems • Concerns regarding energy consumption, its cost and associated sustainability problems
Other	• Absence of field experts as a barrier for implementation on scale

Table 10 TA: Barriers for Mass Adoption of Stablecoins

THEME	**DESCRIPTION**
Subcategories	*Interview Insights*
Overall trends	• There is no uniform view on legal characteristic of stablecoins (money vs assets). As a result of it, there is no clarity regarding taxation of stablecoins' transactions (see additionally other sections of this table and Table 10 TA) • Legal classification of stablecoins' issuers is required • AML, fraud prevention and audit regulation are required (see additionally other sections of this table) • There are no universal regulatory approaches across countries. Differences in approaches arise from differences in financial systems and counties' national interests. However, US-approach may influence on broader market • Needs for regulation which will not block innovations • Collaboration and synchronised action are necessary to address challenges imposed by crypto adoption
Legal characteristic & Taxation	• Taxation problem of stablecoins transaction rise from uncertainty regarding stablecoins legal characteristics (money vs assets). However, generally type of stablecoins determine legal classifications • Questions regarding appropriate level of anonymity which make taxation procedures possible
Systemic and Financial risk	• Request for regulations which can help to lower systemic risk and avoid problem with liquidity • Request for audit procedure which can increase transparency and credibility of pegs
AML, frauds, cybersecurity	• AML, fraud prevention and cybersecurity regulation are required
EU approach	• Views among European regulators are unharmonized and affected by fears of creation additional payment system which will lock out the euro • EU approach (MiCA Framework): Stablecoins pegged to single curremcies are considered as e-money. Stablecoins pegged by other cryprocurrencies, baskets of currencies or commodities are considered as digital assets and therefore subject of taxation. • EU consideration of e-money licenses for stablecoins' issuers. Holding significant reserves are necessary for fiat-backed stablecoins' issuers
UK approach	• The UK is only on consultation stage, however, aim to be leader of financial innovation • The friendliest regulatory environment in the UK is the Isle of Man. • Building trust with regulators are essential for fintech business development
US approach	• US has blanked approach without consideration of stablecoins' types • Direction to push stablecoins' issuers under banks' regulations • Cryptocurrencies are treated as assets with taxation imposed on capital gains • Concerns regarding credibility of pegs, systemic risks involved, potential damage to US monetary system and US$ as global reserve currency • Request for KYC regulation and regulation around security
China approach	• Ban on cryptocurrencies to keep government control over monetary system

	• China banking system skipped retail banking stage and went directly to digital banking
Japan approach	• Development of new regulatory framework to treat cryptocurrencies as assets • Regulatory ambiguity regarding stablecoins • Necessity to comply with ALM and KYC requirement for crypto intermediaries • Necessity to have single point of contact among regulators to move regulation forward • Nowadays regulators do not see any systemic risk due to lack of significant increase in use cases
Canada	• Strick crypto regulation • No one is interested in Canada because major innovation and regulatory changes happens in US and Asia
Singapore	• Cryptocurrencies are considered as a digital payment token • To offer crypto services payment service licence are required • Regulators do not trust USDC/USDT
Thailand	• Cryptocurrencies are considered as assets but there is a view that stablecoins are in sub-category which should be treated as e-money • There are a lot of solutions for money transfer in the market. Central Bank keen on lowering fees for transactions
Regulatory pressure and potential for adoption	• Expert views on region with the most regulatory pressure/friendless have some contradictions • Conservatism prevent Europe to rapidly develop regulations for stablecoins • The biggest potential for stablecoins adoption (in term of friendliness of regulation) lies in Switzerland, Hong Kong and Singapore

Table 11 TA: Regulatory Environment and Risks Involved in SaaPM

THEME	**DESCRIPTION**
Subcategories	*Interview Insights*
Scaling solutions	• It is matter of time of solving "blockchain trilemma" • There are a lot of scaling solutions and projects (e.g. Rollups and ZK Rollups, Polygon, Solana, Polkadot, sharding project and Avalanche blockchain) • Most of scaling solutions are off-chain (side-chain) based. Transactions are built in single one at side chain and brought to execution in one smart contract
Consensus algorithm: Proof of stake	• PoS is consensus algorithm which depends how much cryptocurrency miners are ready to lock up • There is different views whether PoS might solve speed problems. Some says that PoS does not aim to solve speed problem because speed problem is block size problem. Others says that PoS might contribute to solving speed problem in expense of decentralisation
Consensus algorithm: Proof of work	• PoW is consensus algorithm based on computation power available to miners
Other	• There are smart contract based blockchains (Elano and Cardano) which maybe suitable for stablecoins development

Table 12 TA: Consensus Algorithms and Solutions to Blockchain Trilemma

THEME	**DESCRIPTION**
Subcategories	*Interview Insights*
Collateralized Stablecoin	• Backed by actual reserves of the underlying asset, for which the token can be redeemed. Collateral can be a single fiat currency (e.g. USD-backed coins such as Tether, Binance, USDCoin), a basket of currencies, commodities (e.g. Tether Gold, Paxos), or even cryptocurrency.

	• Collateralized stablecoins' sub-categories:
	  o Single-Currency Coins are linked to one underlying currency, e.g. USD, GBP, INR, or even a cryptocurrency, e.g. DAI (backed by Bitcoin)
	  o Basket-Currency Coins are linked to a full basket of currencies, e.g. Saga
	  o Commodity-backed Coins are redeemable against some quantity of gold, oil, silver, platinum, etc. (e.g. Paxos, Tether Gold, Petro)

Non-Collateralized Stablecoin	• Known as algorithmic stablecoins. Total supply is controlled by an algorithm
Tether (USDT)	• USDT runs on Ethereum blockchain • It benefited from first mover advantage • There is a view that USDT is the most efficient stablecoin and can use other chains • It has experienced issue related to credibility of pegs
USDC	• There is a view that USDC may be considered as a credible coin

Table 13 TA: Views on Stablecoin Types and Issuers

THEME	DESCRIPTION
Subcategories	*Interview Insights*
Infrastructure	• Outdated technology on payment processor and acquirer side is a barrier for adding blockchain capabilities into existing network
Opportunities for payment processors	• Facilitate transactions leveraging own network and guaranteeing trust • Cut acquirers (like WorldPay) out of the loop and charge fees directly to merchants • Use stablecoins to real time settlements • Get involved in lending • Issue own stablecoins
Go away scenario	• Go away scenario under pure CBDC model
Other views	• There is a place for payment processors in case of synthetic CBDC adoption (public-private partnership) • Cut in fees as a first response for stablecoins mass adoptin. Payment providers which have trusted network will not go away in near future due to newness technology to the market • Wide adoption of stablecoins/CBDC will require change in value proposition from payment processors' side

Table 14 TA: Payment Processors within SaaPM Environment

THEME	**DESCRIPTION**
Subcategories	*Interview Insights*
Market in next 3-5 years and potential markets	• ~max 1% of current payment market • There is a view that stablecoins adoption growth rate could follow bitcoin adoption growth rate • Market for stablecoins is in developing world because stabelcoins allow developing countries jump directly to digital baking stage • B2B/B2C use cases vary depending on countries. There are opinions that B2B will be first adopters due to lack of interest from consumer's side. However, some points out on existing demand from consumers' side • Banks issuing stablecoins potentially can be driver for their mass adoption • Merchants can be considered as driver for stablecoins' mass adoption

	• Stablecoins' adoption depends on adoption of blockchain technologies in general
Profile of earlier adopters	• Young digital native generation aged between 20 and 45 • Stablecoins issued by banks will be adopted by customers of banks • There is correlation between holding stablecoins and being crypto traders, so crypto traders as earlier stablecoins adopters
Cross-border payments & remittances	• Major current use case and this trend will continue in future • Stablecoins cross-borader payment & remittances transactions can be done with much lower fees and processing time • Absence of political and regulatory consensus across the world is considered as major barrier for stablecoins' and CBDC' cross-border payments& remittances • Questions whether underlying stablecoins fiat money can be spent in destination of cross-border transactions. There are also needs for physical infrastructure from consumers' perspective
E-commerce	• E-commerce might be first adopters of stablecoins payments
Retail payment	• Small retail businesses can be earlier adopters due to agile nature of such businesses. For large organisation cost of reorganising infrastructure is high • Retailers and industries which accept rewards points as payments may adopt stabelcoins payments
Restaurants & Hotels	• There are use cases of accepting cryptocurrencies in Indian restaurants. There is view that stablecoins can be accepted as well. • Hotels can benefit from stablecoins acceptance by reduction level of fraud and chargebacks.
Gaming	• Online gaming platforms have started to accept cryptocurrencies (including stablecoins) and this trend will continue
Banks, Investment firms, DeFi organisations and Insurance	• Institutions (banks, investments firms, DeFi organisations and insurance companies) might be first stablecoins adopters • Opportunity for bank and DeFi organization to build portfolio of products and reach unbanked population. Stablecoins facilitate borrowing using margin accounts and lending on top of tokens, provide opportunities for Digitised stocks and security tokens. • Opportunity for banks to issue stablecoins • Significant network is required to scale effectively B2B transactions among financial institutions. • Small and mid-size banks drive innovations in industry
Cryptocurrencies trading, hedging and storing value	• Cryptocurrencies trading and hedging are main current use cases
Metaverse	• Metaverse provides opportunity for stablecoins due to "the need for means of transaction within that world"
Narrow Bank	• Stablecoins may find implication in Narrow Bank
Paying salary in stablecoins	• Paying in stablecoins might reduce costs involved
No mainstream future in 1-3 years	• There is no real gap in payments' system that can be filled by stablecoins. • Volatility is the reason why people attracted by cryptocurrencies
Other insights	• Crypto payments are not real cryptocurrencies' payment. In this payments conversion to fit currencies is involved • Volatility of fiat currencies and hyperinflation force people to use cryptocurrencies even if it banned • Stablecoins are the bridge between real and digital economies • Utility payments can be potential use case in future • Mitsubishi is launching its stablecoin

Table 15 TA: Stablecoin Market & Use Cases

THEME	DESCRIPTION

Subcategories	*Interview Insights*
CBDC	• Governments and central banks prepare to step in case of CBDC market existence. There is a view that CBDC advantages in comparison with other forms of digital money is unclear • Target market for CBDC: small wealthy countries with high level of digital penetration (e.g. Sweden) • CBDCs works badly in fragmented market with a rich retail banking history • There are questions regarding CBDCs' design. Keeping government control is under government control is key element of some CBDCs' initiatives • Privacy and scalability are major concern • Reasons for CBDCs: international politics, reach unbanked population and to make control of monetary policy easy • Lack of knowledge regarding technology holding back CBDCs initiatives
No for coexistence of stablecoins and CBDCs	• Elimination of needs for private stablecoins • Promotion CBDCs by regulators make them more probable to be widely adopted
Yes for coexistence stablecoins and CBDCs	• Coexistence potential determined by demand for decentralisation and alternative to the government-base system • There is a view that private stablecoin can be gateways for CBDCs • There is a view that CBDC can be a driver for private stablecoins • There is a view that coexistence potential is determined by necessity of currencies variety
Unclear potential for coexistence	• It depends on actions of financial institutions in next 3-10 years • There is a view that in future no "much room for CBDC or anything centralised"
CBDC pilots	• There are CBDCs' project in India, China, USA, Thailand, and Singapore • Singapore is technologically ready to issue of CBDC. CBDC is considered by Singapore as a game changer for banks settlement and fiat processing transaction • There are a lot of concerns on necessity of CBDCs in Japan

Table 16 TA: CBDCs

8.2 Anonymised List of Expert Interviewees

Note: in compliance with UK GDPR guidelines and requirements, we have *excluded* all personally identifiable information (PII) from our list of expert interviewees. We have included only the company, country, and type of interviewee. Where necessary, we have omitted certain details for reasons of security and anonymity. All interviewees spoke on their own behalf and their views do not necessarily reflect those of their employers or firms.

