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EQUITY RESEARCH

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The Future of Finance PART 2

Redefining “The Way We Pay” in the Next Decade

The way we pay is changing. The plumbing connecting banks, merchants, networks and consumers is being reconsidered. From Square and Stripe to Apple and Alipay, innovators are creating new ways to transact - forcing incumbents to adapt. Witness Millennials trading personal data for convenience and retailers backing new networks like MCX to reduce fees. Analytics are helping cut interbank payment delays from days to seconds, while cryptocurrencies like Bitcoin are emerging. All the while, shifting international regulations are creating an uneven global landscape.

The latest in our Future of Finance series lays out where traditional profit pools in payments are being challenged with a focus on where we are headed in the next decade.

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PM Summary: Redefining “the way we pay” in the next decade

Why read this report?

The level of debate around the \$1.2 trillion global payments industry has never been higher. Over the past 40 years, the payments industry has evolved into a complex ecosystem comprised of financial institutions and intermediaries, technology vendors, and service providers. Banks, payment networks, merchant acquirers, money transmitters, and point-of-sale vendors all occupy unique positions in the ecosystem, and have developed their own economic models and profit pools tied to it.

At the same time, multiple mega-trends – technological, regulatory, demographic, and international – are converging that could potentially change or disrupt today’s payments ecosystem. Innovations in network technology and cryptography could change the speed and mechanics of moving money, with the UK ramping a network capable of real time (vs. a 2-3 day time lag in the US system). Millennials have different payment habits than their parents, with 60% regularly performing mobile financial transactions. Governments have enacted legislation to reduce payment transaction fees such as interchange by 50% or more in order to accelerate electronic payment adoption. And consumers around the world have very different relationships with financial institutions than their counterparts in the US, with 50% of the world’s population without access to formal financial services.

We examine each of these megatrends, analyze the business models of emerging players, and look at the potential impact on the payments landscape across three channels: Business-to-Consumer, Consumer-to-Consumer, and Business-to-Business. We also analyze the various profit pools tied to each type of payment market, and whether incumbents are likely to successfully adapt, or lose market share to emerging vendors.

Megatrends that are shaping the face of payments

Trend #1: Technology

- **Faster networks**
- **Big data analytics**
- **Payment security**
- **Bitcoin**

- **Technology** – We see four significant technologies impacting the future of payments: (1) **Faster payment networks** which combine modern network technology with risk scoring have seen adoption abroad, and could replace the US ACH network in the next 5-10 years; (2) **Big data analytics** which aggregate purchaser data can drive higher sales for merchants; (3) **New payment security** methods help safeguard consumer data; (4) **Bitcoin and cryptocurrencies** promise to change the mechanics of transactions.

Trend #2: Regulation

- **Consumer protection**
- **Compliance costs**
- **Interchange rules**

- **Regulation** – Regulation continues to play a vital role in determining the future evolution of payments, in particular: (1) **Consumer protection laws** determine the level of liability exposure for consumers, and can have a profound impact on the adoption of payment methods by geography; (2) **Compliance** requirements (particularly Anti-Money Laundering and fraud rules) have broad implications for consumer payments, particularly money transfers; (3) **Interchange rules** govern the fees charged by banks.

Trend #3: Demographic

- **Generational**
- **Income**

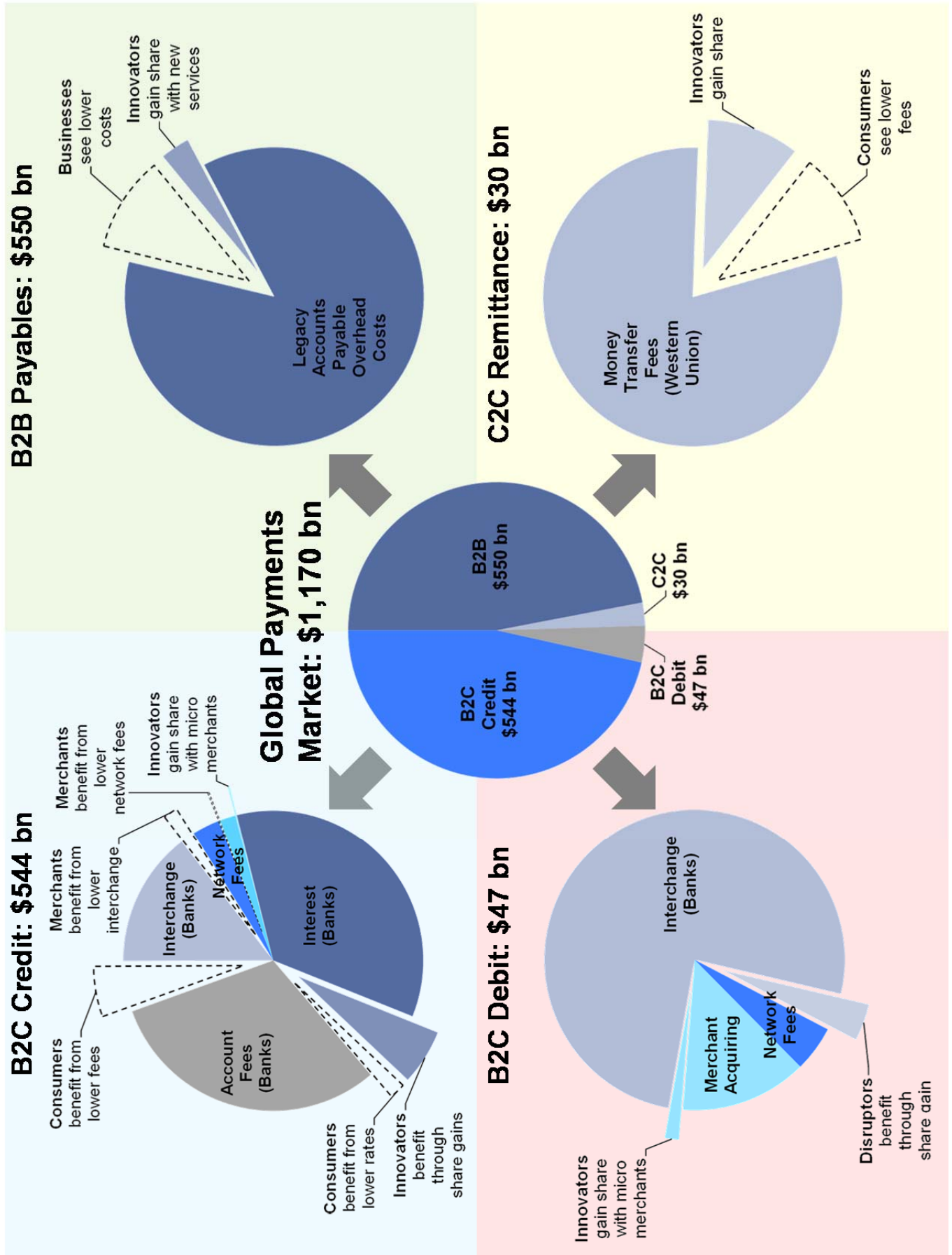
- **Demographics** – Multiple demographic factors are playing a role in the payment choices people make: (1) **Millennials** are adopting mobile payments faster than other age groups, but also rely more on cash, while **baby boomers** tend to use more credit and electronic payments than other demographics; (2) **Income** also plays an important role in consumer payment choices, with higher-income individuals skewing toward credit and electronic payment usage, and low-income consumers using more cash.

Trend #4: International

- **Unbanked population**
- **Credit vs. debit**

- **International** – Outside the US, multiple demographic, regulatory, and cultural factors are driving very different evolution paths for payment methods. We examine the cases of **China** (where online commerce is growing quickly and new services like Alipay are gaining strong traction) and **Africa** (where a large under-banked population is turning to mobile payments faster than the rest of the world).

Mapping profit pools and risks in the global payments ecosystem



Our takeaways for key payment channels: B2C, C2C, and B2B

B2C Payments:

- **Networks maintain a strong position, but emerging players have a fighting chance to make inroads:** Commanding \$590 bn in fees globally, B2C payments is both the largest and most widely debated market in terms of potential disruption. At the heart of B2C payments are electronic payment networks including Visa, MasterCard, AmEx, and UnionPay, as well as cash and checks. Electronic payments offer clear advantages to consumers and merchants as evidenced by the rapid adoption of electronic payments over the last 15 years. But more recently, two groups of new entrants have emerged in the B2C payments market:

B2C payments:

\$590 bn globally in revenue and fees

of which:

\$84 billion (14%) is potentially at risk

- **Innovators (such as PayPal, Square, Stripe, and Cardlytics)** are working within the structure established by payment networks, providing value-added services to merchants (such as analytics, financing, and e-commerce services).
- **Disruptors (such as MCX, Seamless, Dwolla, Coinbase, and Bitpay)** seek to disintermediate payment networks in a bid to provide merchants with lower cost electronic payments.

We believe there is real demand among merchants for many of the services offered by Innovators, and think the technologies being explored by several Disruptors promise to lower cost of payment acceptance. However, banks and payment networks have built a powerful market position, reinforced by tangible benefits for consumers. In the US, credit cards come with attractive rewards programs, allowing consumers to garner benefits based on their spending pooled across all merchants, not just one. US consumer credit and banking regulations also provide powerful protections for consumers (such as zero liability in case of fraud and the ability to dispute payments for unsatisfactory products) – protections unmatched by competitive payment methods.

Importantly, incumbent payment networks are innovating. From enabling mobile payment systems like **Apple Pay, Google Wallet, and Samsung Pay** to developing merchant analytics platforms like **MasterCard Advisors and Visa Transaction Advisors**, payment networks are evolving their offerings to make them more competitive with emerging players. We see the networks' strong market position continuing for the foreseeable future, so long as they remain nimble and innovative. However, we see the opportunity for emerging players to make inroads – particularly outside the US and in emerging markets where regulatory and cultural dynamics differ.

Given multiple factors, including potential changes in regulation as well as inroads made by emerging vendors, we see potential risk of up to \$84 billion or 14% of global industry revenue.

Our analysis suggests:

1. **The greatest benefit could accrue to non-traditional lenders** (such as **Lending Club** and others) if they capture substantial share of the credit card debt service market from banks.
2. **Consumers could capture substantial benefits** in the form of lower overdraft and other account service fees from new real-time bank payment networks, and from lower rates charged by non-traditional lenders.
3. **Merchants could also benefit** from lower interchange rates if governments legislate lower fees in other countries as has already been done in the US, the EU, and Australia.
4. **Finally, emerging players could gain market share** (such as **Square, MCX, Dwolla, and Seamless**) if they penetrate under-served markets like micro-merchants and compete effectively against traditional merchant acquirers and networks.

Thematic investment framework: Navigating payment futures

Exhibit 1: Our thematic investment framework for evaluating payment futures

Theme	Emerging Trend	Public company winners	Notable private companies	At risk
Technology	Faster payment networks promise to reduce the time required to move money in US accounts to seconds, from 2-3 days currently	Fiserv and FIS provide “plumbing” to connect banks to the system	Dwolla is selling real-time transfer systems to banks	Retail banks may see lower overdraft and late fees
	Big Data allows merchants to drive increased sales by combining analytics and marketing	MasterCard and Visa are starting to provide analytics solutions to merchants	Cardlytics, APT, ShopKeep, and Womply provide analytics solutions to merchants	
	Payment security techniques help reduce payment fraud and merchant losses	Verifone and Ingenico outfit merchants with more secure point-of-sale solutions	Square, Revel, ShopKeep are providing EMV-based point-of-sale solutions for SMBs	
	Bitcoin and cryptocurrencies allow for the de-centralized transfer of assets without a central clearing authority	Large merchants benefit from lower payment costs	Coinbase, Bitpay, and Ripple Labs are among the key emerging vendors	Western Union, Moneygram, Xoom could see share loss
Regulation	Consumer protections help insulate consumers from fraudulent charges and identity theft	Visa, MasterCard & banks retain more business given consumer-friendly rules		
	Payment interchange fees are moving lower in many countries driven by legislation	Large merchants benefit from lower payment costs		Banks, AmEx see reduced fees Visa, MasterCard may see reduced spreads
	Anti-money laundering rules help protect against illegal funds transfer and fraud	Smaller-scale money transmitters like Xoom are subject to less regulation	WorldRemit, TransferWise, and Currency Fair could gain share	Western Union and banks could see higher compliance costs
Demographics	Millennials adopt mobile payments faster	Visa, MasterCard, Popmoney (Fiserv) benefit from mobile payment adoption	Square provides easy-to-use mobile solutions; Stripe processes online	
	Young adults are the most under-banked age group	MPesa (Vodafone and Safaricom) provide mobile money services for unbanked		
International	50% of the world’s population is unbanked	MPesa (Vodafone and Safaricom) provide mobile money services for unbanked		Western Union and others see lower fees from account transfer
	Many emerging market cultures prefer debit over credit			Banks see reduced fees; Visa, MasterCard may see reduced spreads

Source: Goldman Sachs Global Investment Research.

C2C Payments:

- **We see the potential for significant disruption ahead:** Today, consumer-to-consumer (C2C) payments represent an estimated \$30 billion in fee revenue, mainly driven by international money remittance. We believe C2C payments are most likely to see significant disruption over the next 10 years for several reasons:

C2C payments:

\$30 billion globally in revenue and fees

of which:

\$6 billion (20%) is potentially at risk

- Incumbent technologies for C2C payments (such as checks and ACH transfers) are generally weak, and have been unresponsive to consumer needs due to the lack of economic incentives for incumbent service providers like banks.
- Most consumers have a simple dual mandate for C2C payments – high speed and low cost – which can be served by applying a mix of modern network technology and smart analytics to drive faster, more efficient payments.
- There are relatively few barriers to entry for new players in the market.

Venmo, Popmoney, ClearExchange, Square Cash, and Dwolla make it easier to transfer money between individuals by applying mobile technology. Making transfers faster will require systematic changes to the system (known as ACH) operated by the US Federal Reserve and banks. A US modernization initiative is still in the early stages, but other countries such as the UK have already adopted systems for real-time money transfer. **Few – if any – domestic C2C services charge explicit fees (they are embedded in standard consumer banking fees) – and thus there is no profit pool to disrupt.**

However, there is a significant profit pool in international C2C payments and cross-border remittance. New online approaches (like **Xoom**) plus new technology approaches (like **Bitcoin, TransferWise, and Ripple Labs**) have the opportunity to disrupt traditional in-person money transfer services provided by **Western Union and many large banks.**

Given both the pricing pressure we see from traditional money transmitters, and the potential for innovators to streamline the international money transfer industry with new technology approaches, we see about \$6 billion or 20% of industry C2C revenue at risk over time, with benefits likely accruing to both innovative service providers (in the form of market share gains) and consumers (due to lower fees) in the long run.

B2B Payments:

- **A rare greenfield opportunity for payments innovation:** We believe B2B payments is a large and exciting greenfield opportunity for the industry over the next 10 years. Today, 50% of the payments processed between businesses in the US are paper checks. Enterprises around the world bear an estimated \$550 bn in direct costs and inefficiencies tied to the manual handling, processing, and reconciliation of corporate payments. By digitizing the payment process, enterprises can reduce both their processing costs and headcount tied to manual reconciliation of payments and receipts. Moreover, digitization can help reduce systemic waste, fraud, and abuse – such as vendors overbilling their customers. Relative to consumer-facing payments, B2B electronic payments are still in their infancy – mainly due to the slow adoption of IT systems among small- and medium-sized businesses worldwide. However, a number of vendors are beginning to gain market traction as electronic B2B payments take hold. New electronic payment methods called “virtual cards” offered by companies like **WEX and FleetCor** target verticals like healthcare, construction, and hospitality, which suffer from high levels of inefficiency.

We see the opportunity for businesses worldwide to reduce their total overhead costs tied to B2B payments by \$74 billion over time, with up to \$17 billion of revenue opportunity for emerging B2B payment vendors such WEX and FleetCor, and an estimated \$57 billion in net cost savings for companies worldwide.

B2B payments:

\$550 bn in costs for companies globally

of which:

\$17 billion is the incremental revenue opportunity for payments companies

\$57 billion is the cost savings that companies could achieve

Did you know...?