Company	Country	Interviewee Type
The Block	UK	FinTech/Crypto Expert
University of Innsbruck	Germany	Academic Expert
Vinod Kothari Consulting	India	FinTech/Crypto Expert
[Company Redacted]	Canada	Academic Expert
IESEG Business School	Belgium	Academic Expert
UK Regulatory Authority [Name Redacted]	UK	Regulatory Expert
Alliance Manchester Business School	UK	Academic Expert
Good Governance Capital Ltd	UK	Regulatory Expert
Deutsche Bank	USA	Regulatory Expert
VISA	Singapore	Payment Processing Expert
Stablecoin Issuer [Company Redacted]	UK	FinTech/Crypto Expert
Cornell University	USA	Academic Expert
THG	UK	Payment Processing Expert
Clemson	USA	Academic Expert
Regulatory Body [Name Redacted]	Japan	Regulatory Expert
CIISE	Canada	Academic Expert
CIISE	Canada	Academic Expert
BlackRock	USA	FinTech/Crypto Expert
OneSixtyTwo Digital Capital	Canada	FinTech/Crypto Expert
Crypto Exchange [Name Redacted]	Singapore	FinTech/Crypto Expert
University of Chicago	USA	Academic Expert
University of Manchester	UK	Academic Expert
Willis Towers Watson	UK	FinTech/Crypto Expert
Business2Blockchain	South Africa	FinTech/Crypto Expert
PSP Lab	UK	Regulatory Expert
Venture Capital Fund [Name Redacted]	Denmark	FinTech/Crypto Expert
Blockchain Company [Name Redacted]	Japan	FinTech/Crypto Expert
Financial Crime and Security Studies (CFCS)	UK	Regulatory Expert
Security and Exchange Commission	Thailand	Regulatory Expert
PayPal	USA	Payment Processing Expert
Payments Solved	UK	Regulatory Expert
Mentat Innovations	UAE	FinTech/Crypto Expert
PayPal	USA	Payment Processing Expert

Table 17 Expert Interviewees List

8.3 Full Interview Schema

The following is the exact interview schema and questionnaire that we used for all of our interviews. We provide this to permit readers to examine our methodology, and replicate or modify it if they see fit to do so.

External organizations interview guide

Our Alliance Manchester Business School (AMBS) project team will conduct this interview with you as part of our due diligence. We seek your insights and knowledge, as a subject matter expert (SME) in this area, about **Stablecoin as a Payment Method (SaaPM)**, on behalf of an external client.

The aims of this interview are to understand:

1. The current structure and likely future development of the stablecoin subsector of the cryptocurrency market;
2. How stablecoins might be adapted into a viable payment and settlement method for B2B and B2C transactions;
3. The likely levels of consumer and merchant demand for SaaPM;
4. What the regulatory, legal, settlement, and other risks are with respect to SaaPM;
5. The relevant technical details of stablecoin implementation and blockchain technology;

The insights gained during our interview with you will be used during our project within our report, which will be sent to our client.

This document outlines the structure of the interview and details the interview questions.

Structure of the interview

Main objective	Purpose of section	Guide timings
1. Introduction & consent	Explain the purpose and format of the interview and establish consent – ask about signing and returning consent form.	2 mins
2. Background	Build rapport with the interviewee and help them to feel more comfortable.	3 mins
3. FOR ACADEMIC EXPERTS	Focus on the major drivers of growth with respect to cryptocurrency usage, and any known barriers to the same. Such interviews will be more focused on technical details and potential commercial applications of blockchain/DLT.	25 mins
4. FOR INDUSTRY SMEs	Focus on key drivers of adoption of stablecoins, specifically, and future use cases. Can be more or less technical depending on how the SME answers.	25 mins

5. FOR PAYMENT PROCESSING SMEs	Focus on how cryptocurrencies will disrupt, or be integrated into, existing payment networks, and how stablecoins can complement the current capabilities of payments companies.	25 mins
6. FOR REGULATORS	Focus on upcoming regulatory developments, issues posed by stablecoins for regulators, likely reactions by regulators, and possible future of CBDCs in the market. Primarily aimed at regulators in developed nations in US, UK, EU, and Asia (excl. ANZ).	25 mins
7. Wrap-Up	Ask final wrap-up question, thank the interviewee and discuss next steps. Ask if interviewee is willing to respond to written further questions.	2 mins

Topic guide

1. Introduction & consent	**2 minutes (2)**
[Make sure interviewees have been sent the consent form and information sheet in advance of the interview] Hi, my name is XXX and I am an MBA student from AMBS, and I am working on this project on behalf of an external client. Thank you very much for agreeing to attend this interview today. We seek to understand the regulatory, financial, economic, and technological environment of the stablecoin market, and your expertise and insight will be invaluable in this regard. Did you get a chance to read the Participant Information Sheet that I sent through? Check with the participant that it is okay to start the recorder so there is a recording of consent. Then, start the video recorder so there is a recording of the participant giving consent. **If consent is not given, reassure interviewee that this is fine and we will take written notes instead.** *Reiterate what was in the information sheet:* ● The interview will take around 30-45 minutes. ● There are no right or wrong answers and you don't have to answer any questions you're not comfortable with. If you like, we can give you the recording or interview notes afterwards. ● **You can stop the interview at any time, and don't have to give a reason for doing so.** ● **You can also withdraw your responses after the interview up until the point in which your responses have been combined with others for analysis. If you decide you'd like to withdraw**	

your responses - just email me and we will delete all of your data that is possible to do so at the time of the request. ● Do you have any questions? *Recording consent* ● We will record the interview for the purpose of transcription, but everything you say will be anonymised in the final write-up so that your answers will not be linked back to you. Are you happy for me to record the interview? Wait for consent ● By consenting to this interview, you authorise us to share your responses with key members of the data gathering team at AMBS, on behalf of our client. Are you happy for your responses to the interview, to be accessed by other members of AMBS team, and our external client? Wait for consent ● We write up our findings from our interviews. We may include anonymous quotes or a summary of your answers from this interview in a report, presentation or other deliverable, but all identifiable information such as names and names of locations will be removed. Are you happy for us to use your responses in any final research outputs? Wait for consent Are you happy to participate in the interview?	
2. Background	**3 mins (5)**
• **Could you please give us some idea of your background, research interests, and areas of specialisation, so that we can focus our interview questions?** *Depending on the answer and known background of interviewee, skip to ONE relevant section below.*	
3. FOR ACADEMIC EXPERTS	**25 mins (28)**
• **What are the top 3 drivers of, and barriers to, mass adoption of cryptocurrency as a payment method in your geography?** • **What do you consider to be the top trends in cryptocurrency regulation, specifically, that will drive, or hinder, consumer usage of stablecoins as a payment method, and why?** • **How do you see the use cases for stablecoins developing over the next 1-3 years, as opposed to volatile cryptocurrencies?** • **What opportunities do you see for payment providers in your market to use and leverage stablecoins within their networks, if any?** • **What are the costs and fees associated with stablecoin transactions, especially given that most of the widely traded**	

coins operate on already existing and widespread blockchains (e.g. Tether on the Ethereum blockchain)? • **The *blockchain trilemma* - the three-way trade-off between decentralisation, security, and scalability – poses significant challenges for the adoption of stablecoins. What recent developments do you see that will address this well-known issue?** • **Which industries do you believe will adopt stablecoins as a payment method first, and why?** • **What kinds of consumers (in terms of age, income, profession, and geographical brackets) do you believe will be most likely to adopt stablecoins as a method of payment?** • **Where do you see the most likely areas of regulatory development, therefore reduction of regulatory uncertainty in the industry – the USA, Europe, or Asia?** • **What is your opinion of Central Bank Digital Currencies (CBDCs) as a payment method in the foreseeable future?**	
4. FOR INDUSTRY SMEs	**25 mins (28)**
• **In your view, what is the current state of the market for stablecoins, in terms of most prominent use cases, in your specific industry?** • **What are the most important use cases that you see evolving in your industry over the next 1-3 years?** • **What do you see as the major benefits, and drawbacks, of stablecoins if they are to be used as payment methods?** • **Turning to the "blockchain trilemma" of the trade-off between decentralisation, scalability, and speed, which appears to be a major blocker to cryptocurrency adoption, what developments do you see in the industry that will get around this issue?** • **What is your opinion of the current the regulatory environment with respect to stablecoin adoption as a payment method?** • **Is the "peg" for stablecoins really credible – can stablecoin issuers really be trusted to back up their issued tokens with the underlying assets? (See e.g., Tether's failure to demonstrate a credible asset base for USDT.)**	

• **What are the major transaction costs involved with using stablecoins as a payment method?** • **Looking beyond your own industry, which other industries do you believe will adopt stablecoins as a payment method first?** • **What kinds of consumers (in terms of age, income, profession, and geographical brackets) do you believe will be most likely to adopt stablecoins as a method of payment?** • **Will the broad-scale introduction of CBDCs attack or eliminate outright the existence of privately held stablecoins, or will CBDCs complement them?**	
5. FOR PAYMENT PROCESSING SMEs	**25 mins (28)**
• **What are the major challenges with cryptocurrencies as a method of payment?** • **How do you see cryptocurrencies in general, and stablecoins in particular, fitting into (or challenging) the existing business model of payment processing networks?** • **What facilities and capabilities will stablecoins provide for customers/merchants, that payment processors currently CANNOT provide?** • **Given that stablecoin transactions currently are very slow, how can payment processors leverage their own networks to increase the speed of these transactions?** • **What are the major infrastructure challenges involved in using stablecoins for mass-market payments between consumers and merchants?** • **Which industries do you believe will adopt stablecoins as a payment method first, and why?** • **What kinds of consumers (in terms of age, income, profession, and geographical brackets) do you believe will be most likely to adopt stablecoins as a method of payment?** • **Approximately how large do you believe the market for stablecoins as a payment method could be over the next 3 years, in terms of number of transactions, total revenue, or number of customers/merchants that will use this method?**	

• **Will CBDCs address many, if not most, of the major concerns surrounding cryptocurrencies as a payment method, as far as payment processors are concerned?** • **What are the major costs, benefits, and drivers, of payment processors in issuing their own stablecoins?**	
6. FOR REGULATORS	**25 mins (28)**
• **What are the major types of stablecoins in circulation at the moment?** • **What unique challenges do stablecoins pose for regulators, in terms of transactional, criminal, economic, and systemic risk?** • **What do you see as the most likely legitimate use cases for stablecoins over the next 3 years?** • **How will stablecoins address some of the existing concerns that you have about cryptocurrencies as payment methods?** • **Which industries do you believe will adopt stablecoins as a payment method first?** • **What kinds of consumers (in terms of age, income, profession, and geographical brackets) do you believe will be most likely to adopt stablecoins as a method of payment?** • **How do regulators view stablecoins from a taxation perspective – as *assets*, therefore subject to taxation on gains in value, or as *money*, therefore not subject to taxation?** • **Are stablecoins generally "trustworthy" assets, in your view, especially given some of the well-known issues with the credibility of the pegs for asset-backed coins?** • **Do regulators in your jurisdiction view stablecoins as a significant source of systemic risk?** • **What kinds of regulatory changes need to be made in order to facilitate the use of stablecoins as a payment method?**	
7. Wrap-Up	**2 mins (30 - 45)**
Optional final question:	