UNBANKED POPULATION

2.5bn+

50% of the world population is still unbanked, and over 25% of the US population is either unbanked or under-banked. (Page 21)

GLOBAL DIVIDE: CREDIT VS. DEBIT

Less than 1% of consumer transactions in Germany are made with credit cards. (Page 23)

< 1%

MILLENNIALS

40%

Millennials in the US use more cash – in 40% of transactions – than any other age group. (Page 17)

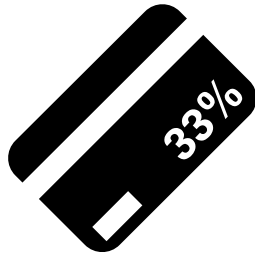
**4,000x
FASTER**

A bank account holder in Nigeria can move money to another account in seconds, but in the US this takes up to 3 days. (Page 10)

INNOVATION IN EMERGING MARKETS

BABY BOOMERS

US consumers over 65 use credit cards more than any other group, 33% of the time. (Page 16)



MOBILE PAYMENTS

13 million

Kenya has more mobile payments users than any other country. (Page 52)

PAPERLESS SHIFT

50%

Nearly 50% of payments by US businesses are still made with paper checks. (Page 58)

INNOVATORS GAINING GROUND IN CHINA

Nearly 1 in 10 of all payments in China are made using Alipay. (Page 46)

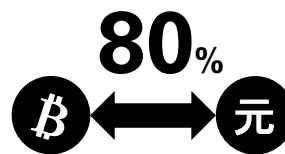
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10**

BIG BOX / SMALL MERCHANT PAYMENTS DIVIDE

“Big box” merchants in the US command over 50% of all purchase volume, but pay just 10% of payment processing fees. (Page 34)

50%
PAY
10%

BITCOIN HAS MOMENTUM IN CHINA



80% of Bitcoin volume is exchanged into and out of Chinese yuan. (Page 12)

Key Shaping Trend #1: Technology

As in many industries, technology is rapidly evolving both at the core and the edge of payments. We briefly examine four salient technology changes – faster network technology, big data analytics, payment security, and Bitcoin – and assess the likely impact of these technologies on the future of payments.

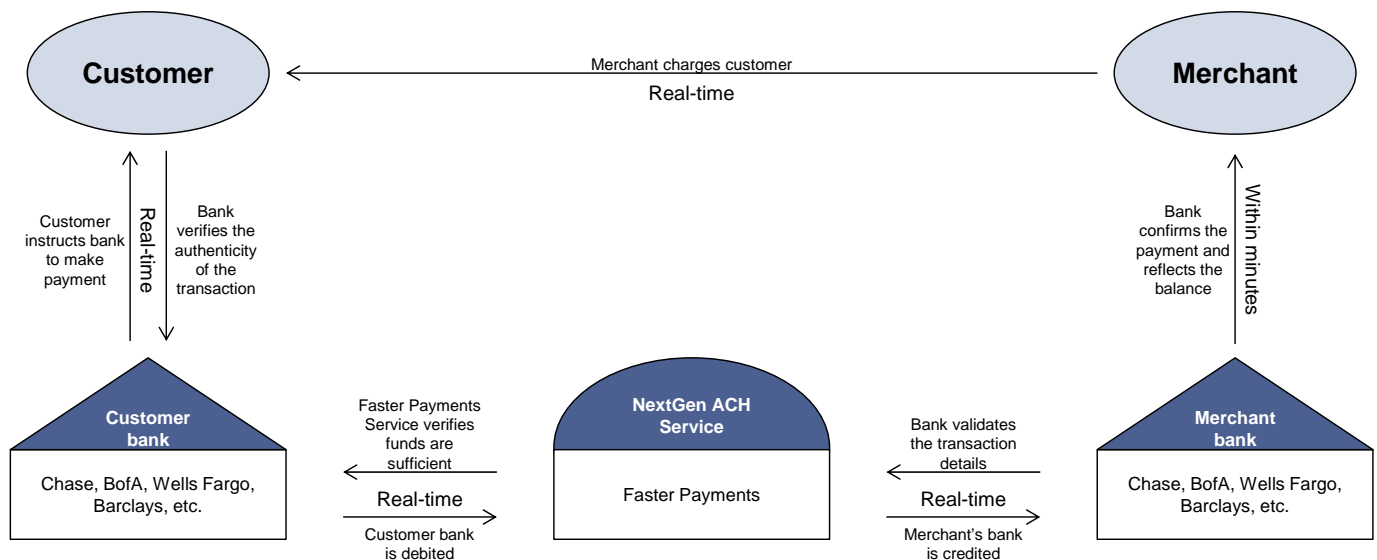
Technology Trend #1: Faster payment networks

What’s wrong with ACH, the current interbank payments network in the US? The system which connects banks to each other and the US Federal Reserve is known as the Automated Clearinghouse or ACH. Overseen by National Automated Clearinghouse Association (NACHA), the ACH system links depository institutions together. During the day, credit and debit transactions are forwarded between member banks on the network, and these transactions are accumulated and settled in a batch process at the end of each day. The ACH operator calculates the net debit and credits for each member bank, and each bank’s reserve account is adjusted by an appropriate amount at the US Federal Reserve, which acts as the settlement agent for member banks. In 2012, the ACH network processed more than 22 bn transactions with a total value of \$39 tn.

FIS and Fiserv provide technology solutions to small banks that connect them to payment processing networks like ACH

Currently, ACH network rules mandate that credit transactions settle between banks in two business days, with debit transactions settling the next business day. However, it may take up to three days for funds sent from one customer’s bank to be available for use by a customer of another bank. Despite the fact that the ACH network has been in operation for over 40 years, the long settlement times experienced by customers are not only technology related, and can occur due to: (1) the large number of small financial institutions in the US connected to the network; (2) procedures and policies instituted by banks to mitigate risk and fraud; (3) regulatory measures mandated by the government (including Know Your Customer and Anti-Money Laundering provisions) designed to prevent illegal activity.

Exhibit 2: Next-generation national payment networks use updated technology plus risk-scoring algorithms to transfer money between consumers and business in seconds or minutes, compared to 2 - 3 days currently



Source: Goldman Sachs Global Investment Research.

Dwolla, FIS, and Fiserv are providing upgraded real-time money transfer capabilities to banks

New payments networks are driving nearly instant flow of funds between banks. By using a mix of updated network technology – and more importantly, sophisticated risk-scoring and analytics techniques – several countries have begun to transform their interbank payment systems to provide for near-real-time (within minutes) transfers between banks. Notably, the UK’s Faster Payments Service (FPS) began operations in 2008 and cleared over GBP 770 bn of transactions in 2013. Singapore, Poland, and Nigeria have also established similar systems at a smaller scale. The US Federal Reserve is currently developing a roadmap for payment system modernization in the US. Although still in the consultation phase, we believe this process is likely to lead to the adoption of a more modern, near-real-time system for electronic funds transfer between US banks. Given the very large scale and complexity of the US banking system as well as our discussions with industry participants, we believe that such a system could be implemented in the US in a 5-10 year timeframe. In addition to providing greater convenience for consumers, we believe it could significantly reduce late and overdraft fees currently levied by banks.

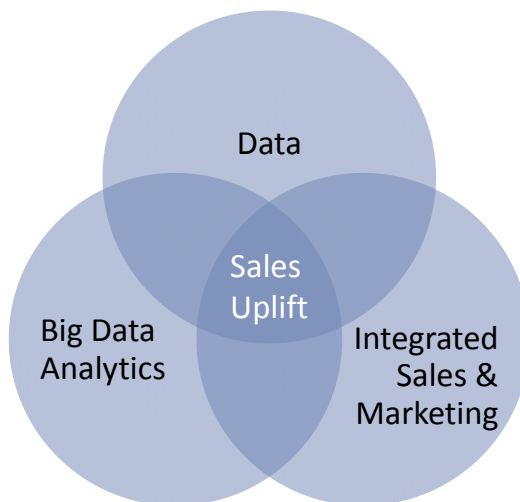
Cardlytics, APT, ShopKeep, and Womply are equipping merchants with analytics

Technology Trend #2: Big Data - Using data to drive increased sales

Big data, when combined with loyalty programs, could deliver a sales lift of 2% - 5% for merchants. Big data solutions are clearly still in their infancy, but early results among retailers are encouraging. McKinsey has noted that several of its clients in the grocery, drugstore, and do-it-yourself retail verticals have achieved sales uplifts of up to 3% - 5% with increased profit of 1% - 4% when using Big Data solutions. Dell reported that it achieved incremental revenue of \$200 mn in 2013, increased conversions by 30% and increased customer satisfaction by 30% following use of Big Data applications. Applied Predictive Technologies (APT), a provider of Big Data analytics software to the retail industry, cites several customer case studies where retailers using big data solutions to optimize retail space have achieved sales uplift of up to 2% with increased profit of up to 4%. We believe retailers will increasingly seek Big Data solutions to help boost sales and customer retention.

Card-linked offers are one concrete way merchants are leveraging Big Data to drive higher sales. Offers are tied directly a consumer’s debit or credit card (or mobile device), and consumers shop normally with no slowdown at the register. Consumers avoid all the hassle related to cutting and printing of paper coupons, mail-in rebates and related follow-up. Merchants benefit from the precise targeting of customers based on purchase history and enhancing sales and loyalty with high-value customers. Banks also see card-linked offers as a way of enhancing customer engagement and increasing wallet share.

Exhibit 3: Big Data combines analytics & marketing with datasets to drive higher sales

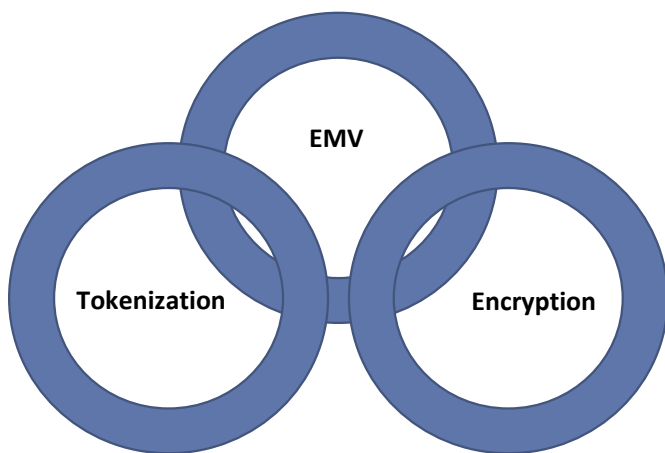


Source: Goldman Sachs Global Investment Research.

Technology Trend #3: Payment security and tokenization

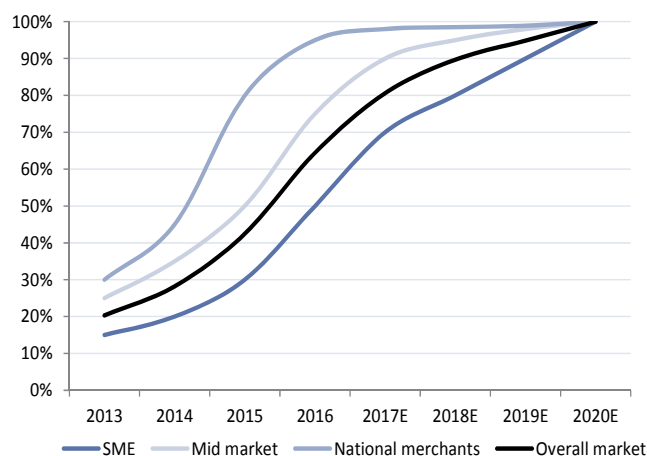
Payment security has moved to a top priority for retailers following data breaches. Cybersecurity became an extremely high-profile topic in 2013, and we believe interest has accelerated further in 2014 following a series of high-profile consumer data breaches at eBay, Target, Home Depot, and others. Given the magnitude of some of these breaches and the significant erosion in consumer confidence experienced by some retailers, we believe consumer data and transaction security has become a more prominent topic than ever before in corporate boardrooms. What was once perceived as a “cost of doing business” with an implementation timeline set by internal IT departments has now become a business imperative for merchants – with security programs now closely monitored by the C-suite.

Exhibit 4: EMV, tokenization, and encryption can enhance payment security



Source: Goldman Sachs Global Investment Research.

Exhibit 5: Large merchants are leading EMV adoption
Percentage of merchants by category enabled with EMV



Source: Goldman Sachs Global Investment Research.

Square, Revel Systems, and ShopKeep provide secure point-of-sale software and hardware solutions to merchants

We believe three complementary pieces of technology are required to provide maximum security in the payment ecosystem: EMV (chip cards), tokenization, and encryption. Each of these technologies addresses a different security vulnerability: **1) EMV or chip card technology** helps prevent the use of counterfeit cards; **2) tokenization** safeguards consumer data by breaking the link between a consumer’s identity and their financial account data; **3) encryption** ensures that account data cannot be “skimmed” or stolen at the point of sale or between points in a merchant’s data network. Although each of these technologies is helpful independently in reducing fraud and increasing data security, we believe all three need to operate together to ensure the highest possible level of security.

Tokenization is vital to new mobile payment methods like Apple Pay, and is being provided by payment networks including Visa, MasterCard, AmEx, and banks. Instead of providing the actual cardholder’s account number to the merchant, tokenization generates a substitute number for the purpose of the transaction which is used to communicate with the card network and member banks. Even if tokens are lost or stolen, they are of limited value as tokens carry defined constraints such as maximum transaction value. Tokenization is completely transparent to the consumer – and happens entirely in the software within the payment network. We believe the primary beneficiaries of US EMV adoption are traditional terminal vendors like **Verifone and Ingenico** which enable security at the point of sale.

Coinbase operates a regulated Bitcoin exchange in the US

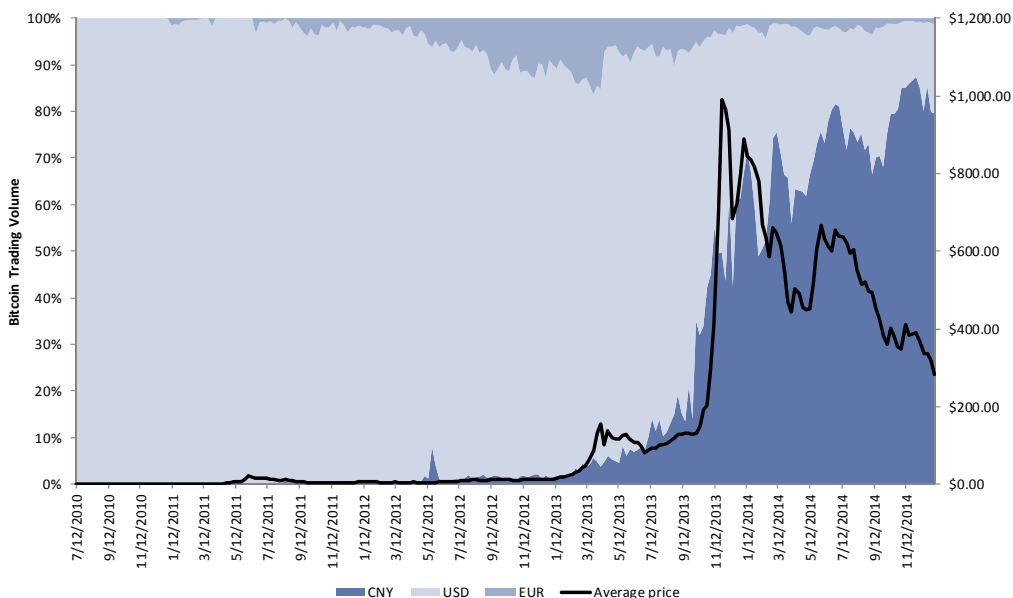
Bitpay allows merchants to accept Bitcoin payments online

Ripple Labs is creating new protocols for cross-border FX transfers

Technology Trend #4: Bitcoin - the era of “pervasive cryptography”

What is Bitcoin? Bitcoin is a decentralized, peer-to-peer network that allows for the proof and transfer of ownership without the need for a trusted third party. The unit of the network is bitcoin (with a little “b”), or BTC, which many consider a commodity or a form of currency. The Bitcoin network was conceived in 2008 and launched in 2009. The network is based on a series of mathematical computations, and people around the world called “miners” who perform sophisticated computations to generate bitcoins. The formula and software are freely available for anyone to use. There is a finite amount of bitcoins that can be produced and as more bitcoins are created, the mathematical computations required to create more become increasingly difficult. Bitcoin can be traded or used to buy goods and services. Bitcoin transactions are recorded in the “block chain” – a massive and transparent ledger of all bitcoin transactions maintained by miners. There is no central authority that oversees Bitcoin. Importantly, there are many other cryptocurrencies that operate similarly to Bitcoin and are used for a specific purpose, which we detail later in the report.

Exhibit 6: About 80% of Bitcoin exchange volume is now driven by the Chinese yuan
Bitcoin trading volume breakdown by the top 3 currencies



Source: *Bitcoinity.org, Goldman Sachs Global Investment Research.*

How could Bitcoin change the payments landscape? Rather than using a centralized clearing system operated by a single authority (such as the government, a federation of banks, or a single payment network), Bitcoin and other cryptocurrencies use distributed computing power to clear and authenticate transactions between counterparties. In the context of business-to-consumer purchase transactions, merchants would still likely need a “merchant acquirer” or a processor to act as a service provider to handle payments. Without a single large entity such as a large bank or payment network acting as an intermediary for processing transactions, competition between payment processors could in principle be increased significantly, potentially resulting in lower processing fees. Similarly, in consumer-to-consumer money transmission, foreign exchange fees could also be potentially reduced.

Key Shaping Trend #2: Regulation

Over the years in developed markets, national governments have imposed significant restrictions on banks and their ability to issue credit and debit card products. These regulatory trends are detailed in each of our Future of Finance reports. In many cases, they create a competitive gap in the costs at which banks can offer financial products relative to smaller, less regulated peers including technology and internet companies.