If you could wave a magic wand and remove the single biggest obstacle involving widespread adoption of stablecoins as a payment method, according to your knowledge and expertise, what would that one obstacle be? **Thanks and wrap up.**	

8.4 Customer Survey Design & Data

8.4.1 Survey Design & Logic Flow

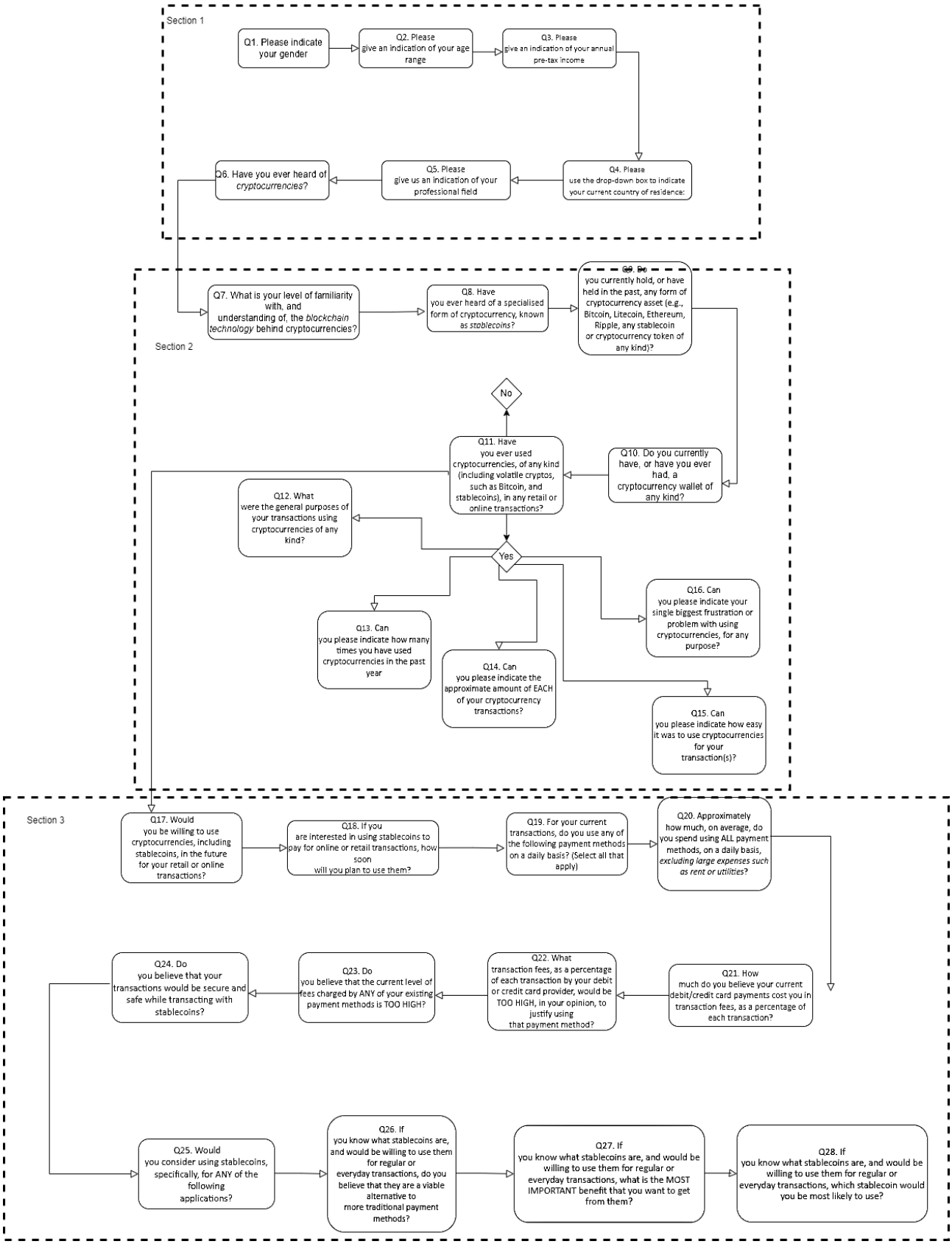

Figure 62 Branching Logic Design of Customer Survey

8.4.2 Supplemental Qualtrics Data

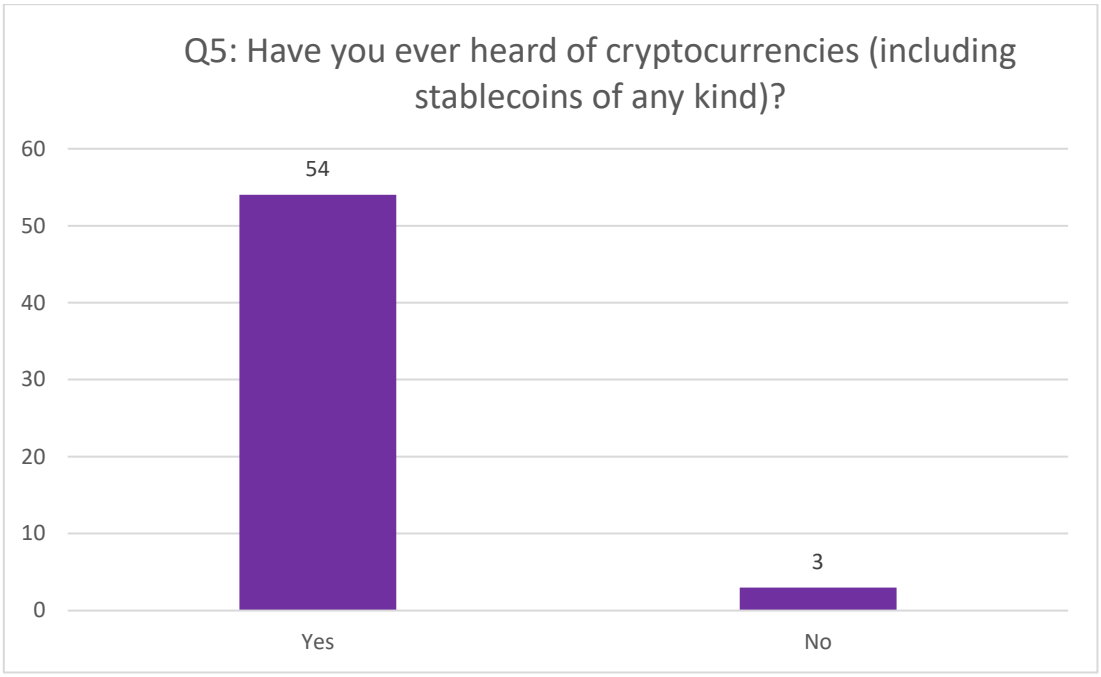

Figure 63 Qualtrics: Knowledge Level of Cryptocurrencies (n = 57)

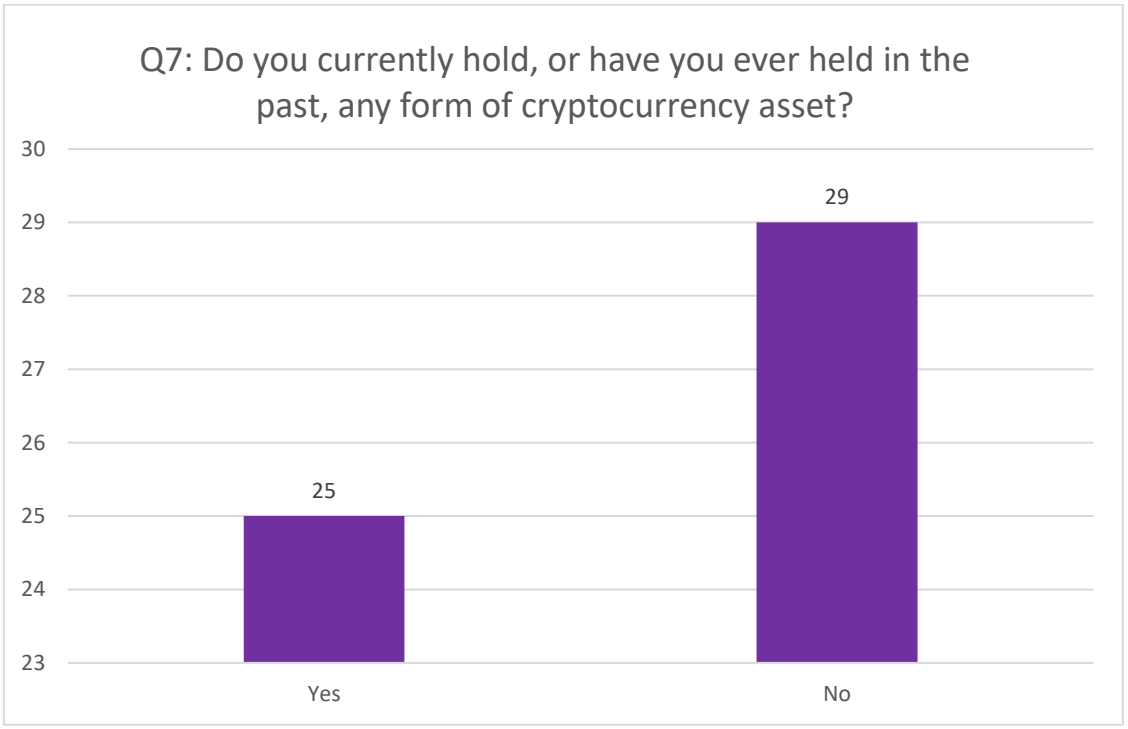

Figure 64 Qualtrics: Ownership Rates of Cryptoassets (n = 54)

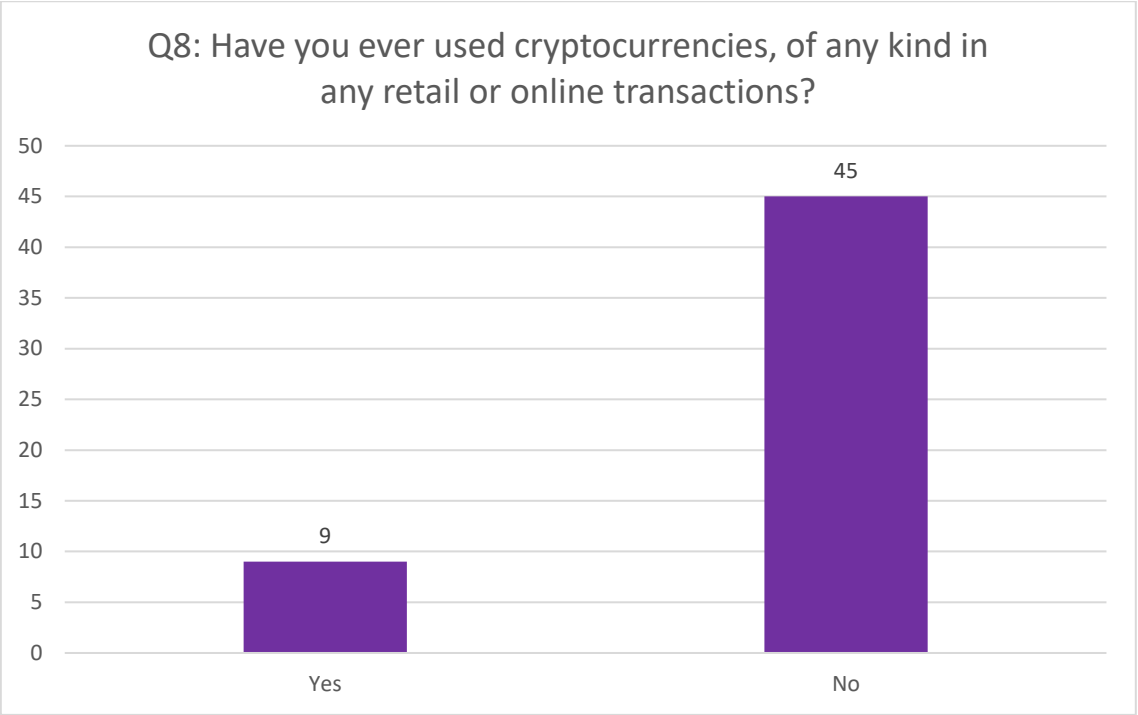

Figure 65 Qualtrics: Usage of Cryptoassets for Transactions (n = 54)