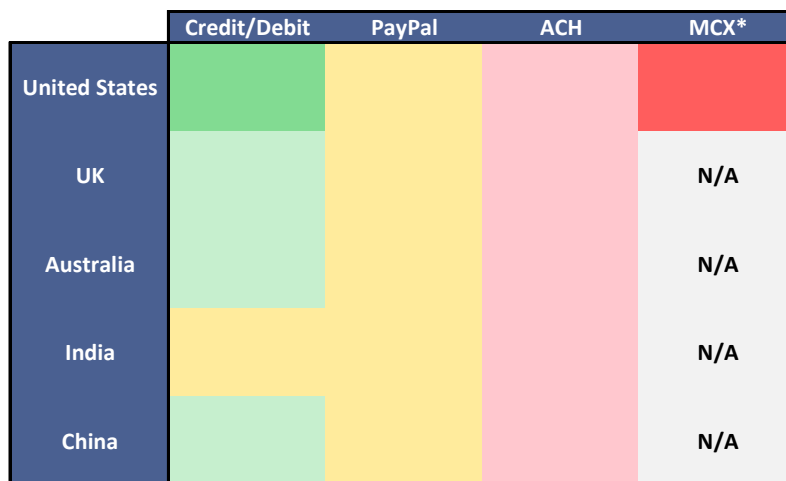
Regulatory Trend #1: Consumer liability and fraud protection

Credit & debit incumbents offer significant consumer protection relative to most emerging payments methods

Consumer fraud liability: Even though banks are subject to significant regulatory costs related to the issuance of credit and debit cards, they also provide a number of important protections that are attractive to consumers. Most important, US banks are subject to a number of federal lending and electronic banking rules which limit consumers’ liability for unauthorized or fraudulent use of their account (i.e., consumer liability). In many cases, consumers in the US and other geographies are subject to zero liability on authorized or fraudulent transactions made without their knowledge – although this varies by country.

Chargebacks: Consumers in the US and other geographies are also afforded significant protections against merchants who do not deliver goods as advertised, or who deliver unsatisfactory goods to the consumer. This is called a “chargeback,” and the transaction is typically immediately credited to a consumer’s account pending an investigation by the card-issuing bank. Relative to most other emerging payment forms, conventional credit and debit cards offer consumers substantial financial protections – which we believe may make them relatively difficult to displace, especially for longstanding users.

Exhibit 7: Conventional credit and debit cards afford substantial consumer protections relative to some emerging payment forms



Strong consumer protection **Weak consumer protection**

**MCX data is based on CurrentC pilot program rules
 Note: Factors used to gauge relative consumer protection include terms related to consumer liability for unauthorized charges and chargeback/refunds*

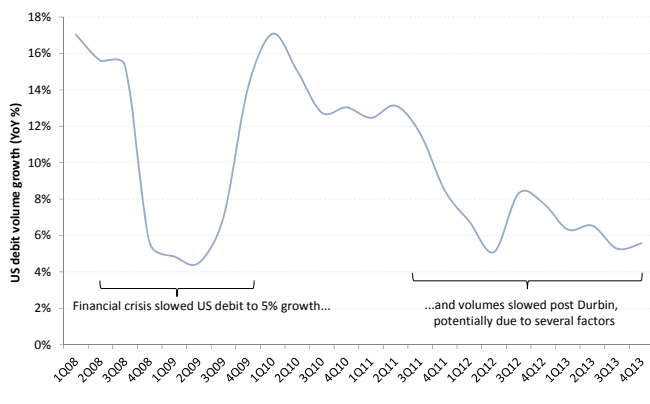
Source: Company data, Goldman Sachs Global Investment Research.

Regulatory Trend #2: Interchange fee rules

US debit interchange caps have changed the mix of payments. As part of the Dodd-Frank financial reform legislation in the United States, Congress regulated the interchange fees charged by banks for consumer card transactions (see B2C Payments section). Recall that banks – not Visa and MasterCard – collect interchange fees. However, interchange rates can impact the types and mix of cards banks issue – and hence the consumer transaction behavior that results. The so-called “Durbin amendment” constrained interchange fees for debit transactions (credit interchange was left untouched). The text of the original legislation left the Federal Reserve to set specific fee caps, and the Fed subsequently went through several iterations of fee rules. Although these rules were challenged in court by merchants (led by Wal-Mart) as being excessive, they were ultimately upheld by the US Supreme Court. Most notably, the rules cut debit interchange fees by nearly 70% – capping debit interchange fees at \$0.22 + 5 bps of transaction value. Among other things, these fee reductions led US banks to largely eliminate “debit rewards” designed to incentivize debit card use. Over time, US banks have gradually shifted the mix of card usage toward credit, in part through the use of rewards programs.

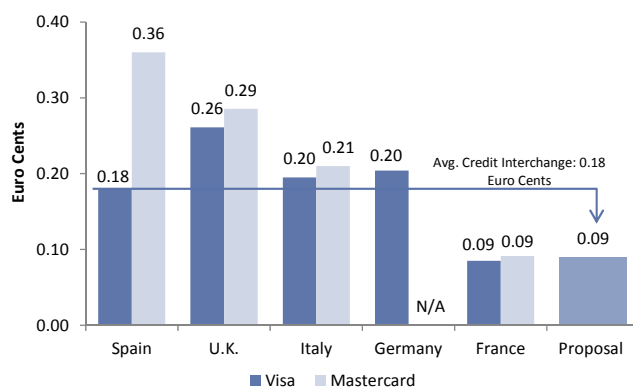
Next step: EU interchange and bundling rules. Interchange fees have received similar scrutiny by the European Commission (EC). In January 2015, the European Parliament endorsed draft rules that would cap the debit interchange fees at a flat rate 20 bps of transaction value or 0.05 EUR, whichever is lower. Credit transactions would be capped at a flat rate of 30 bps. This fee cap is constant across all forms of debit and credit, including PIN debit, signature debit, and card-not-present (CNP) transactions. The European Parliament will vote on the draft rules when it convenes in April 2015. These provisions would take effect six months after the legislation is passed. Perhaps more important, the proposed rules may impose “unbundling” requirements between card brand pricing and switching/processing that could drive share shifts in processing revenue. These rules would take effect 12 months after the legislation is passed.

Exhibit 8: US debit volume growth slowed post Durbin...
Includes estimated volume shifted to regional debit networks



Source: Nilson, company data, Goldman Sachs Global Investment Research.

Exhibit 9: Proposed EU rules would cut rates in half
Assumes a transaction value of 30 Euro



Source: Company data, Goldman Sachs Global Investment Research.

Further interchange regulation – particularly around US credit – represents a risk. Although there has been no recent action in the US Congress to regulate credit interchange rates, we recognize this as a long-term potential risk for banks and payment networks. Although the card networks do not receive any portion of interchange fees, we believe the network fees for US credit transactions are among the highest rates for different transaction types – and thus a reduction in US credit interchange fees could result in a long-term degradation in overall spreads they can capture in the future.

Regulatory Trend #3: Anti-money laundering (AML) and fraud rules

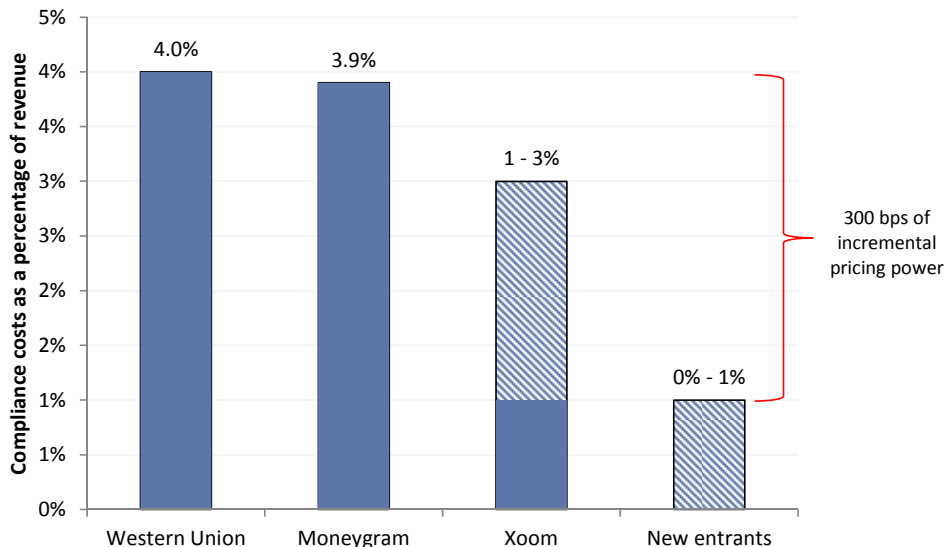
Over the past ten years, governments' increasing focus on combating terrorism and drug enforcement has driven significant regulatory scrutiny in the area of consumer-to-consumer (C2C) payments, especially across international borders. Compliance with the US Bank Secrecy Act as well as other international regulations has required that many money transmitters enforce so-called "Know Your Customer" (KYC) protocols to ensure proper identification and traceability for individuals moving money. These protocols have driven regulatory burdens higher for many players in the space, most notably large banks and established money transmitters.

Xoom, WorldRemit, TransferWise, Currency Fair, and other emerging remittance players are innovating with new approaches to money transfer

Large money transmitters carry a higher regulatory burden than startups

As mentioned above, a variety of regulations on the national and state levels has driven increased compliance costs for a variety of banks and established money transmitters. In some cases, specific incidents involving affiliated local money transfer agents (affiliated with Western Union) have resulted in additional ongoing regulatory and enforcement costs. As a result, a notable "regulatory umbrella" has developed between large, established money transmitters (such as Western Union and MoneyGram) and niche technology startups who offer domestic or cross-border money transfer services. We estimate this burden is as high as 4% of sales for Western Union, and below 1% for some emerging money transfer players. As a result, we believe small-scale money transmitters may be able to price more aggressively in the market.

Exhibit 10: Regulatory costs for larger money transmitters creates "regulatory umbrella" below which emerging peers can offer more competitive pricing



Source: Company data, Goldman Sachs Global Investment Research.

Key Shaping Trend #3: Demographics

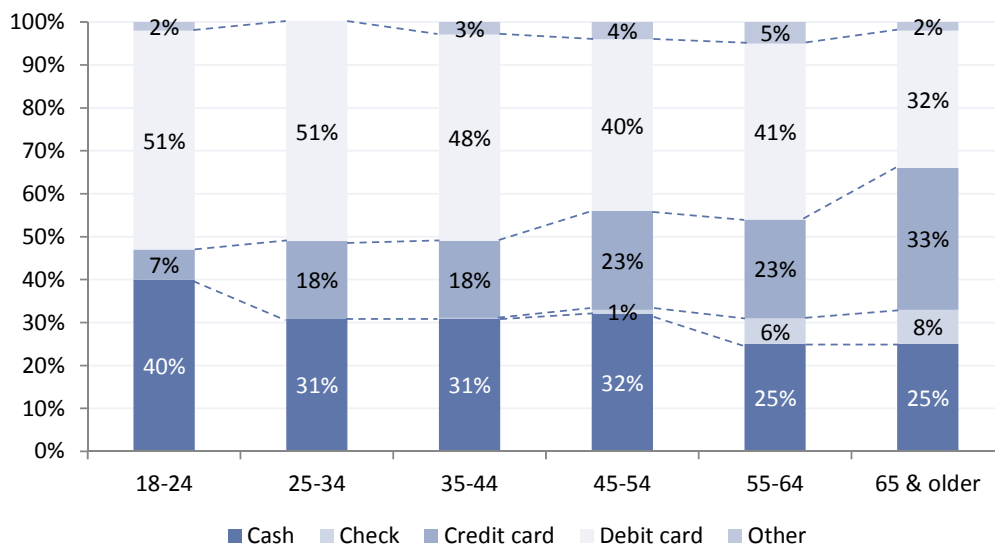
Perhaps even more than technology, one of the most compelling changes impacting the payments industry is demographics. As technology evolves, so too does the comfort level of different demographics with the latest technology – from PCs to mobile devices such as smartphones and tablets, and from cash to plastic to mobile payments. As consumers age, they become wealthier – and this also impacts their spending capacity and credit worthiness. We examine some of the potentially disruptive effects of these shifts.

Venmo, Square, and Popmoney (Fiserv) provide mobile money transfer services which are popular among Millennials

Coming of Age: The story of Millennials, Gen X, and Baby Boomers

Consumers’ financial habits change as they age. As they get older, personal income grows and personal wealth is gradually amassed – which drives differences in consumers’ interactions with banks over time. As a consumer’s relationship with a bank changes, changes in payment preferences follow. A 2013 study of US consumers by the US Federal Reserve yielded some surprising results. In contrast to the conventional wisdom that older consumers use far more cash because they are not conditioned to use electronic payments, younger consumers actually use the most cash (40% of transactions) relative to all other age groups – and among the demographics using the largest fraction of electronic payments is consumers ages 65 and up. Perhaps not surprisingly, consumers aged 65+ use credit cards nearly 5X more often than ages 18-24. However, debit card usage is far greater among consumers ages 18-34 (at 51%) relative to older consumers.

Exhibit 11: Somewhat surprisingly, consumers ages 18-24 use the most cash. Less of a surprise is that younger consumers use more debit. Consumers ages 65+ use by far the most credit.

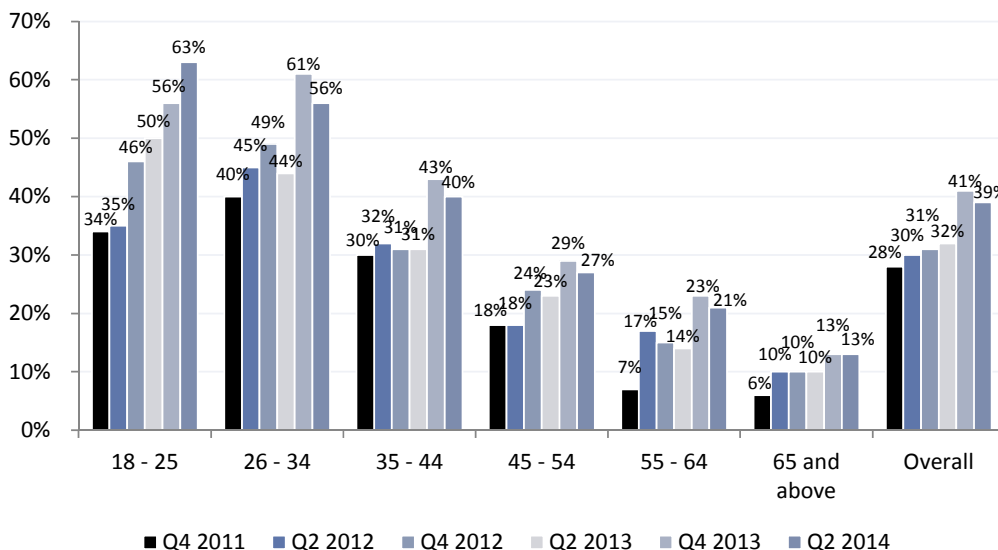


Source: US Federal Reserve.

Not surprisingly, there are significant differences in adoption rates for the use of mobile payment services by age – with over 60% of users aged 18-25 having made at least one money-related transaction with their mobile device in the past month relative to just 13% for consumers over 65 (as of 2Q14). However, even within age cohorts there have been significant shifts that have occurred within just 30 months. For example, the fraction of consumers using mobile payments methods has nearly doubled for ages 18-25 – and this

increase has been even more dramatic for other cohorts such as consumers aged 55-64, where mobile payment usage has tripled to 21% (albeit from a low base) over that same timeframe. This suggests to us that the adoption is technologies – even within age cohorts – is rapidly evolving and is far from static.

Exhibit 12: Percentage of banked smartphone/tablet owners who have performed at least one mobile money-related transaction in the past month

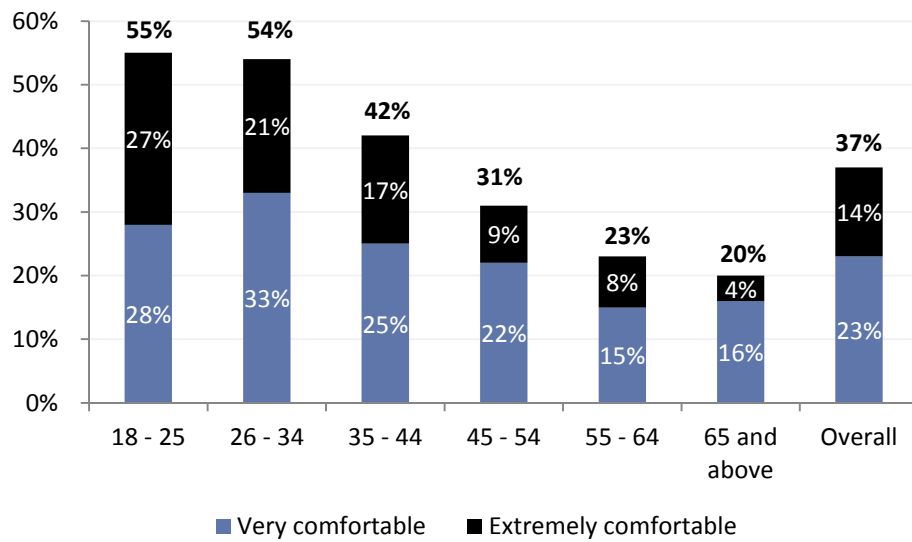


Source: AlixPartners.