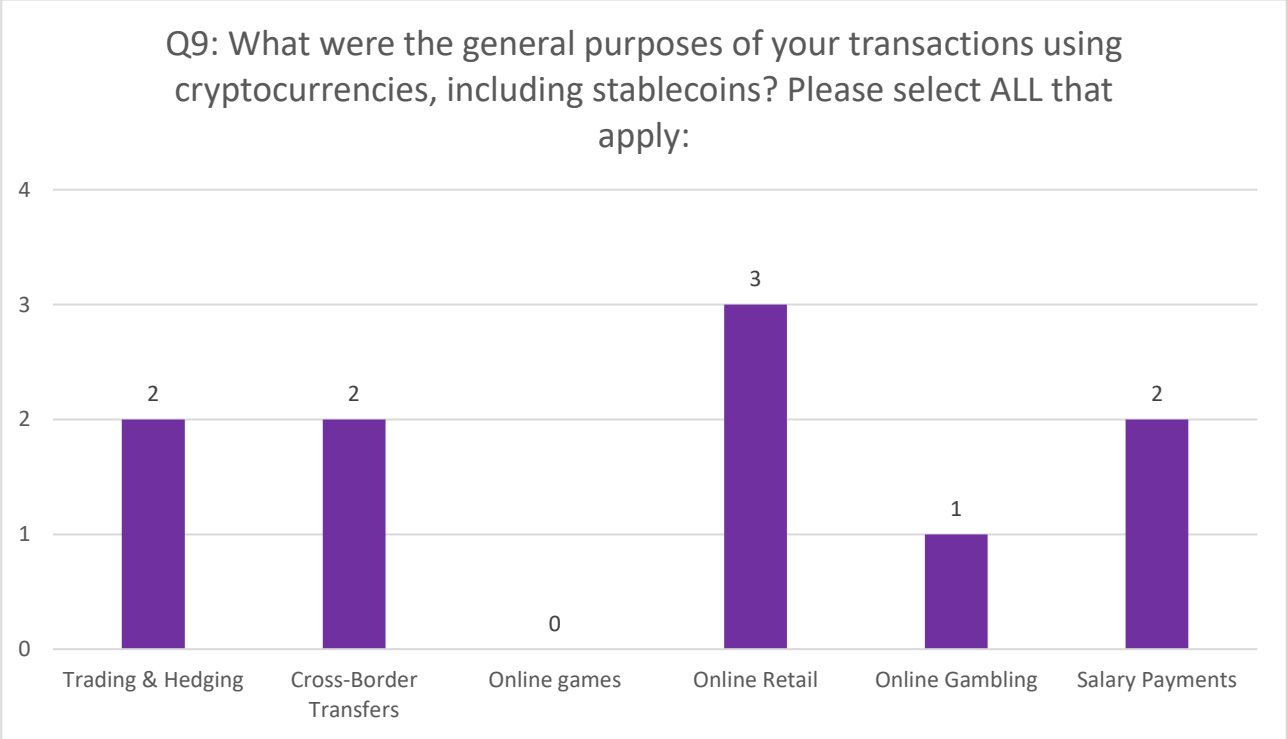

Figure 66 Qualtrics: Purposes of Crypto Transactions by Active Users (n = 9)

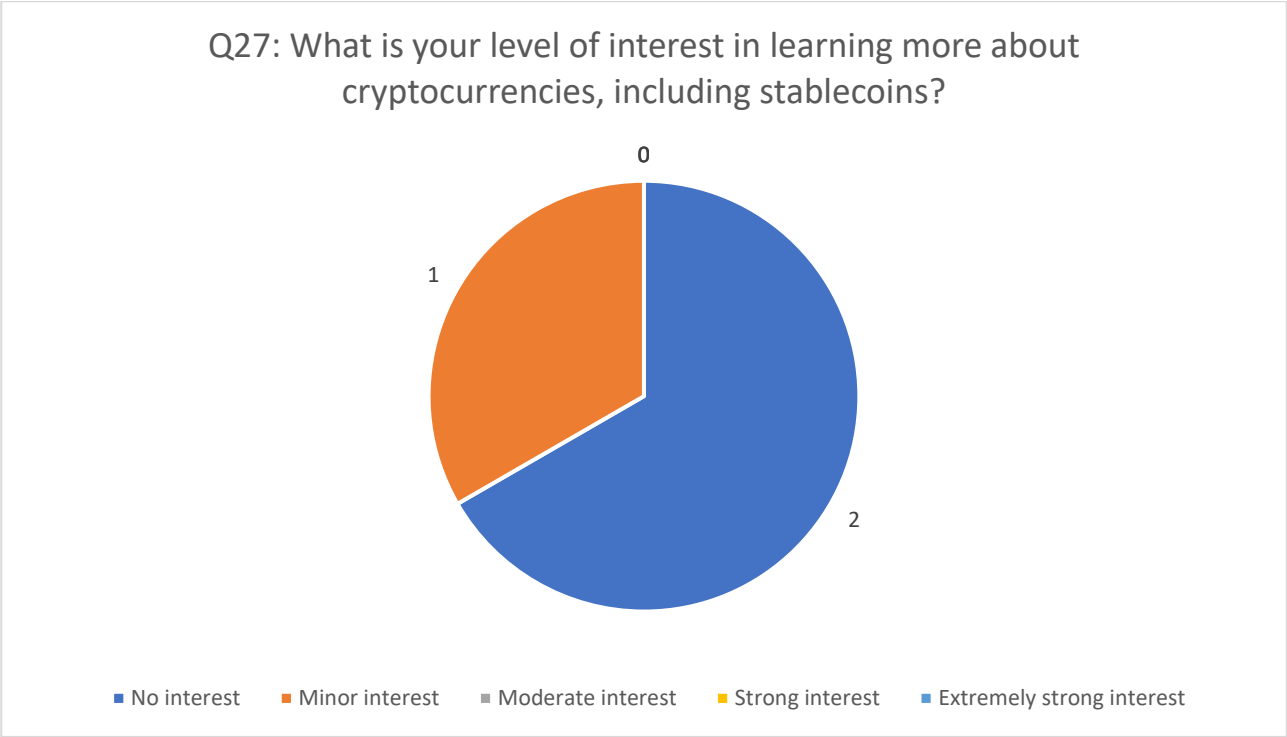

Figure 67 Qualtrics: Interest in Cryptoassets Among Those Lacking Familiarity (n = 3)

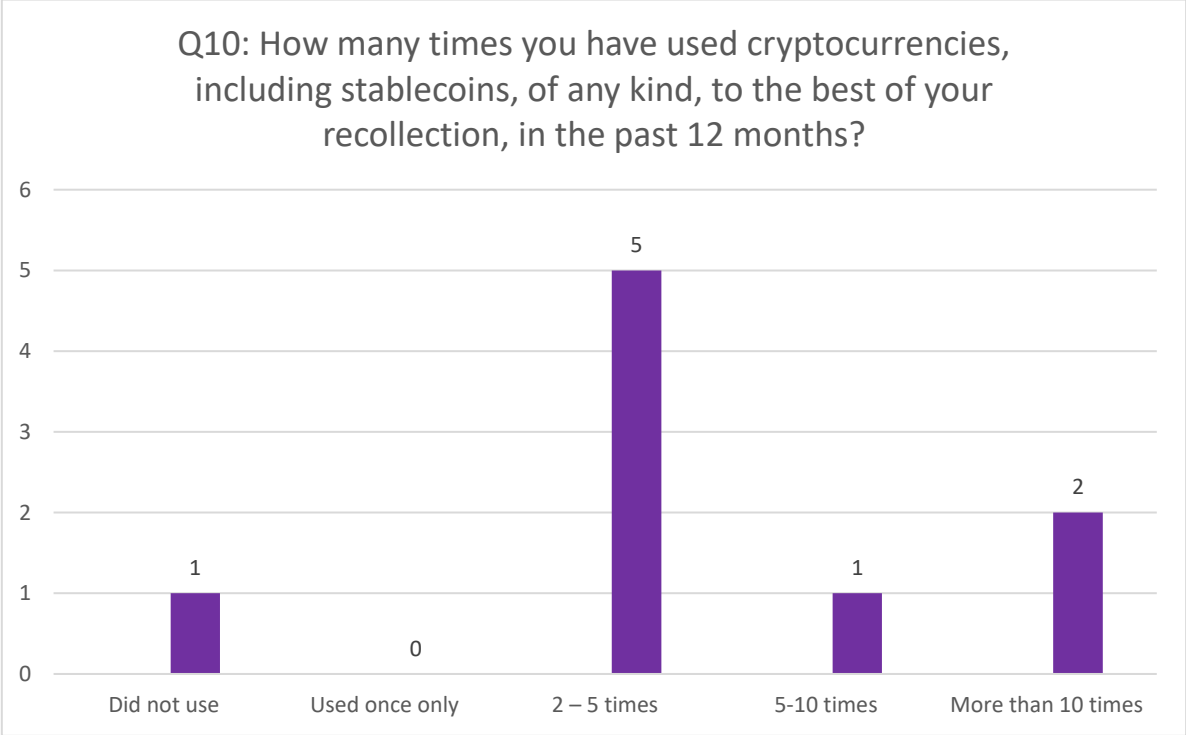

Figure 68 Qualtrics: Usage Rates of Cryptoassets Among Active Users (n = 9)

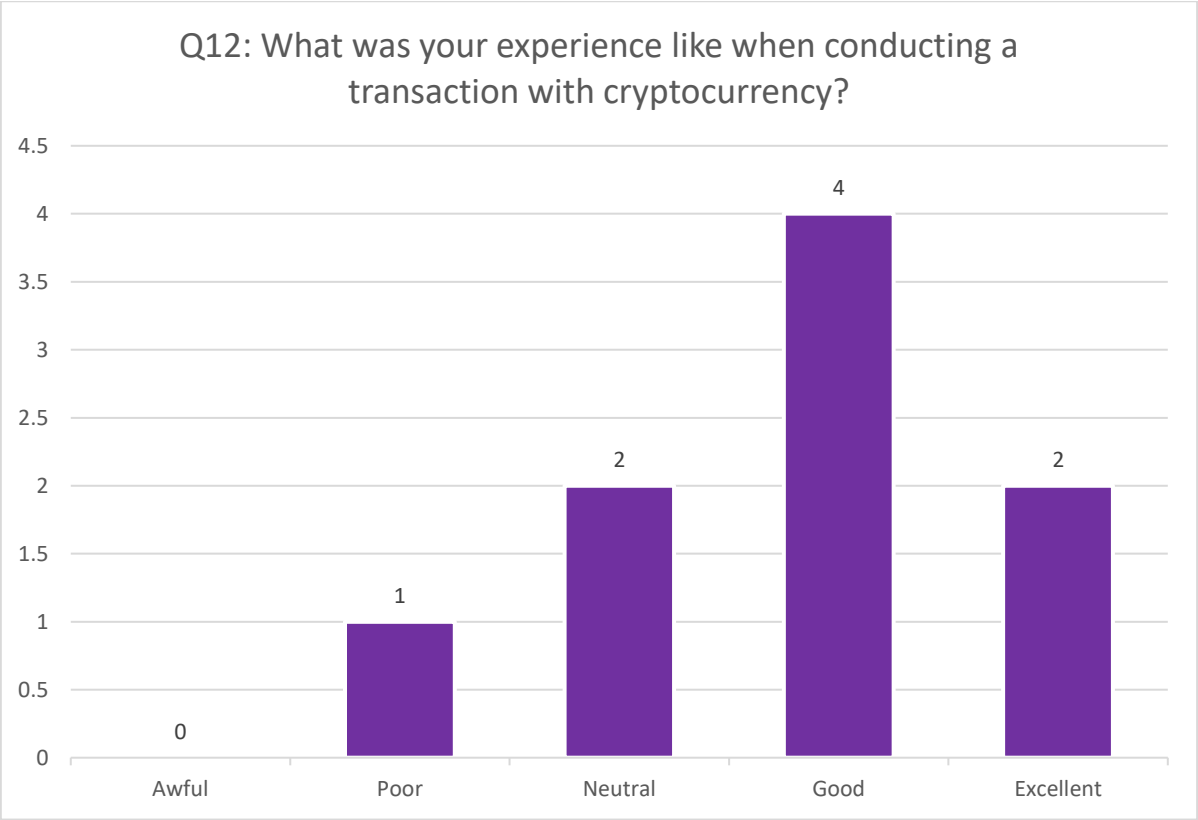

Figure 69 Qualtrics: User Experience of Cryptoassets (n = 9)

Figure 70 Qualtrics: Level of Interest in SaaPM (n = 51)

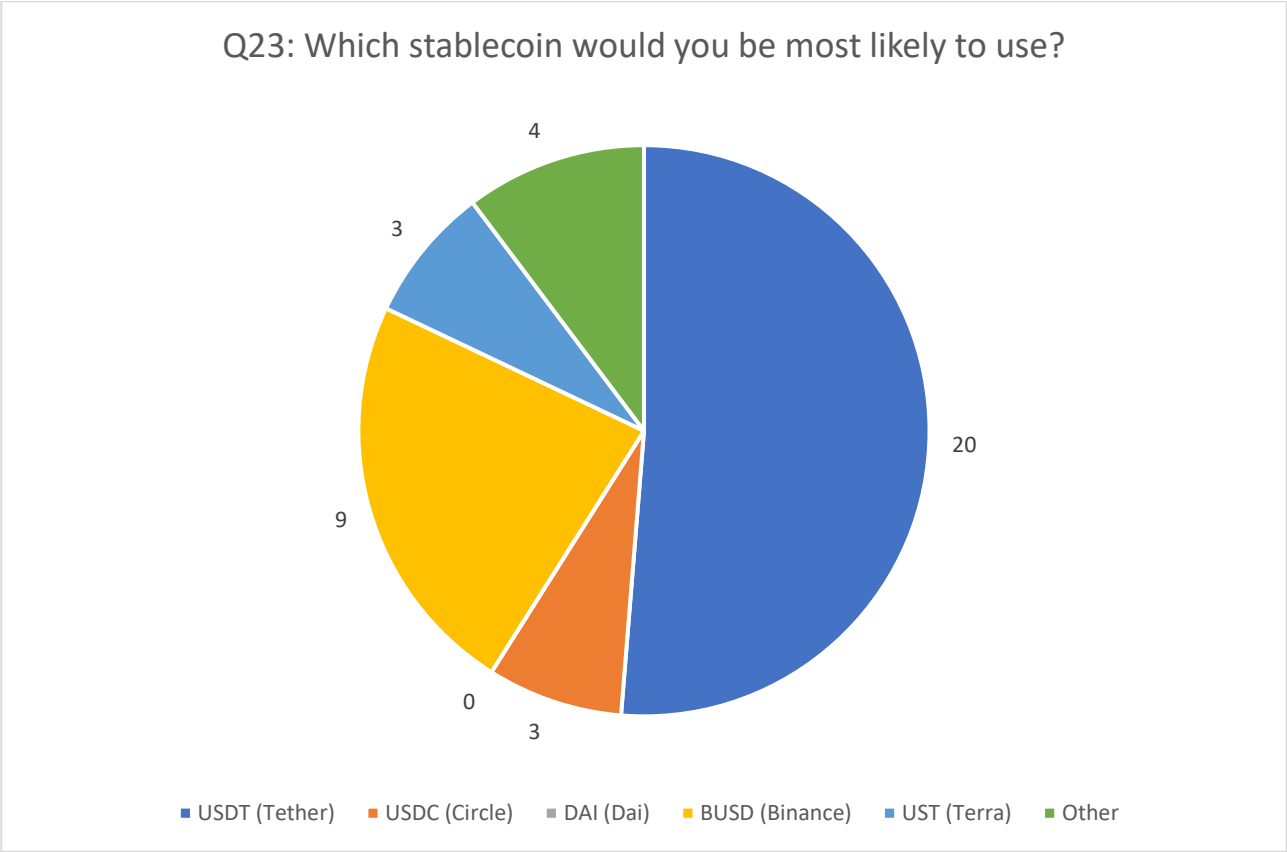

Figure 71 Qualtrics: Stablecoin of Choice Among Those Interested in Use (n = 39)

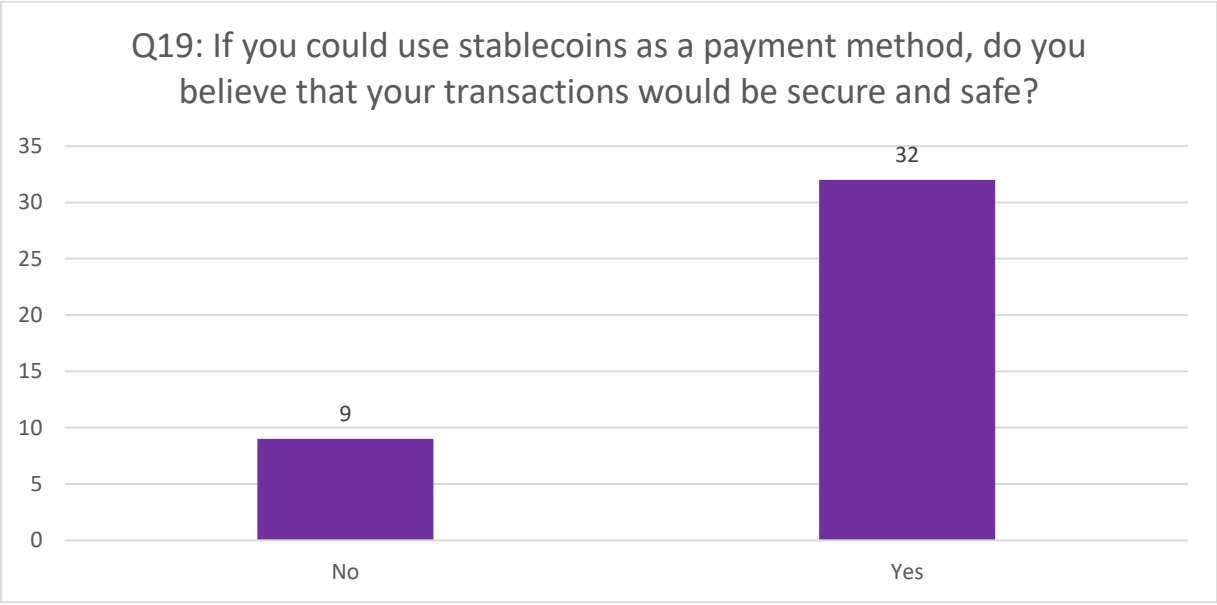

Figure 72 Qualtrics: Potential-User Views of SaaPM Security (n = 40)

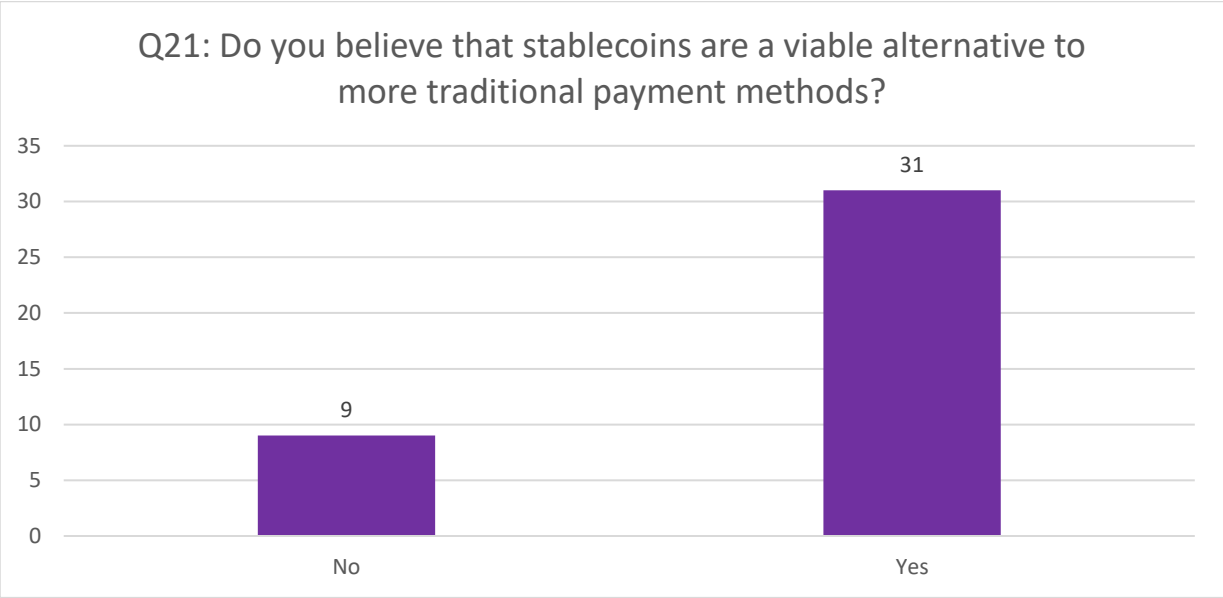

Figure 73 Qualtrics: Potential-User View of SaaPM Viability (n = 40)