The comfort with public availability of personal information is one area that is perhaps driven more by generational and cultural factors than any other. A recent study of US consumers by AlixPartners showed that about 55% of respondents under 35 were “very comfortable” or “extremely comfortable” with sharing personal data with companies in exchange for offers or rewards. This fraction drops significantly to 42% for ages 35-44 and to 31% for ages 45-54. Perhaps most notably, this drop coincides with the generations known as Millennials (born between 1980 and 2000) and Generation X (born between the early 1960s and the early 1980s). This suggests to us that younger consumers, for reasons beyond considerations of income, are more likely to respond to rewards and offers from corporate advertisers or social media companies.

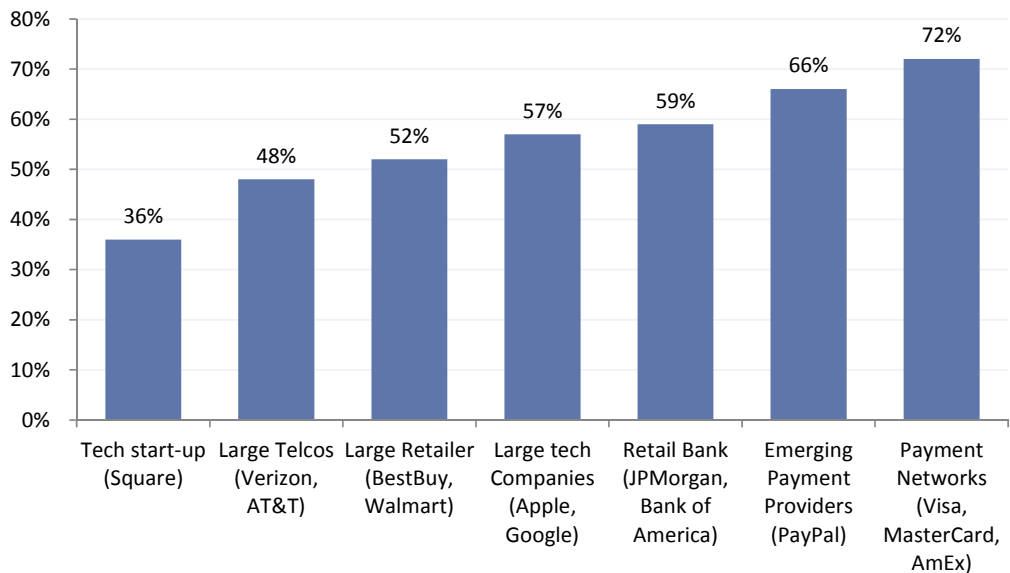
In terms of vendor preferences for mobile wallets and mobile payments, we believe recent consumer survey work from Accenture yields some interesting observations. Consumers still view credit card networks as top providers – with 72% of respondents preferring Visa, MasterCard, or AmEx. However, emerging payment providers with scale such as PayPal are not far behind (at 66% of respondents) – and notably are ahead of retail banks (at 59%), large technology companies like Apple and Google (at 57%), retailers (at 52%), and wireless carriers (at 48%).

Exhibit 13: Consumers under 35 display a significantly greater willingness to provide personal data in exchange for rewards



Source: AlixPartners.

Exhibit 14: Traditional payment networks lead consumer preferences for mobile, but PayPal and other challengers are not far behind



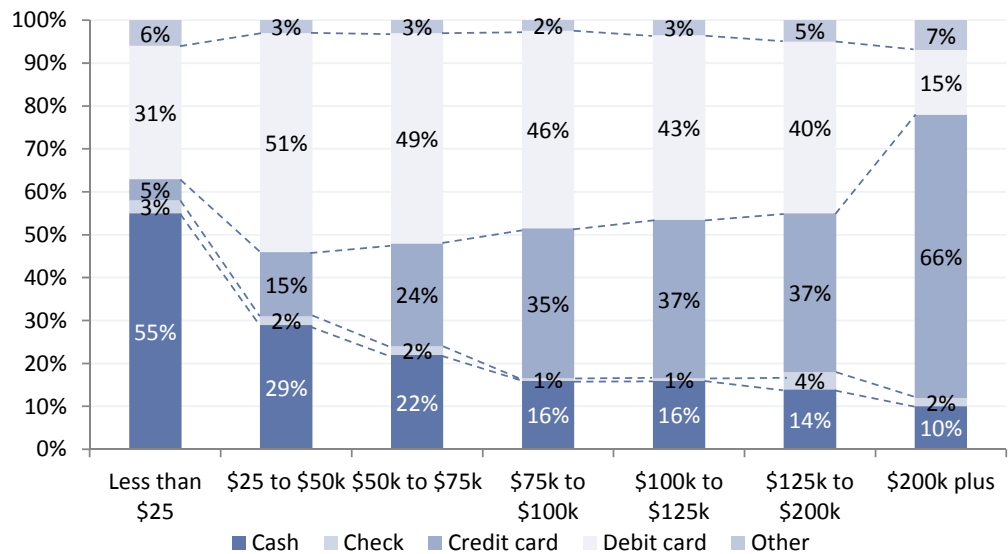
Source: Accenture, North America Consumer Payments Survey, 2014

Income: The wealthy, the unbanked, and the under-served

In the US, there is a notable divergence in payment preference by income group. Even more than age, income dictates payment preferences among consumers in the US. Data from the US Federal Reserve shows that low-income consumers use far more cash

than any other demographic, with 55% preferring cash. In part, we believe this reflects the relatively large proportion of US consumers in this category who are unbanked or under-banked. The preference for cash declines dramatically as income grows, to just 10% for incomes over \$200k. For many of the same reasons, there is a similar discrepancy for credit card use, where just 5% of consumers with incomes under \$25k expressed a preference for credit cards, growing to 66% for incomes over \$200k. Although debit preference is far more stable across income groups (especially among those with moderate incomes), there is a significant tail-off for both low-income consumers (just 31% for incomes under \$25k) as well as high-income consumers (just 15% for incomes over \$200k). Among low-income consumers, we would attribute this gap to a lack of banking services. However, among high-income consumers, we would attribute this downshift to much higher yield consumer incentives and rewards programs tier to credit card products vs. other payment forms.

Exhibit 15: Significant payment preference gaps exist among income levels in the US, with low-income individuals expressing a strong preference for cash and high-income for credit

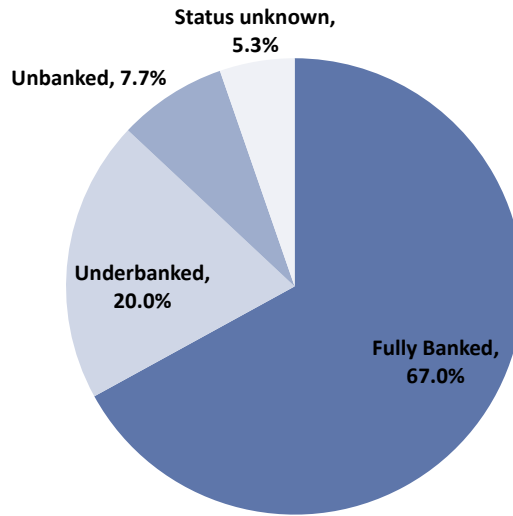


Source: US Federal Reserve.

28% of adults in the US are unbanked or under-banked.

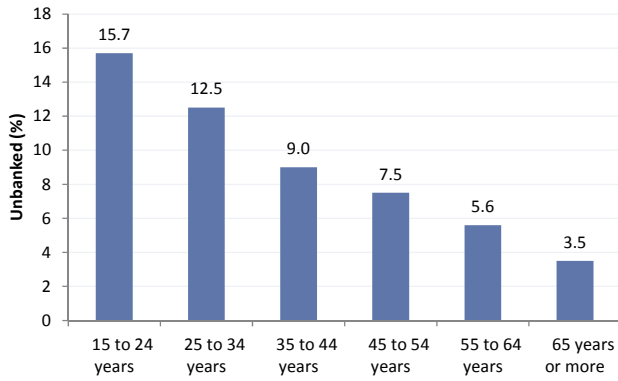
Since the financial crisis, low-income individuals have been an increasing source of focus for payments companies and the banking system. A 2013 FDIC survey shows that nearly 8% of adults in the US are unbanked, with no access to a retail banking account. Fully 20% of US adults are under-banked, which is defined as individuals which have a bank account but that rely heavily on non-traditional financial services such as payday loans and check cashing services. When unbanked individuals were asked the reasons why they do not have a bank account, the largest proportion – 39% - said that they do not have enough money to maintain a bank account. 15% stated that they do not like dealing with banks as a primary reason, and 13% cited high fees as the main reason.

Exhibit 16: Approximately 28% of US consumers are either unbanked or under-banked



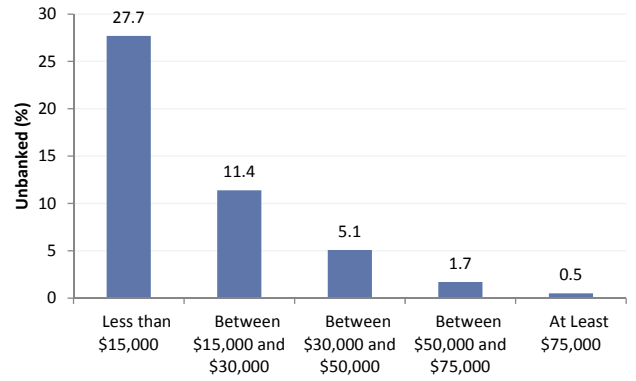
Source: FDIC.

Exhibit 17: Young adults are the most unbanked
US unbanked- by age group



Source: FDIC.

Exhibit 18: Low income groups are the most unbanked
US unbanked- by income bracket



Source: FDIC.

Key Shaping Trend #4: International

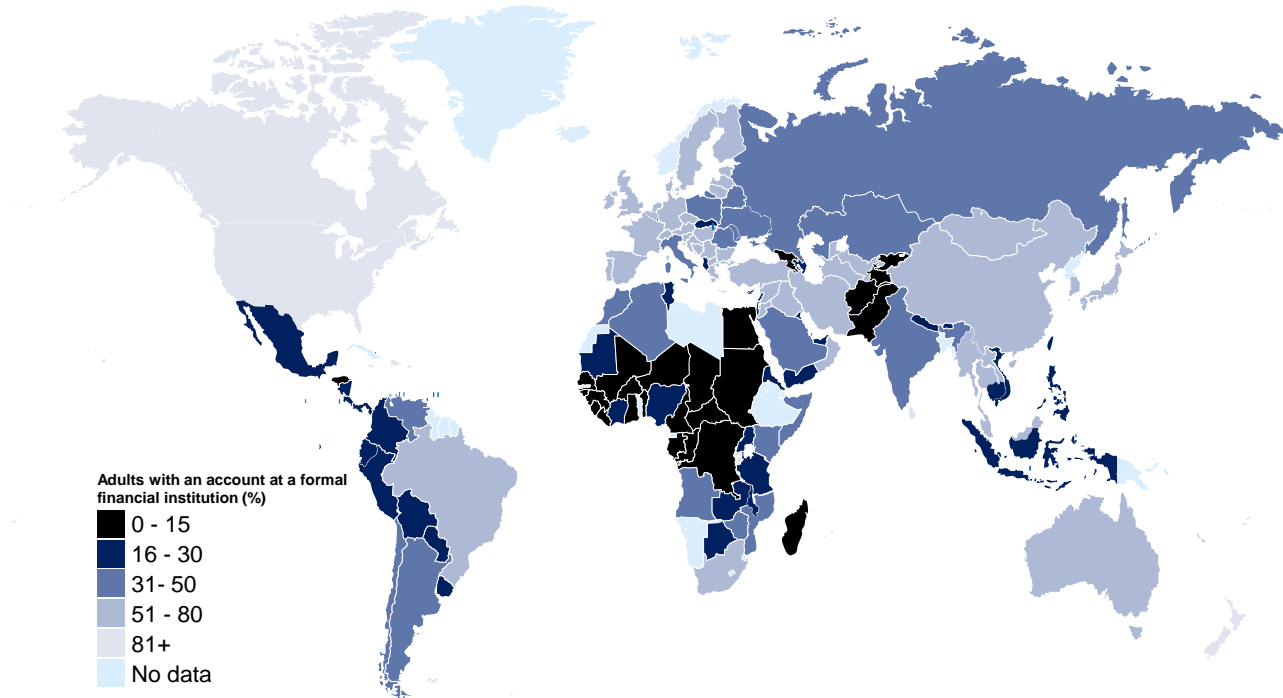
The US remains the global innovation leader in the technology sector, including in payments. However, local conditions – including legacy infrastructure, regulation, customer spending patterns, and cultural norms – will dictate the adoption of these technologies. In emerging markets, large groups of unbanked and under-banked individuals are driving the adoption of new technologies ahead of their counterparts in the developed world. As a result, most payment solutions tend to be local or regional in nature, except for a few cases like PayPal which enjoys wide acceptance in many countries.

50% of the world population is without access to financial services

MPesa (Vodafone and Safaricom) provide mobile money services for the world's under-banked

Access to a bank account is one of the most basic needs in developed markets like US and Western Europe. However, the World Bank estimates that more than 50% of the global population (over the age of 15) does not have access to basic financial services. In many emerging markets, sizeable “shadow economies” exist which operate entirely on cash. These “shadow economies” comprise legal activities – including retail sales and employment – which are unreported or under-reported for the purposes of tax avoidance.

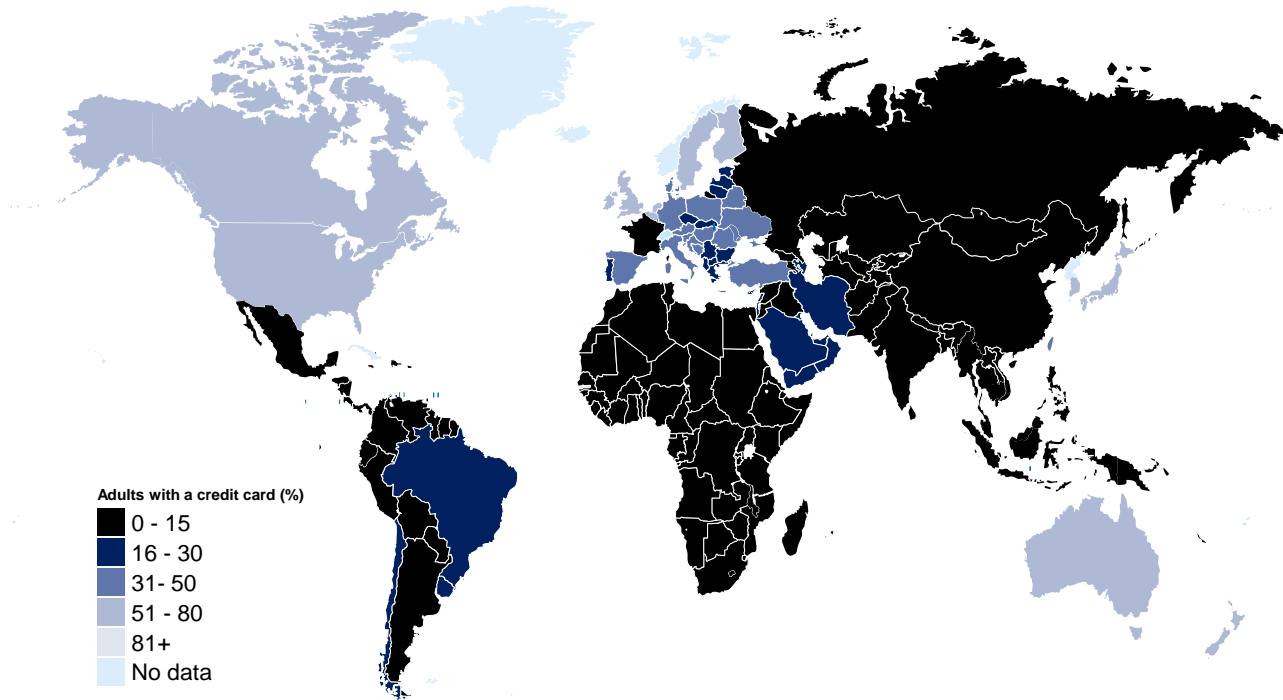
Exhibit 19: Africa and Asia remain the least penetrated financial services markets
 Adults with an account at a formal financial institution



Source: World Bank.

Exhibit 20: Credit penetration remains low outside US and developed Europe

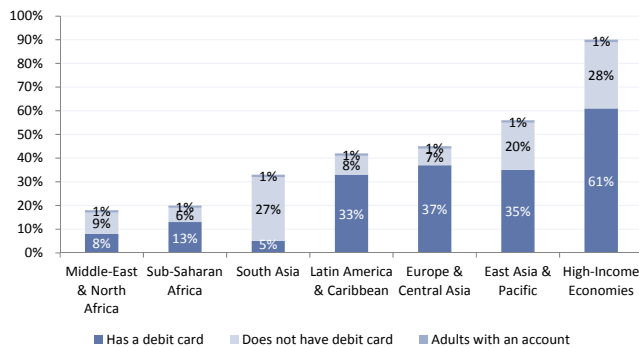
Adults with a credit card



Source: World Bank.