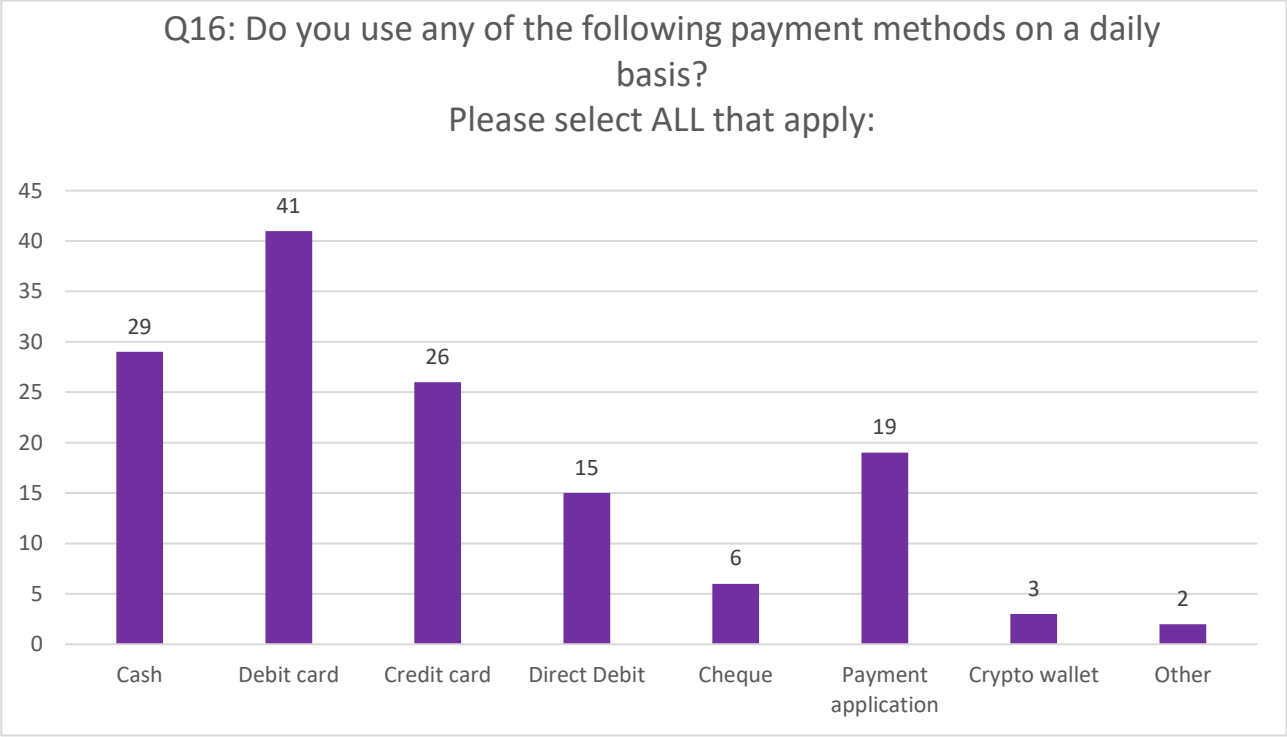

Figure 74 Qualtrics: Payment Methods Used by Respondents (n = 51)

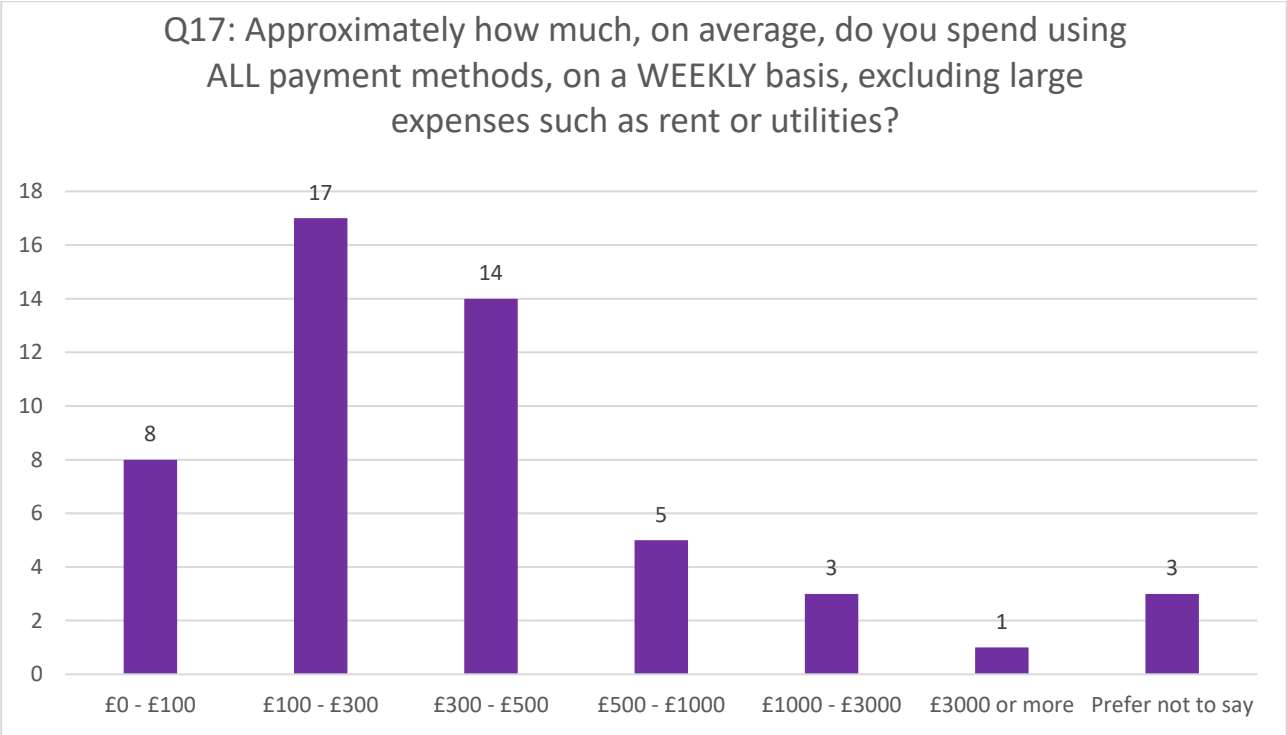

Figure 75 Qualtrics: Average Wekly Spending of Respondents (n = 51)

8.4.3 Supplemental Survey Monkey Data

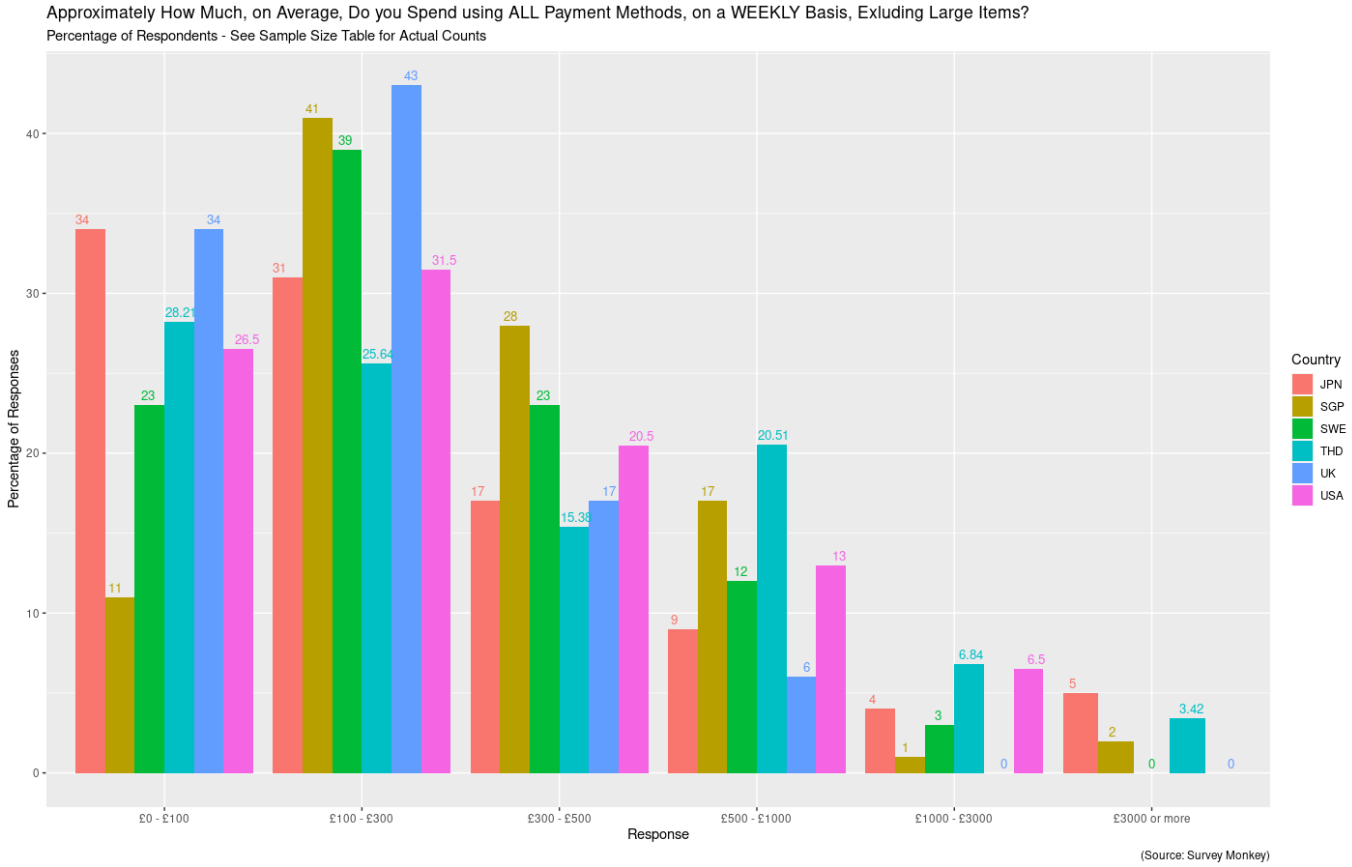

Figure 76 SM: Average Amount of Crypto Transactions Among Actual Users

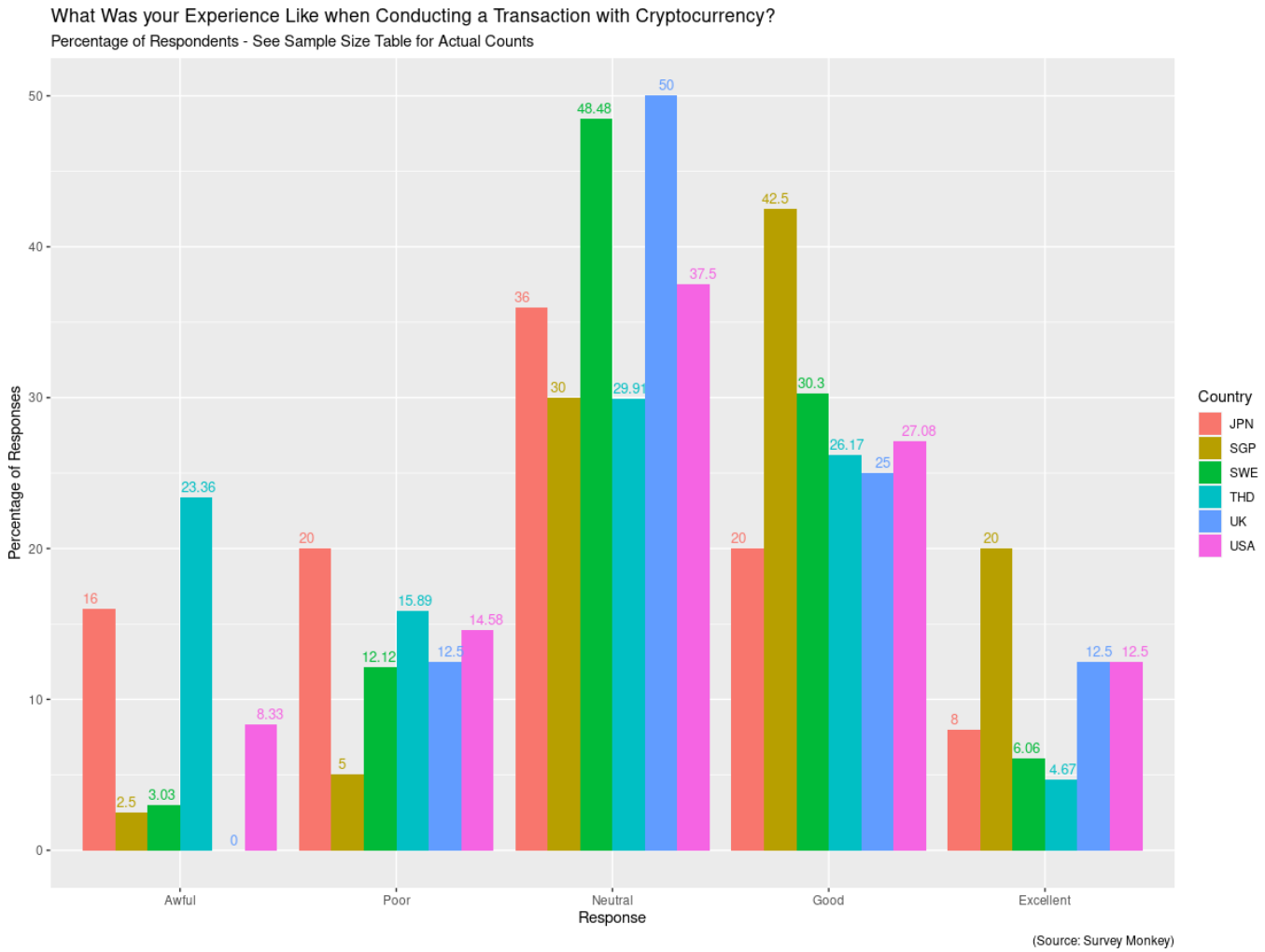

Figure 77 SM: Experience with Crypto Transactions Among Actual Users

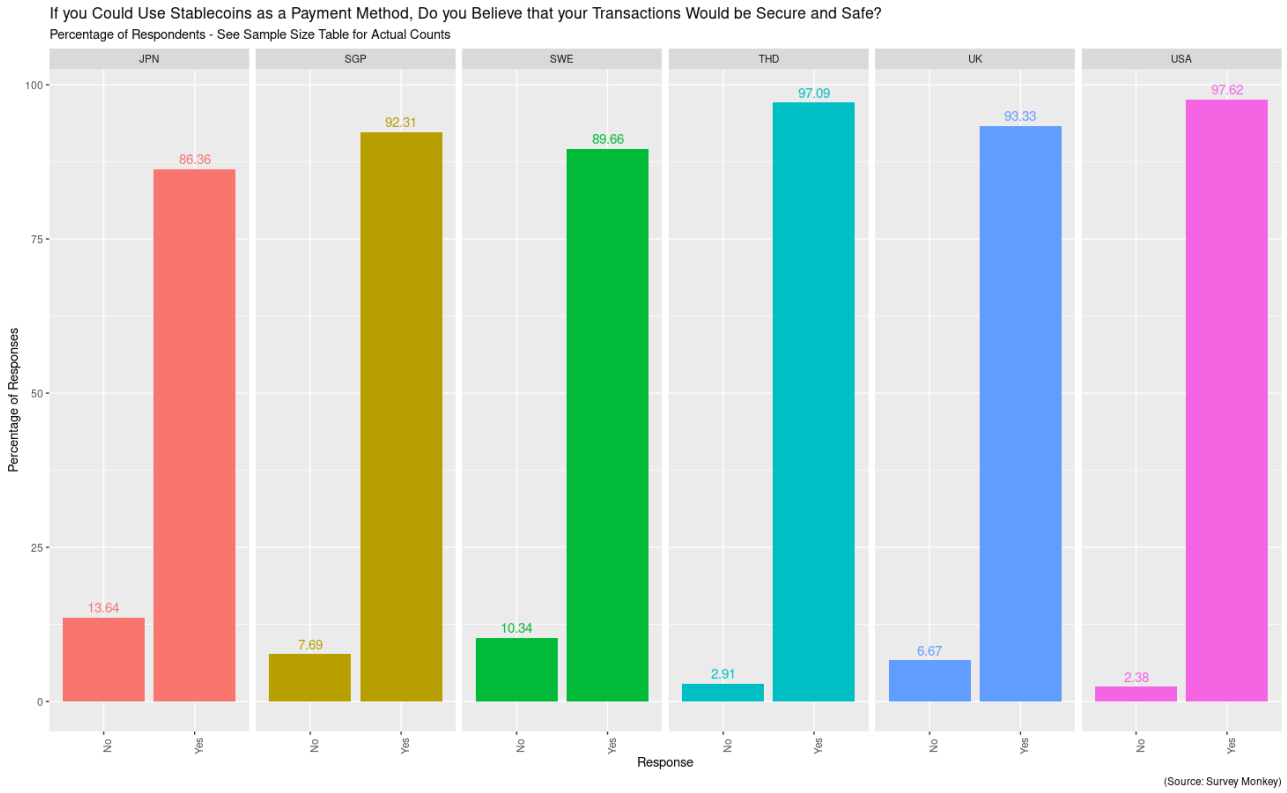

Figure 78 SM: Respondent Views on SaaPM Security by Country

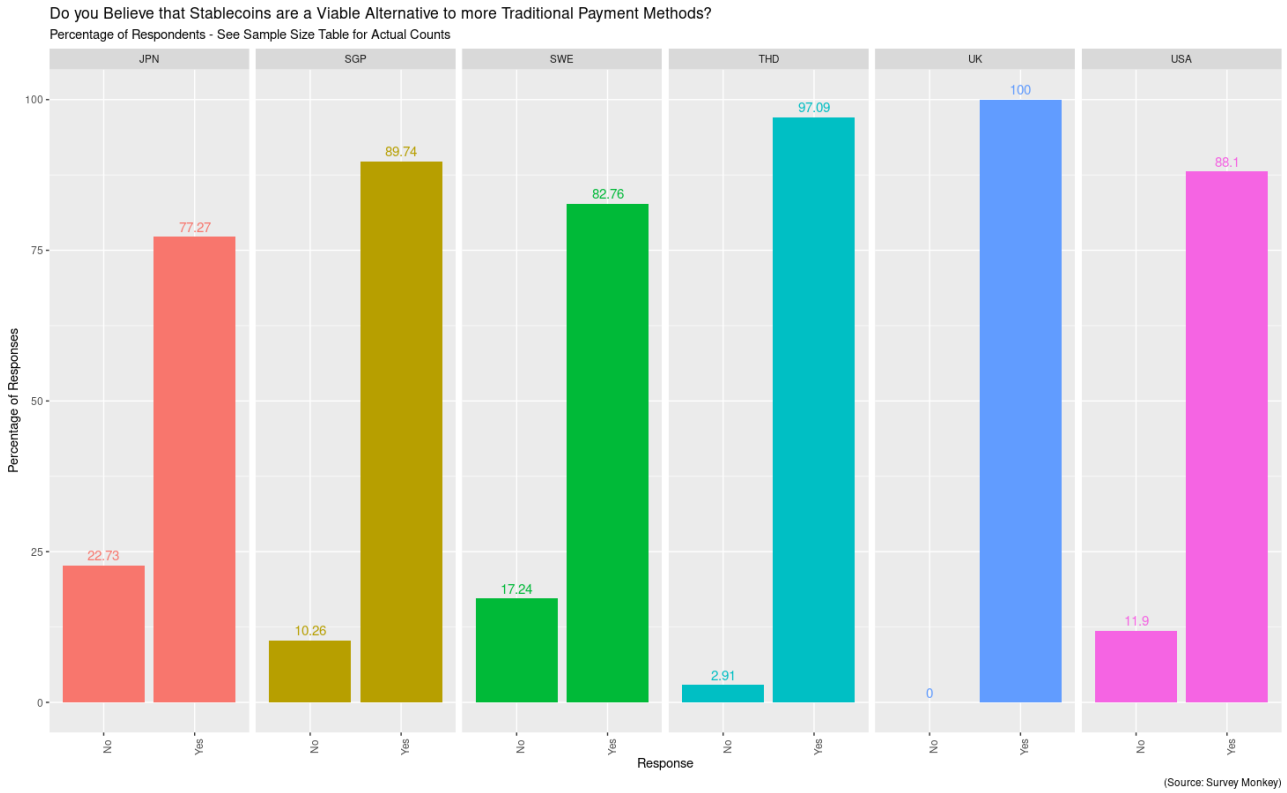

Figure 79 SM: Respondent Views on Viability of SaaPM by Country