Exhibit 21: Africa and Asia have low debit card ownership

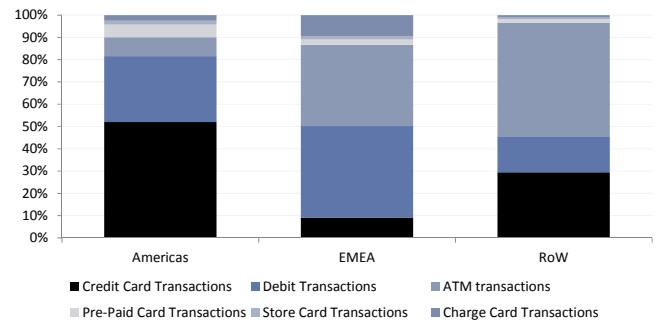
Adults with a formal account by debit card use



Source: World Bank.

Exhibit 22: Credit dominates in the US, while debit remains the primary method in EMEA

% of cards transactions by format



Source: Eurostat.

Developed markets have highest adoption of electronic payments

In select economically developed markets such as the United States, Scandinavia, and the UK, there has been a substantial shift away from paper forms of payment (cash and checks) toward electronic payments – and in particular credit and debit cards – over the past 20 years. However even today, we estimate that over 50% of global consumer transactions are still conducted with paper payment methods.

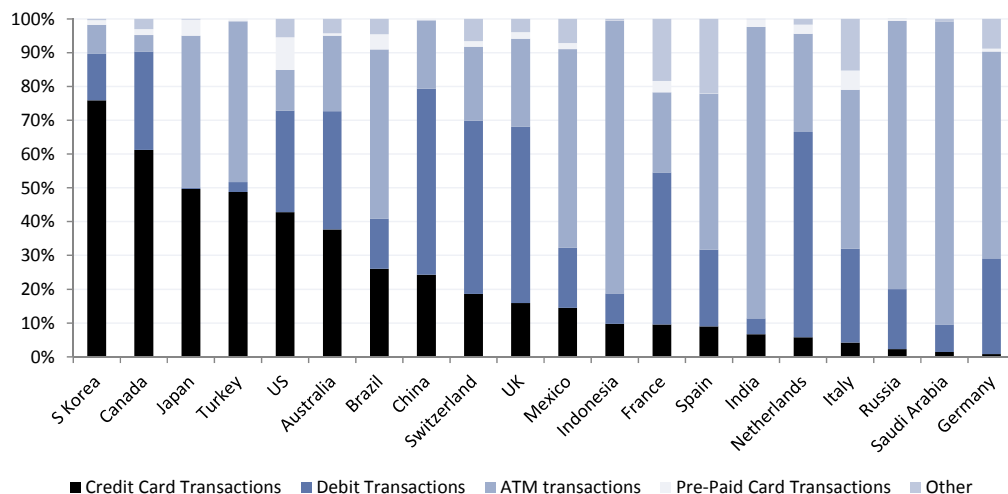
The shift toward electronic payments in developed markets has been largely driven by consumer-perceived benefits such as greater convenience relative to handling cash and bank/merchant-financed rewards for using cards. Although the penetration of electronic

payments in emerging markets is still small, government-driven initiatives (for raising tax revenue and reducing shadow economy) are accelerating the move.

We estimate that in 2014, about 30% of the growth in card-based payments came from seven emerging markets within the top 20 largest economies by GDP, namely China, Brazil, India, Russia, Indonesia, and Mexico. At the same time, over 50% of this growth was driven by a mix of countries (both developed and emerging) which comprise the other 20% of global GDP not captured by the top 20. Roughly 20% of this growth is coming from traditional developed markets within the top 20 GDP countries.

Exhibit 23: Developed markets have high adoption of electronic payments

Transactions by payment format



Source: Eurostat.

The mix of credit and debit varies based on culture and regulation

Historical consumer spending patterns vary widely different across key geographies. While the US is one of the biggest users of consumer credit, Europeans tend to largely use debit for most consumer transactions.

Credit cards in the US offer more protection and less risk to consumers because funds are not being directly withdrawn from the user’s bank account as they are with a debit card. Along with bank- and merchant-financed rewards programs, we view these consumer protection regulations as key reasons for the higher adoption of credit cards in the US.

Connecting megatrends to payment channels

Although there are multiple ways to classify payments, we believe they are best discussed in terms of commercial channels, each with its own characteristics and participants. We identify B2C (Business to Consumer), C2C (Consumer to Consumer), and B2B (Business to Business) as the three main payment channels based on market participants and underlying funding mechanisms. In the context of the megatrends we have identified (technology, regulation, and demographics), we see technology as most actively shaping C2C payments, with regulation, demographics, and technology impacting B2C and B2B in various ways.

B2C: Incumbents are deeply entrenched, but continue to innovate

The B2C payments market is perhaps the most difficult to predict because of the multiple sets of competing incentives for merchants and consumers. On one hand, merchants seek to maximize their sales while simultaneously minimizing their costs – making payments a utility and a cost center for most. On the other hand, consumers want incentives in return for their shopping dollar, as well maximum convenience and protection against fraud and unauthorized charges – and these features largely explain the dominant market position which banks and networks like **Visa, MasterCard, and AmEx** have in the market.

Demographics and technology are key trends that we believe could shift the B2B landscape in the future, allowing for emerging players like **Square, PayPal, and Seamless** to gain market share. However, we believe regulation is the main trend dictating the prospects of incumbent payment providers in the long term. In the absence of significant regulatory changes, we believe banks and networks remain well positioned in the market – especially in light of their continued innovation with initiatives such as Apple Pay.

C2C: A fast-moving market with significant disruption potential

C2C payments involve consumers directly transacting with each other using technology infrastructure provided mainly by banks. Technology and demographics are shaping C2C payments, with new technologies like “Instant ACH” allowing for real-time transfers between consumer bank accounts, and mobile apps like **Venmo and Square Cash** being adopted by tech-savvy Millennials for everyday transactions between friends. Disruptive technologies provided by **Dwolla** promise to replace existing infrastructure to make payments faster. Although Bitcoin and other cryptocurrencies are still in the early stages of development, they could gain traction once clear use cases become more established. International money transfers are the only real revenue opportunity for market disruptors in C2C payments, with innovators like **TransferWise and Bitcoin** exchanges leading the way.

B2B: Slow-moving market, but a greenfield market for payments

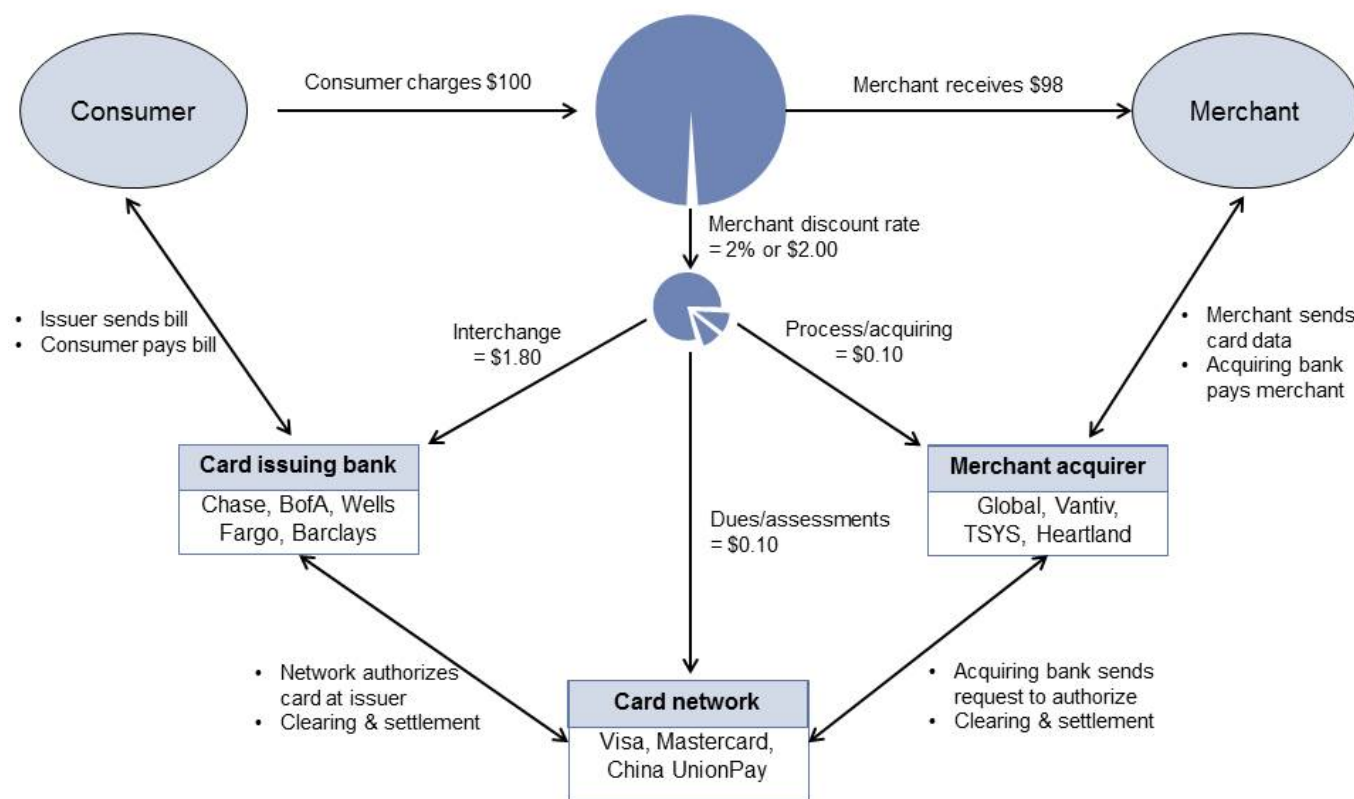
B2B payments mainly involve businesses, and tend to move very slowly given the significant time and cost required to change technology infrastructure. Although technology and demographics have a very gradual impact, regulation is the biggest potential catalyst of change in the segment. We see a significant shift from paper payments (such as checks) to electronic formats in the long run. Integration challenges and a shortage of IT resources for implementation are cited as key reasons for slower change in B2B channels. As new electronic products like virtual cards come to market and as IT Services and BPO vendors accelerate their investments in this space, adoption among businesses should drive significant opportunities for **WEX, FleetCor** and various **IT Services vendors**.

B2C Incumbents: An overview of today's credit & debit ecosystem

How the four-party system works for credit and debit. In any merchant credit transaction, the exchange of goods for payment involves the delivery of goods to the consumer by the merchant, as well as delivery of payment to the merchant. Both activities involve certain risks, such as product delivery risk (the merchant fails to deliver), credit risk (the customer is unable to pay), and fraud risk (by either consumer or merchant). In the event where the merchant itself is fraudulent or processes fraudulent transactions, the merchant acquirer is responsible for the transaction cost. This happens most frequently when an online merchant account is established with false documentation. If a counterfeit physical credit card is used to make a purchase which is properly validated by the card network, the issuing bank is liable for the amount due the merchant.

Exhibit 24: Overview of information and money flow in the four-party payment ecosystem

Information and money flow through the payments value chain



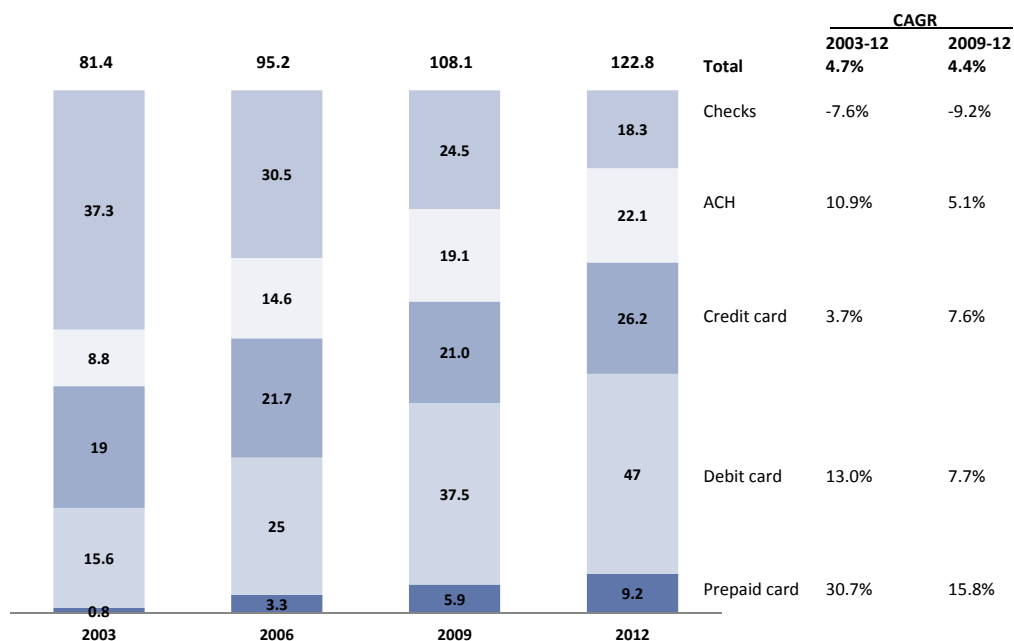
Source: Company data, Goldman Sachs Global Investment Research.

Consumer convenience and universal acceptance: keys to the early growth of the payment networks. The need for a system where banks can easily communicate and process credit card transactions gave rise to credit card networks such as Visa and MasterCard, which began as bank-owned associations facilitating authorization, clearing, and settlement among member banks. As interstate and international travel grew, so did the role of the credit card networks. The fact that credit card networks began as bank-

owned institutions is critical to understanding how credit cards gained such wide acceptance among consumers and how they operate. Credit card networks operate as associations of member banks, which “sponsor” their affiliates on the network. Merchant acquirers are responsible for vetting the credibility of their merchant clients, and bear ultimate financial responsibility if they behave improperly. Merchant acquirers can also use ISOs (independent sales organizations) as a sales channel to recruit merchants. Similarly, card issuing banks extend credit to consumers, and are financially responsible in the event consumers are unable to pay for their purchases.

Perhaps more important, the card network associations established a number of rules which bind merchants accepting credit cards, in order to ensure both consumer acceptance of credit cards as a form of payment, as well as the equitable treatment of all banks that are part of the network. Ultimately, these rules were key to the early expansion of credit card acceptance in the United States given the convenience of using electronic payments and the lack of additional charges for doing so (for consumers), the incremental sales (and higher ticket rate per transaction) generated (for merchants), and fees and interest generated from greater consumer credit balances (for issuing banks). In the US, this system has resulted in a dramatic increase in electronic forms of payment over the past 20 years. We expect this to continue globally, with growth in electronic payments of about 13% through 2018.

Exhibit 25: US credit and debit card transactions continue to climb at high-single-digit rates – with prepaid growing at double this rate – while checks are still in rapid decline
 Number of US transactions, in billions



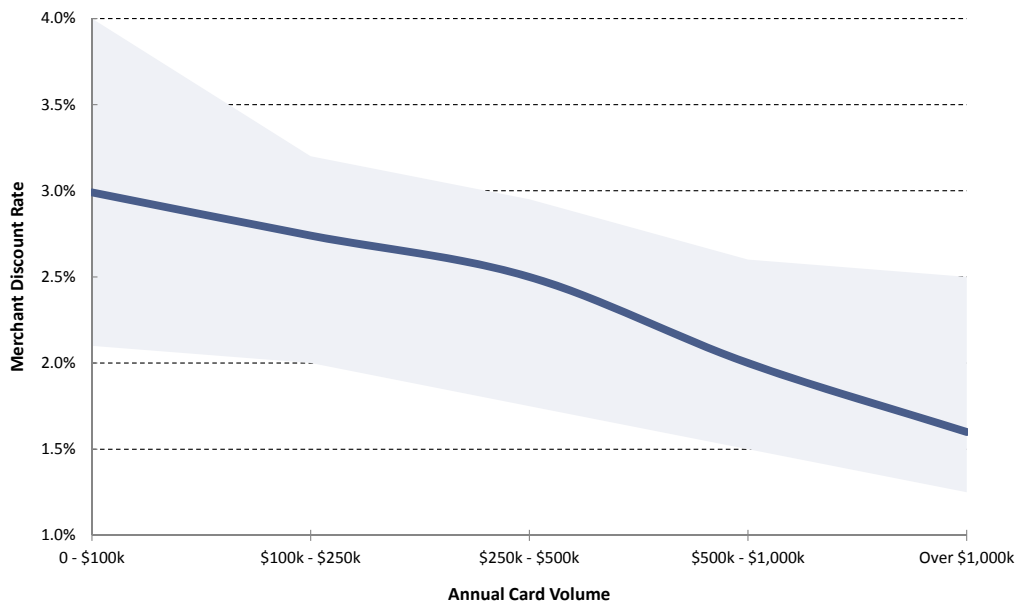
Source: United States Federal Reserve.

How does the credit and debit network ecosystem make money?

MDR feeds the ecosystem: The current electronic payment ecosystem is funded indirectly through the Merchant Discount Rate (MDR), a fee embedded in the sales price of products purchased at a retailer. The merchant discount rate encompasses all the transaction-related fees associated with processing, settling, and clearing a transaction – and is subtracted from the total amount paid by the consumer when payment is remitted to the merchant.

The MDR is negotiated between a merchant acquirer and a merchant, and varies based on the merchant’s purchase volume.

Exhibit 26: The merchant discount rate paid by merchants varies by volume



Source: Electronic Transaction Association (ETA), Goldman Sachs Global Investment Research.

The MDR is composed of the following fees:

- Interchange** – Interchange typically comprises the largest portion of the MDR in a transaction, and is intended to cover the cost of cardholder charge-offs and most credit card fraud. At the low end, interchange ranges between a flat fee of \$0.23 (for a debit transaction), and 2.95% at the high end (when a premium high-end credit card is used). Interchange rates for various transaction and card types are set by the card networks, although issuing banks receive the entire interchange fee. **Visa and MasterCard do not receive any portion of the interchange fee. Interchange received the greatest scrutiny of any aspect of the electronic payment ecosystem.** As part of the Dodd-Frank financial reform legislation in the US, Congress regulated the fees charged by banks for consumer debit transactions.
- Network and data processing fee** – The network fee is charged by the card network for routing the transaction, typically 4 – 25 bps of the purchase price.
- Merchant acquiring/processing fees** – The processing fee is charged by the merchant’s credit card processor for transaction handling and clearing on the merchant side, and is typically assessed as a fixed fee (for example \$0.003 - \$0.10 per transaction). The acquiring fee is charged by the merchant’s acquiring bank for handling and settling the transaction, and is intended to cover costs related to settling transaction balances with merchants, as well as the cost of merchant fraud.

Players in the four-party system: Card networks and card issuers

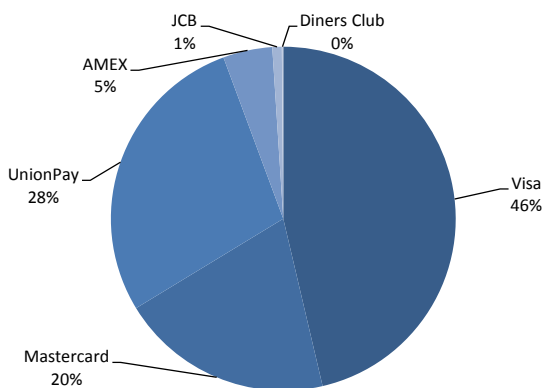
The role of card networks is to seamlessly connect issuing and merchant acquiring banks, and to securely process, route, and verify merchant transactions as quickly as possible. Payment network operators derive income from **1) transaction fees** on purchase volumes carrying their brand; **2) data processing fees** on credit and debit transactions routed through their network; **3) international transaction and foreign exchange fees** on cross-border transactions processed through the network:

- **Visa:** The largest card network, with 62% of worldwide transactions processed in 2013. Notably, Visa operates independently from Visa Europe, which operates as a bank-owned network within Europe. Visa does not derive any transaction revenue directly from Visa Europe, though their processing networks interoperate seamlessly.
- **MasterCard:** The second-largest card network with 26% of global volume, MasterCard has significantly greater exposure to Europe (given Visa’s separation from Visa Europe) than Visa.
- **UnionPay:** UnionPay is a bank-owned card network based in China, the third largest network globally. UnionPay has a reciprocal agreement with Discover that accepts Discover at merchants in China which accept UnionPay, and accepts UnionPay at merchants in the US and Canada which accept Discover.

Bank credit issuer & network operators derive revenue from the same sources as card networks, as well as 1) interchange fees collected by issuing banks; 2) interest charges on outstanding customer credit balances; 3) license fees paid by third-party issuers of network-branded cards (for example, AMEX issued by Bank of America):

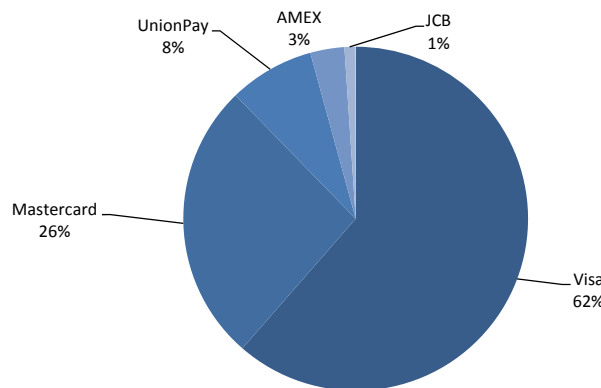
- **American Express:** Operating as the largest card-issuing network globally, AMEX also offers a range business and consumer financial products.
- **Discover:** Discover offers a variety of consumer lending services (70% of sales) as well as issuing branded credit cards (30% of sales). As noted above, Discover has a reciprocal agreement with China’s UnionPay. Discover also has an agreement with EBay’s PayPal to process PayPal transactions over Discover’s network.

Exhibit 27: Visa and Mastercard together held about 66% of \$20.6 trillion credit/debit transaction value in 2013...
Percentage share of global credit and debit transaction value



Source: The Nilson Report.

Exhibit 28: ...but process a far greater share of transaction volume
Percentage share of global credit and debit transaction volume



Source: The Nilson Report.

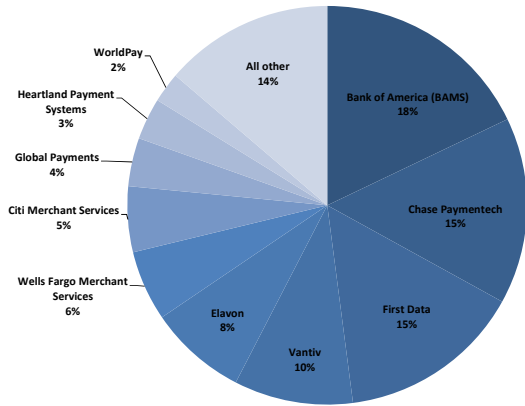
Players in the four-party system: merchant acquirers & processors

Merchant acquirers perform several basic functions for merchants: 1) Underwrite merchants, allowing them to accept network-branded cards; **2) Sell or rent point-of-sale equipment** used to validate transactions; **3) Process transactions**, which means facilitating transaction authorization, clearing, and settlement. Different companies in the payment ecosystem perform one or all of these services for merchants. In order to gain access to the card networks, a merchant acquirer is either part a bank or sponsored by a bank. Merchant acquirers often use ISOs (Independent Sales Organizations) to recruit new merchants.

Merchant acquiring and processing: Fixed costs dominate, so scale is critical. Processing card transactions requires significant fixed infrastructure investment, including datacenter

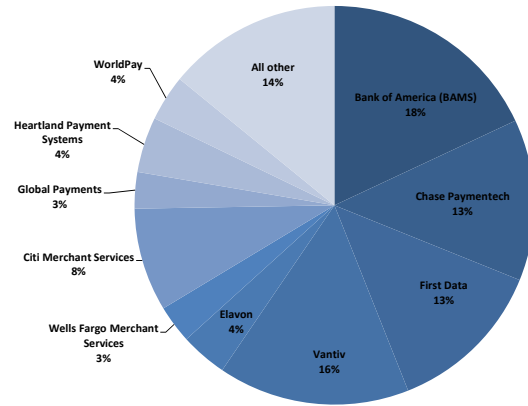
processing capacity, telecommunications lines, software, information security, and regulatory compliance. However, once the infrastructure is built, the incremental cost to process each additional transaction is low – making card processing a scale business.

Exhibit 29: The Top 10 merchant acquirers in the US process 86% of all credit transaction volume...
 Percentage share of US processed credit transaction value



Source: The Nilson Report.

Exhibit 30: ...and a similar share of transaction volume
 Percentage share of US processed credit transaction volume



Source: The Nilson Report.

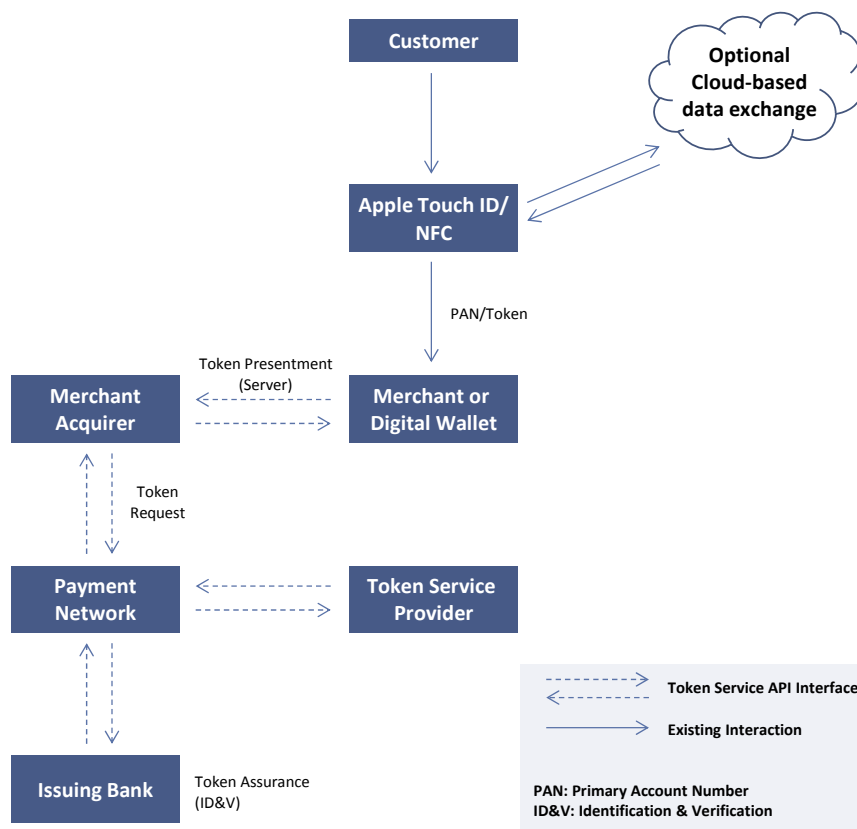
B2C Payments: Mobile payments – evolution or revolution?

Mobile Wallets: Apple Pay, Samsung Pay, and Google Wallet: Re-shaping - not disrupting - the existing credit card ecosystem

In September 2014, Apple introduced Apple Pay, its mobile payments service. Apple Pay allows iPhone 6 and 6 Plus users (and later, owners of the Apple Watch) to make one-touch payments for goods and services with their Apple devices at retail locations with NFC-enabled terminals. The solution works with payment and technology incumbents (including networks and banks) to bring ease-of-use and increased security features to consumers, issuers, and merchants. Over 90% of US credit card issuers, the payment networks, and several merchants have already signed up to support Apple Pay, which we believe signals the early impact Apple Pay is having on the industry. In addition we believe Apple Pay will serve as a slight catalyst for merchant NFC adoption, with many large merchants already accepting Apple Pay payments.

Previous launches of mobile payments systems in the US – including Softcard (formerly ISIS), and Google Wallet – have gained limited traction, either because participants attempted to significantly change the economics of the existing credit/debit card system (limiting issuer support), focused on collecting user data, or because of limited adoption at merchant locations. Apple Pay does not attempt to disrupt the existing payment system, but rather works with payment and technology incumbents (including networks and banks) to bring ease-of-use and increased security features to consumers, issuers, and merchants.

Exhibit 31: Overview of token provisioning for Apple Pay transactions



Source: Goldman Sachs Global Investment Research.

Assessing the market opportunity for Apple Pay

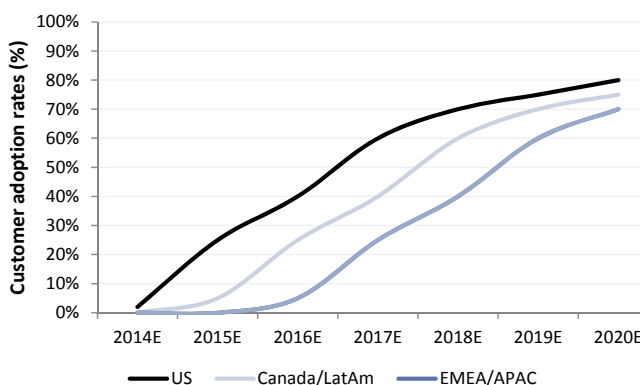
Apple Pay addresses counterfeit card fraud and consumer data theft, two of today’s most prevalent security threats. It combines EMV, NFC, and Touch ID to ensure the credit card information used is protected, and is being properly authorized by the cardholder. Apple Pay uses tokenization provided by Visa, MasterCard, AmEx, and banks to ensure that consumer identity and credit card information is never stored on merchants systems and hence not subject to data breaches. The main reason why we believe Apple Pay can succeed is because Apple is not trying to capture an outsized share of the economics. **With Apple Pay, we believe Apple effectively establishes a payments infrastructure with a balanced cost-benefit for consumers, card issuers, retailers, and networks.** Consumers pay virtually nothing to be able to benefit from the service. Retailers must invest significant capital in upgrading to NFC, but hope to gain increased consumer wallet share. Card issuers sacrifice a moderate amount of margin, which they hope will be mostly offset by reduced fraud charges and increased purchase volume. Considering that a group of banks accounting for 90% of US credit card purchase volume have already partnered with Apple Pay at launch, we believe Apple Pay will not significantly impact the underlying economics of the payments industry.

We think Apple Pay is unlikely to have a material impact on Apple’s financials

To arrive at our forecast for Apple Pay’s revenue impact, we assessed a number of inputs, including the percentage of total credit card terminals with NFC capability the purchase TAM for the US, Canada/Latin America, Europe, and Asia, and several other factors. In the US (where credit card interchange rates charged by banks are highest, typically over 150 bps of purchase volume), we expect Apple will receive 5 – 15 bps for credit transactions (depending on the size of the issuer, with very large issuers such as Chase likely paying toward the lower end of this range) but significantly less for debit transactions. If we assume that Apple earns 10 bps – the midpoint of our scenario analyses – on every credit transaction in the US, Apple Pay would contribute \$210 million to the company’s revenues in 2016, which represents a mere 0.21% of our forecasted total gross profits for the fiscal year. At the high end, if Apple collects 15 bps on credit card transactions, Apple Pay could generate \$290 million or 0.29% of gross profits. **The bottom line: it will be hard for Apple Pay to ever have a meaningful, direct impact on Apple’s financials.**

Exhibit 32: Apple Pay customer adoption is likely to be led by the US

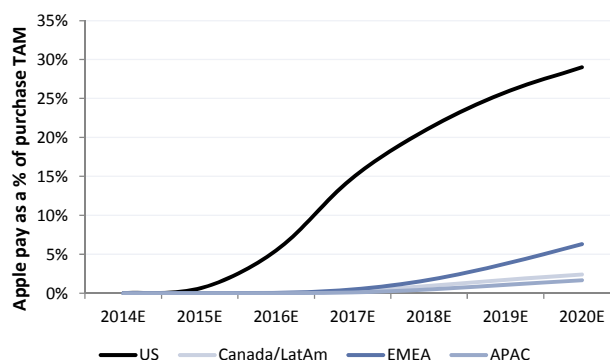
Estimated consumer adoption rates by region



Source: Goldman Sachs Global Investment Research.

Exhibit 33: Expect the US to constitute the vast majority of Apple Pay adoption

Potential Apple Pay transactions as a % of purchase TAM



Source: Goldman Sachs Global Investment Research.

Loyalty and rewards integration: There have been intermittent press reports suggesting that Apple Pay will integrate loyalty and rewards programs with mobile payment through beacons and Bluetooth. In principle, the service would allow loyalty and rewards programs to activate automatically based on the customer’s location when visiting a merchant.

Purchases could be linked to rewards programs via Bluetooth after payments instead of scanning rewards codes, creating a more seamless transaction for the customer. We believe the integration of loyalty and rewards will be a key catalyst to push consumer adoption of mobile wallets, and we will be closely monitoring developments in this area.

Samsung Pay: An opportunity to leapfrog Apple Pay adoption?

Still early, but Samsung Pay offers significantly greater merchant acceptance at launch:

On March 1, 2015, Samsung launched Samsung Pay, a mobile payment system running on top of Google's Android OS, along with the introduction of its flagship Samsung Galaxy S6 smartphone. Samsung Pay is different from Apple Pay in that it relies on two alternate hardware methods to transmit payment information. In addition to incorporating NFC wireless functionality (similar to Apple Pay), Samsung Pay also uses another wireless magnetic technology (based on Samsung's February 2015 acquisition of private vendor LoopPay) which allows the phone to transmit the user's credit card information via magnetic field to most standard magnetic stripe point-of-sale terminals. In both cases, the user's transaction is verified by the smartphone's fingerprint reader. As with Apple Pay, Visa and MasterCard are enabling Samsung Pay's security by providing tokenization services. Although we believe Samsung Pay's security protocol is less tight than the fully NFC- and EMV-compliant stack offered by Apple Pay, it is still more secure than traditional physical magnetic stripe cards because of the presence of fingerprint authentication technology. In principle, Samsung Pay could allow significantly faster merchant adoption than Apple Pay as we estimate that over 80% of merchants already possess POS hardware that is compatible with Samsung Pay (vs. 13% of US merchants with Apple Pay compatible POS hardware in 2015). As such, we believe Samsung Pay could shape the default wallet offering for Samsung devices. Samsung announced confirmed issuer partnerships including Citi, USBank and Synchrony; it is in talks with Chase, B of A, and AmEx. Samsung Pay will launch in the US in the summer of 2015.