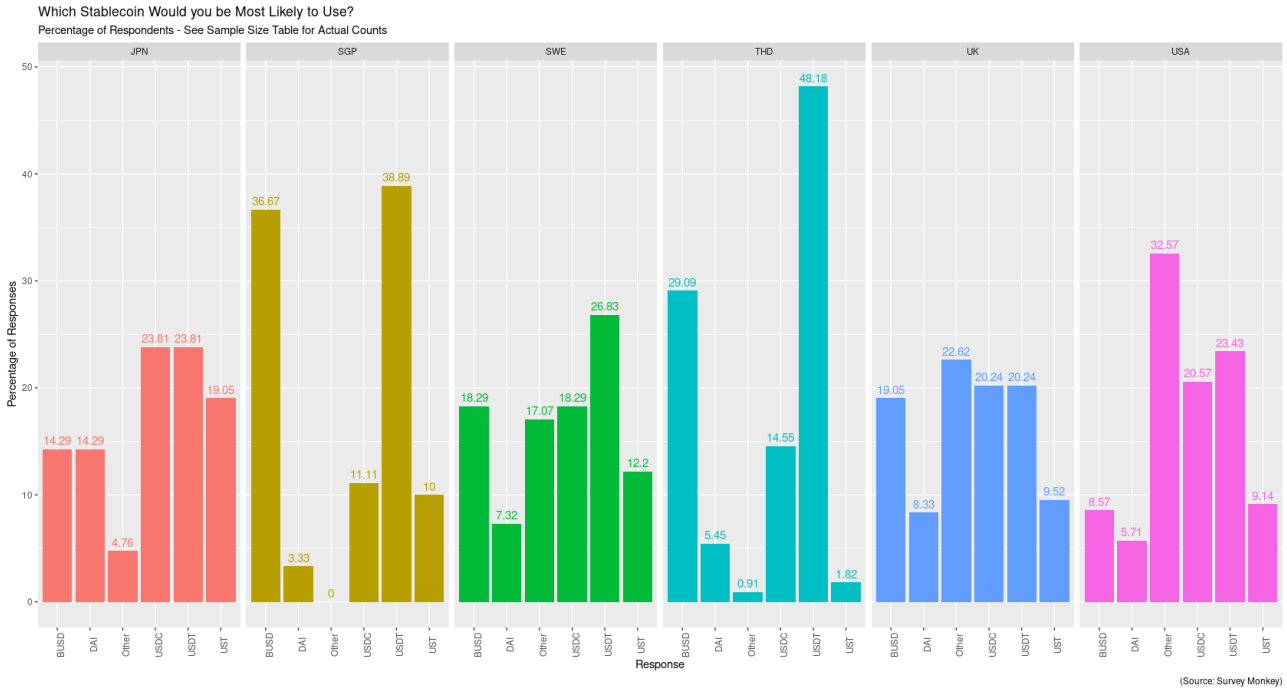

Figure 80 SM: Most Preferred Stablecoin by Country

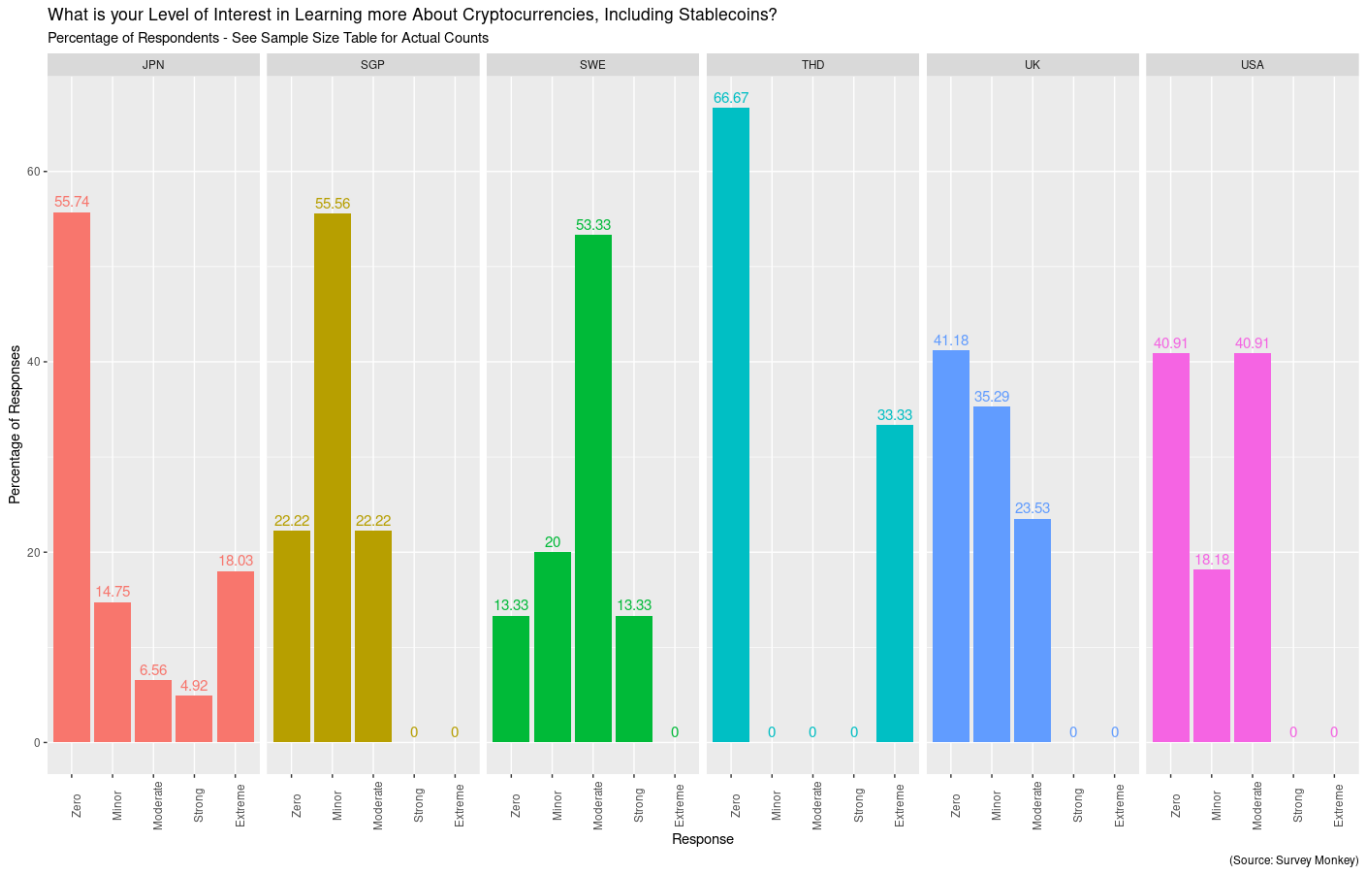

Figure 81 SM: Interest in Cryptos from NON-KNOWLEDGEABLE Respondents

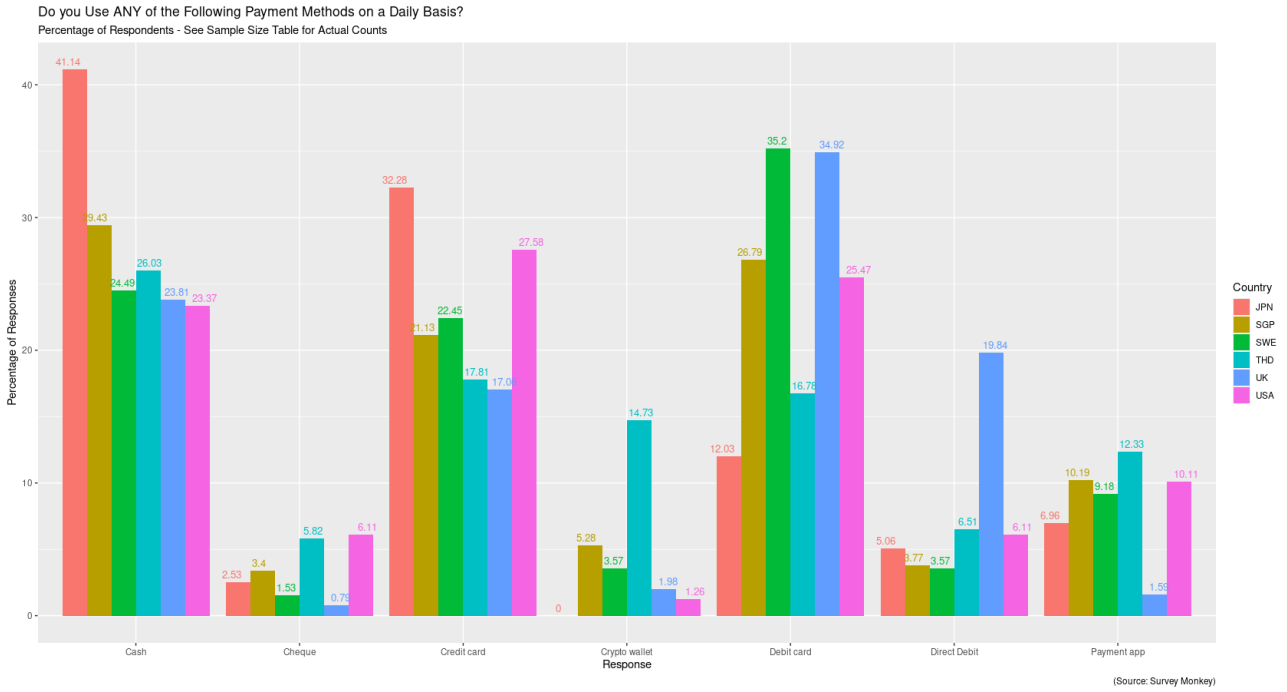

Figure 82 SM: Current Payment Methods Used by Respondents

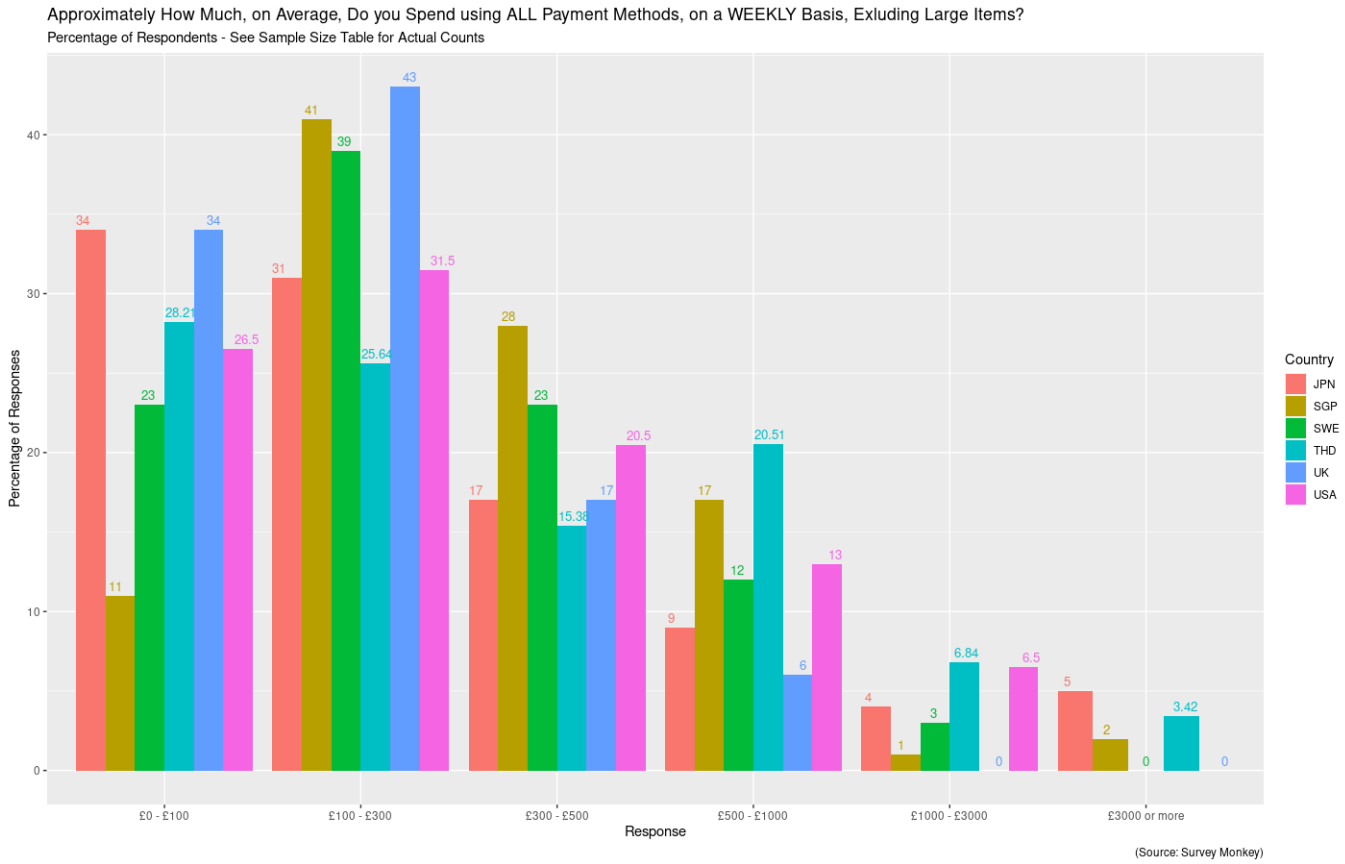

Figure 83 SM: Average Spending Across All Methods by Respondents