Google Wallet: We expect a competitive response in 2015

The state of play: Launched in September 2011, Google Wallet is a free digital wallet app provided by Google. Google Wallet is available for Android phones and iPhones, and it allows customers to make in-store payments via a linked credit or debit card or by using their Wallet balances. Google Wallet users can also store loyalty programs in their phones, use a Google Wallet Card to pay at MasterCard locations, send money to each other via the app or a Gmail account, and pay online with Wallet balances. Google Wallet uses NFC technology to enable customers to "tap and pay" at the point of sale. Google recently retired its Google Wallet API for Digital Goods, which supported payment processing for purchases of select digital items excluding content and in-app purchases.

What's next for Google Wallet: As we mentioned above, we believe the introduction of Apple Pay will serve as a moderate catalyst for NFC adoption. We think 2015 will be an opportune time for Google to respond to moves from Apple and others. In February 2015, Google acquired assets from Softcard (formerly ISIS), and announced an agreement with US carriers including AT&T, Verizon, and T-Mobile to pre-load Google Wallet (with NFC functionality) on smartphones distributed by those carriers. Our software and select Internet analyst Heather Bellini expects Google to enhance Google Wallet and potentially re-launch the product in conjunction with its Google I/O Conference in May 2015. Although the direct financial opportunity related to payment processing is limited, we believe the prospect of gaining access to consumer data makes the market very attractive for Google to the extent that it could monetize consumer transaction data through advertising.

Payment Innovators – Working within the ecosystem to deliver value-added services

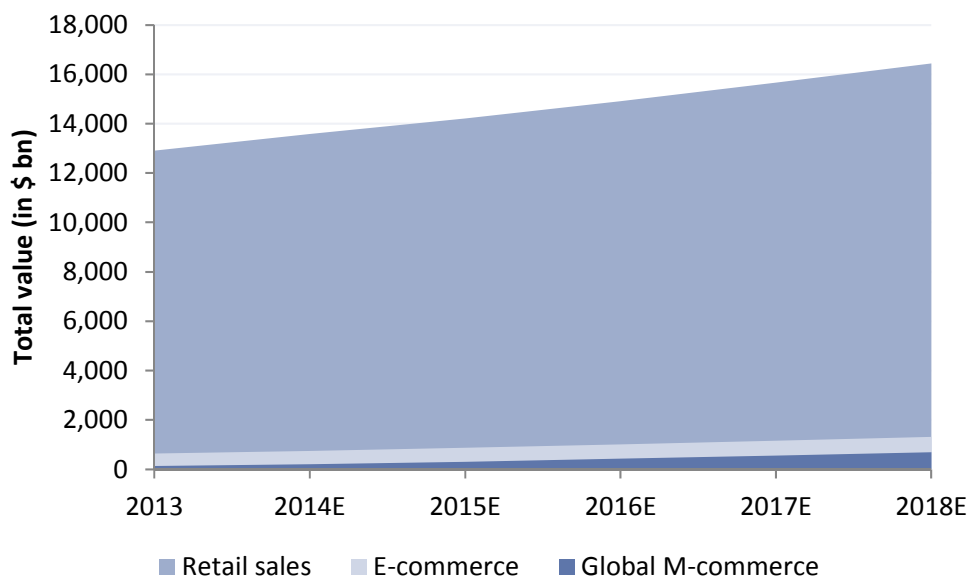
New technology capabilities, including big data analytics and mobile devices like tablets, are creating the opportunity for new services for merchants, and offer the promise of driving higher sales, enabling an e-commerce presence, and streamlining operations. These capabilities are being rapidly “democratized” – and are now being offered to small- and medium-sized merchants as well as large merchants.

Online innovators: PayPal and Amazon

PayPal: Strong traction in e-commerce, but offline adoption remains modest. PayPal has become one of the most successful payment systems for m-commerce transactions, processing \$27 billion in volume in 2013. Our Internet analyst Heath Terry estimates that PayPal processes 55% of its volume with the traditional card networks, with 30% via ACH, and 15% funded by stored balance (including sales on EBay). We would also note PayPal’s partnership with Discover, which enables broad PayPal acceptance at merchants which accept Discover cards. We expect EBay to continue its strong growth trajectory in e-commerce given its solid acceptance with many online merchants. We believe that a portion of these transactions will continue to be done via ACH, which in our view represents an immaterial headwind for the card networks given the share of EBay transactions processed via ACH. Although this headwind could grow significantly if PayPal were to gain substantial acceptance among offline merchants, PayPal has thus far gained minimal traction in this arena – partly for reasons related to the slow adoption of offline mobile payments we examine below. We would point out that more recently, Visa Checkout and MasterPass have emerged as competitive offerings from payment networks.

Exhibit 34: Mobile commerce is still small today relative to total card transaction volumes, but could reach 3% - 4% of total card volume by 2018

Includes products and services ordered in the internet using mobile devices; excludes travel and event ticket sales. Dollars in billions.



Source: Goldman Sachs Global Investment Research, Euromonitor.

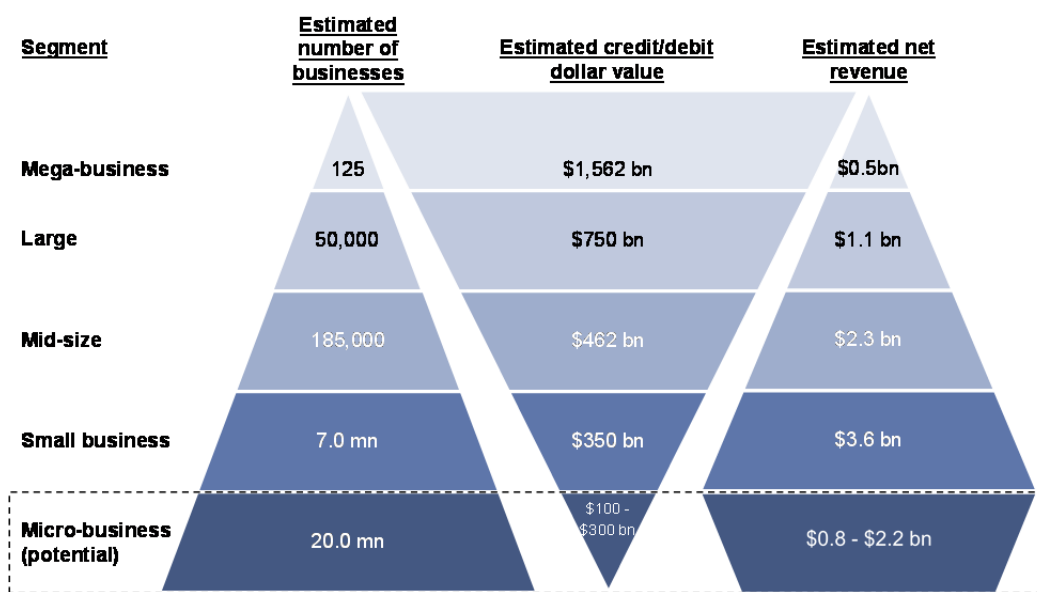
Amazon Payments: Competition heats up in online payments. In October 2013, Amazon introduced its “Login and Pay with Amazon” service to partner e-commerce sites, allowing users to pay with credit card information attached to an Amazon ID (Amazon currently has about 240 mn monthly active users with stored credit card information). In June 2014, Amazon extended its Amazon Payments service to small- and medium-sized businesses to accept recurring payments made by consumers or other businesses with credentials tied to an Amazon ID (including credit and debit cards as well as bank accounts via ACH). Amazon’s standard payment processing fee is 2.9% plus \$0.30 per transaction for the lowest transaction volume, and this fee is reduced to as little as 1.9% plus \$0.30 for merchants with \$1.2 mn or more in annual volume (similar to those charged by PayPal). Our internet analyst Heath Terry believes that Amazon’s moves in this area put it in more direct competition with PayPal in the online payments space. However, he believes that Amazon is also likely to face challenges as it expands in payments, as many merchants view Amazon as more of a potential competitor than a partner. In January 2015, Amazon shut down its beta Wallet. As with PayPal, we believe Amazon could gain some level of traction in online payments – but think it is likely to rely mainly on conventional credit/debit card transactions for purchases.

“Democratizing” payments and capabilities for small merchants

Merchants with relatively low credit card volume (under \$50k) have been under-served by incumbent payment vendors, in part because of the low absolute profit levels associated with handling very small merchants. As a result, the penetration rate of electronic payments within this category has significantly lagged the broader market. However, vendors like **Square** have targeted the micro- and small merchant segments using mobile point of sale terminals (mPOS) based on standard consumer tablet hardware in order to significantly reduce fixed and setup costs. From being a vendor originally focused on mobile POS terminals, Square has extended its positioning to become a merchant aggregator offering a wide variety of value-added products and services including merchant analytics tools, scheduling and calendaring, and merchant financing services. In Europe, a similar effort is being led by vendors including **iZettle, SumUp and Payleven**.

Exhibit 35: Micro merchants represent an untapped market

Customer segmentation of the merchant acquiring industry



Source: First Annapolis (2010 estimates).

Breadcrumb (acquired by Groupon) provides attractive payment processing rates (1.99% + 15¢ per transaction) for SME merchants, along with a POS offering integrating ERP and analytics (\$99 - \$399 per month, depending on the merchant size and number of terminals). The monthly fee can be reduced or waived when merchants initiate Groupon campaigns.

Establishing an e-commerce presence and accepting payments online remains a cumbersome and expensive process for small merchants due to high set up fees, monthly fees, and charges for failed payments. Vendors like **Stripe** offer a set of unified APIs and tools to allow websites to more easily accept payments (without requiring a merchant account). Stripe has a seven-day waiting period for transactions to be completed so that Stripe can profile the businesses involved and detect fraud. Stripe charges 2.9% + 30¢ per transaction (or less, based on volume). In the US, Stripe accepts payments in 100+ currencies (an additional fee of 2% fee plus FX charges for foreign transactions). In February 2015, Stripe launched support for Bitcoin, charging 0.5% per Bitcoin transaction.

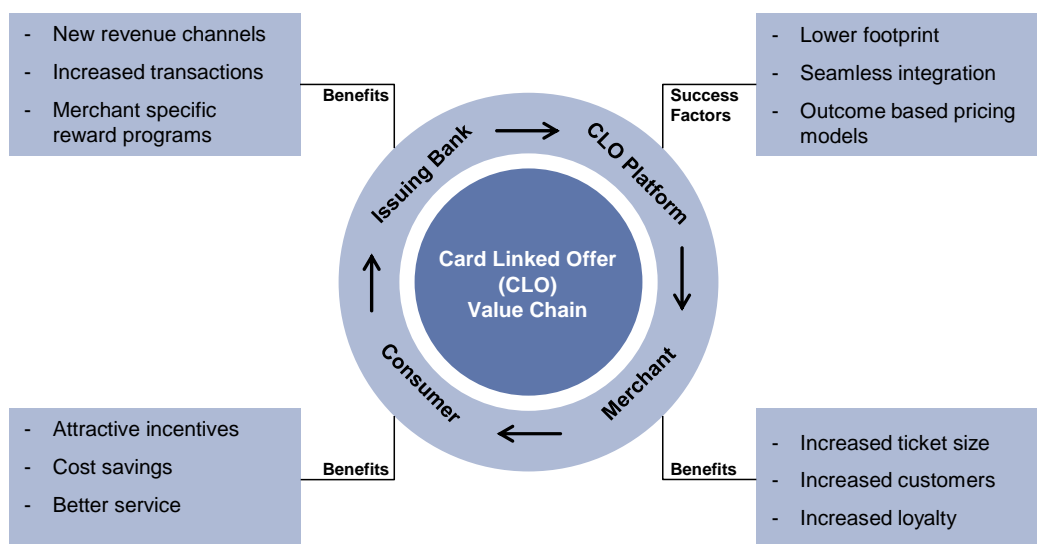
Using analytics to drive higher sales for merchants

Card linked offers (CLOs)

New analytics platforms can be of significant value for merchants who are increasingly focused on enhancing customer loyalty and generating higher sales and profits. Card linked offers and rewards are transaction-based marketing programs based on the usage and purchase patterns for credit, debit, and prepaid cards. Although in principle card linked offers are a win-win for consumers and merchants, many card linked offers have historically been difficult to use, lacking good analytics to deliver relevant offers.

Digital coupons are tied directly a consumer’s debit or credit card (or mobile device), and consumers shop normally with no slowdown at the register. Upon making a purchase, the consumer can see the discount applied on his or her card account statement. In the case of mobile payments, the consumer can see the discount applied at the merchant point of sale in real time. Card linked rewards are typically simple – a percentage or a fixed discount applied to a shopper’s purchase. Key vendors in the card linked offers and rewards space include **Cardlytics, Edo, CardSpring (Twitter), Free Monee, Shopkick, Cartera Commerce, Reward Insight, and SavingStar**. **CardLinx** operates as an industry group coordinating a series of technical and business standards related to card-linked offers.

Exhibit 36: Card linked offers provides value to all participants in the value chain
Card Linked Offers (CLO) value chain

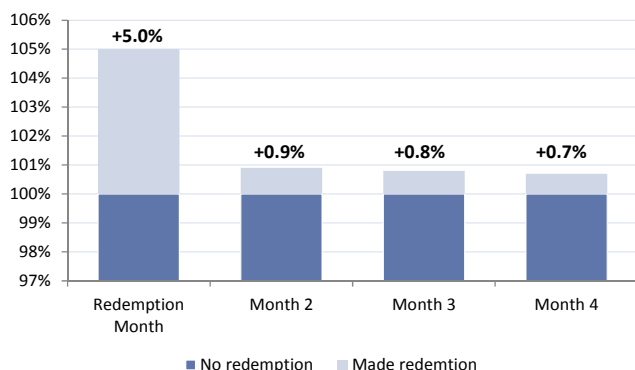


Source: Goldman Sachs Global Investment Research.

For consumers, the clear benefit is avoiding all the hassle related to cutting and printing of paper coupons, mail-in rebates and related follow-up processes. Once a consumer registers a card with a CLO, all processes are automatic. The increased use of mobile wallets and payment applications is likely to help merchants more effectively target consumers with offers, and “close the loop” between offer and redemption. We believe improved analytics tools, increased ease of use, and the adoption of mobile platforms are key to the increased adoption of card linked offers.

For merchants, the key benefit is precise targeting of customers based on purchase history and enhancing sales and loyalty with high-value customers. Merchants also benefit from reach of its bank or loyalty program account partner. A merchant can easily track the performance of its offer, and pay the bank or loyalty program a commission for only offers that are actually redeemed. Since card-linked offers generally require no changes to merchant point of sale systems, and little training to implement discounts, merchants typically see a rapid ROI from card-linked offers.

Exhibit 37: Customers who use card linked offers have an overall higher spend on their cards with usage
Impact to total monthly spend after first redemption



Source: Cardlytics.

Exhibit 38: Better ability to reach loyal customers is seen as the most important benefit from card-linked offers
Perceived benefits of card-linked marketing



Source: Cardlytics.

For banks, card linked offers are a good way to engage customers and incentivize them to spend more. Increased card usage for the bank leads to increased interchange revenues and reduced customer attrition. According to a Cardlytics study, a customer’s first redemption drives a 5% increase in their total spending for that month and a sustained lift in spending over successive months.

Exhibit 39: Key vendors in the card linked offers landscape
Key vendors and their respective partners in card linked offers landscape

Company	Domicile	Partners	Target segments and customers
Cardlytics	U.S		BofA, PNC bank, Llyods Bank, integrates with 400+ banks
edo Interactive	U.S	Visa Europe	6 of the top 10 card issuers, 1000+ retailers
CardSpring (Twitter)	U.S	First Data, Verifone	Financial institutions , Merchants (Starbucks etc.)
Truaxis (Mastercard)	U.S	TSYS	Financial institutions
Cartera Commerce	U.S	Groupon	4 of the top 10 card issuers, 5 of the 6 airlines , merchants
Reward Insight	U.K		Financial institutions , Merchants

Source: Company data.

Using analytics to enhance customer loyalty

Customer loyalty remains one of the key concerns for retailers. Retailers are launching multiple loyalty programs to enhance customer loyalty. According to the Aberdeen Group, the top three reasons why retailers develop loyalty programs are to generate repeat visits (61%), boost incremental sales (58%) and increase overall customer satisfaction (57%). Although daily deals are an option, they come with a number of challenges including consumer email fatigue.

Merchant-centric analytic platforms are an easy way to provide timely, accurate insight and analysis of the consumer buying behavior – which facilitates better forecasting, benchmarking and business decisions for merchants. On the merchant side, analytics tools help track and measure the benefits from a new loyalty or rewards program. Consumers can also benefit as these tools can spot credit and debit card transactions at participating merchants, and push cash credits directly back to credit and debit card accounts.

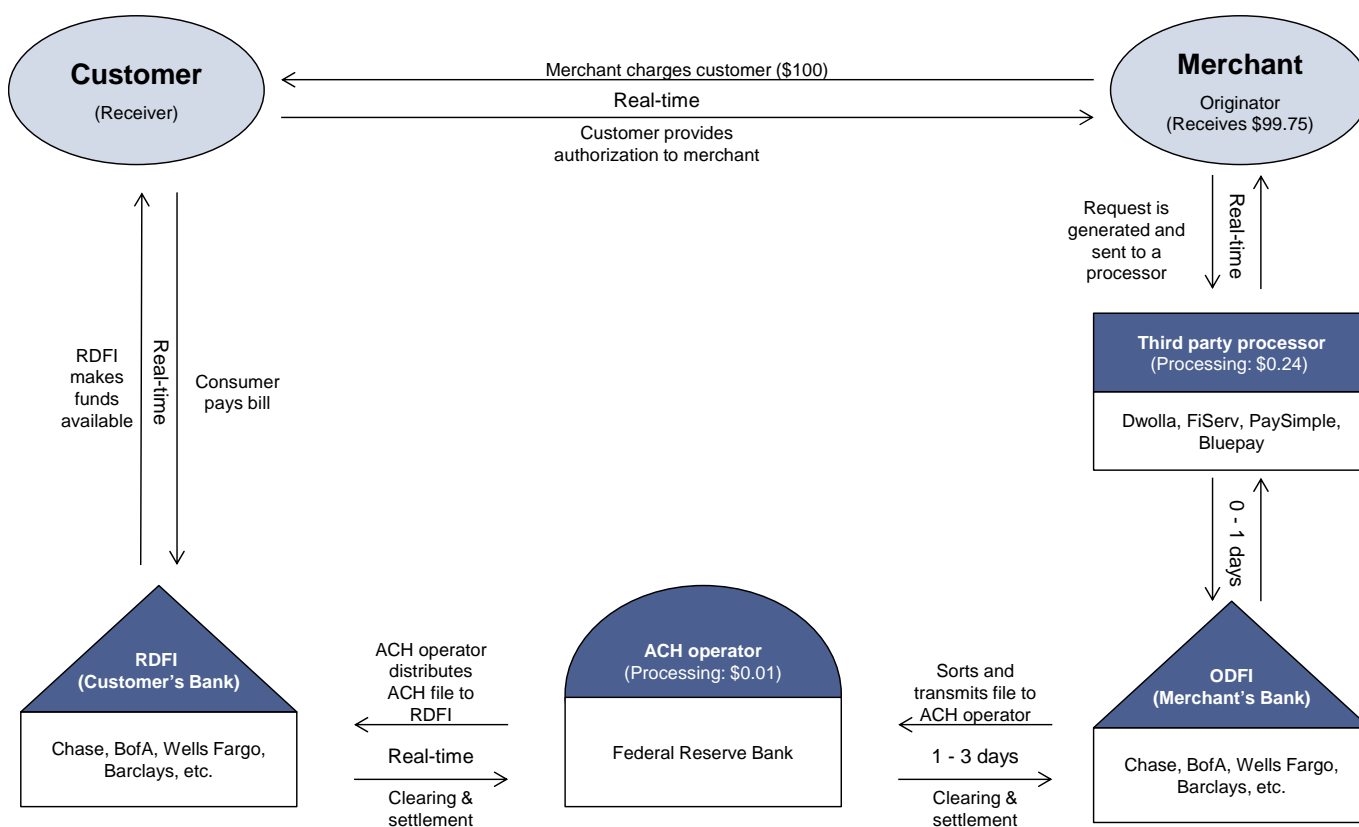
Key vendors in the space include **Womply** and **Swipely**.

Payment Disruptors – Could they disintermediate the credit/debit ecosystem?

Over the past few years, several alternatives to the conventional credit and debit card ecosystem have developed. These systems seek to lower the cost of payment acceptance for merchants by replacing the existing credit/debit card networks operated by Visa, MasterCard, and AmEx with either existing payment infrastructure (such as ACH) or distributed network technology (such as Bitcoin). We call them Disruptors, since their success (unlike the Innovators) would mean the disintermediation of conventional payment networks. Although we think these alternatives have a chance to succeed, they will have to overcome several disadvantages including less consumer protection plus a lack of loyalty and rewards programs compared with traditional credit/debit card networks.

Exhibit 40: ACH-based payment transaction system

Average payment clearing time of 1-4 days



Source: Goldman Sachs Global Investment Research.

MCX: Merchants attempt to disrupt the credit & debit networks

We expect Merchant Customer Exchange (MCX), a JV formed by the nation's largest retailers, to launch its own mobile payments solution in 2015. MCX was formed in 2012 as a joint venture among over 70 national merchants including WalMart, Target, Best Buy, CVS. These merchants account for an estimated \$1 trillion of annual purchase volume over 111,000 merchant locations. As a payments organization created by merchants, MCX seeks to **(1) reduce or eliminate interchange fees charged on purchases** – typically 2% for credit cards or \$0.23 for debit cards – in order to lower merchant costs; **(2) provide**

merchants with granular consumer data (which it does not receive when consumers pay with standard credit or debit cards transactions) to drive increased sales. MCX has partnered with Fidelity National Information Services (FIS), which has built a system to connect merchants to banks to enable direct debits from consumer bank accounts. Based on press reports, we believe MCX has also partnered with Paydiant to develop point-of-sale infrastructure for merchants.

CurrentC, MCX's mobile wallet product, has been launched through a private pilot program in select locations across the country which is expected to continue to expand – and we believe regional and national rollouts are likely to follow in mid-2015. Unlike Apple Pay and Google Wallet transactions which use NFC, MCX uses QR codes to present a secure transaction token. CurrentC is currently limited to debit, gift card, and ACH transactions, but recent company press releases suggest it will ultimately support credit transactions as well (potentially with store-branded credit cards issued by third parties). We would highlight that many large MCX members, including WalMart, CVS, Best Buy, and Target and Walmart, are not supporting NFC-based payments such as Apple Pay and Google Wallet in anticipation of the MCX launch.

We believe MCX's success will hinge on the effectiveness of payment and data security, consumer policies, and rewards programs. We recognize that MCX offers some compelling advantages to merchants both in terms of potential cost reduction from lower transaction costs, as well as potential sales upside if merchants are able to fully exploit customer data. However, we also believe MCX faces several potential challenges to gaining market traction. First, despite the fact that MCX reportedly uses tokenization to ensure transaction security, we believe some consumers may be reluctant to provide their bank account information in light of recent merchant data breaches. Second, according to MCX's initial terms of service, consumers are liable for instances of transaction fraud – making MCX less “consumer friendly” than traditional credit cards which afford attractive terms to consumers regarding fraud liability and chargebacks. Third, MCX retailers will need to fund alternate rewards programs to compete with rewards programs offered by card issuers – which could potentially dilute the interchange cost savings afforded by MCX. Some press reports had speculated about the possibility of MCX consolidating its members' reward programs under one universal platform. However, speaking at the Money 20/20 trade show in November 2014, MCX CEO Dekkers Davidson indicated that MCX members will maintain separate, merchant-specific rewards programs such as the Target Red program. We will be closely monitoring MCX and the CurrentC pilot as it prepares to launch into the broader market.

ACH disruptors: Making ACH faster and easier for merchants

Seamless and Dwolla: Improving upon and replacing ACH in the US. Seamless provides a mobile payment platform for both merchants and consumers which functions using direct account transfers, outside of the traditional credit and debit card networks. This approach is attractive to merchants because Seamless offers a ~50% discount to the processing rates charged by traditional credit card networks and merchant acquirers. The Seamless system operates by using optical QR codes that can be read by most standard smartphones. Seamless is already operating in several countries throughout Europe and has partnerships with a number of large retailers and QSRs – and the company has begun to forge partnerships to prepare for expansion to the US.

Dwolla is focused on quickening the pace of payments between banks in the US by providing a real-time replacement for ACH transfers between participating banks. Currently, many standard money transfers in the US take 2-3 business days to clear via the ACH (Automated Clearing House) system. This is driven in part by significant delays introduced in overnight batch processing of transactions, as well as AML, risk-scoring, and other compliance processes used by banks. By charging a fixed fee for moving money (\$0.25 for

transactions over \$10), Dwolla allows for the near-real-time transfer (using FiSync technology) of money between accounts at participating institutions. Dwolla has forged a number of key partnerships to date, including with BBVA. Dwolla is currently focused on expanding its service for individuals (C2C) and businesses (B2B) at participating banks in the US – but it believes it could expand to serve the B2C market over time. In February 2015, as part of its objective to move away from paper-based processes, the US Federal Government payment portal (pay.gov), will begin accepting digital wallet payments through PayPal and Dwolla.

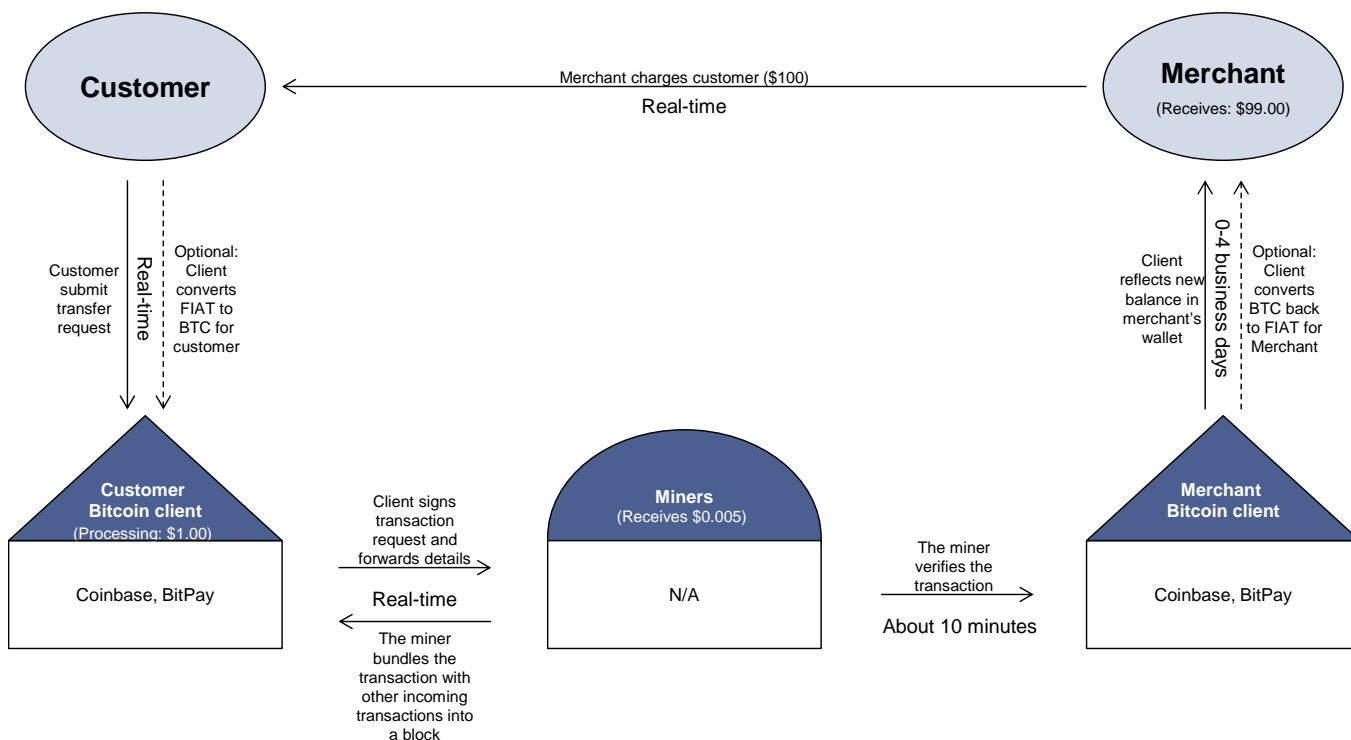
Crypto-currencies: Can Bitcoin gain broad merchant acceptance?

Bitcoin - Solving the “trust problem” between online buyers and sellers?

Over the past two years, merchants have begun to investigate – and in some cases adopt – Bitcoin and other cryptocurrencies as alternative means of payment to fiat currency, and several merchant processing services have risen to fill this demand. Currently, the two largest names in Bitcoin merchant processing services are **BitPay** and **Coinbase**. As with other processors of Bitcoin transactions, both companies allow merchants to accept Bitcoin as a form of payment. Processing costs are typically charged to merchants as a flat subscription fee, or as a percentage transaction fee. Merchants also have the option to settle transactions in local fiat currency based on spot rates, which allows them to support Bitcoin payments without having to hold bitcoin balances. While bitcoin balances are commonly updated for a transaction within minutes, fiat currency settlements can take multiple days and may be subject to charges.

Exhibit 41: Bitcoin-based payment transaction system

Average payment clearing time: 0-4 days



Source: Goldman Sachs Global Investment Research.

Merchant acceptance is still in its infancy, but early indicators are mixed. Although actual merchant adoption is still in its infancy, a meaningful number of merchants have expressed an interest in accepting Bitcoin and other cryptocurrencies. Among merchant acquirers and ISOs surveyed in our recent survey conducted with the Electronic Transactions Association (ETA), approximately 2% of merchants already accept Bitcoin – but beyond this level, 23% have plans to begin accepting Bitcoin within the next two years, which we see as meaningful. Although there is no readily available public data on the number of merchants accepting Bitcoin today, based on anecdotal disclosures we believe the number of merchant accepting Bitcoin is now well over 100k.

Among major e-commerce retailers, there have been several retailers of size which have begun accepting Bitcoin for online purchases including Overstock.com (started Jan. 2014), TigerDirect.com (started Jan. 2014) and Expedia (started Jun. 2014). In addition, a number of other major retailers have been testing bitcoin payment in specific areas of their business, including Dell, which is accepting Bitcoin for digital goods purchases. Despite optimism among some merchants, there has been little evidence of strong sales traction among consumers. For example, Overstock.com had originally projected that it would reach \$10 - \$15 mn in Bitcoin sales in 2014, but achieved just \$3 mn (0.2% of total revenue). Even though early traction has been uneven for merchants, we would point out that Bitcoin remains in its infancy – and we will be closely monitoring the situation in the coming quarters.

Thus far, most merchant Bitcoin activity has been concentrated among US and European-based merchants. Despite China’s higher trading activity, restrictions enacted by the PBoC to limit Chinese Bitcoin companies’ access to traditional Chinese payment processors have prompted many large Chinese companies to stop accepting Bitcoin. However, in light of a somewhat stabilizing Bitcoin economy in China, a few payment processors have re-emerged, such as BTC China’s JustPay.

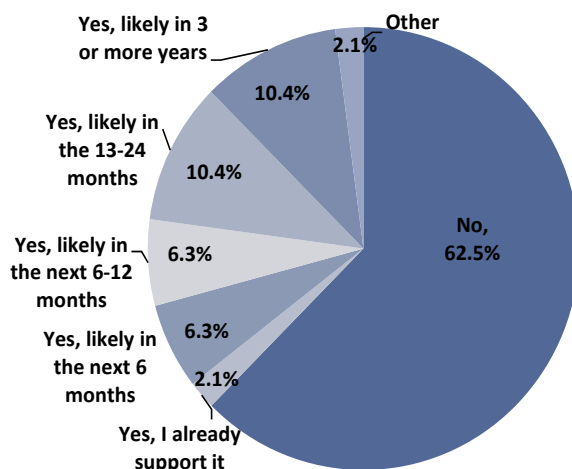
Exhibit 42: Fee structures for Bitcoin services can vary
BitPay vs. Coinbase merchant services comparison

	BitPay	Coinbase
Merchant processing fee	Monthly fee based on 3 tiers. Processing fee applies to Business and Enterprise tiers.	No processing fee
FIAT settlement fee	No fee, unless minimum settlement amount is not met.	Free for first \$1 mn then 1% fee after
Key differentiators	Quickbook integration/payroll services	Offers subscription services
Conversion time	Instant	Instant
Cash Settlement time	1-2 business days	2-3 business days
Number of merchants	50,000+	38,000+
Countries available	33	24

Source: Company data.

Exhibit 43: A majority of respondents in our fall 2014 ETA survey have no plans, but adopters have increased from our last survey

Do you plan to enable the acceptance of Bitcoin for your merchants?



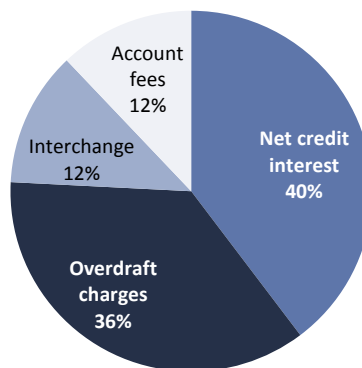
Source: ETA, Goldman Sachs Global Investment Research.

A look at bill payment: Why bank fees aren't what they used to be with "instant ACH"

We believe the emergence of alternative payment systems could have a meaningful impact on overdraft fees. Traditionally, bank revenue generated from personal current accounts comes in three forms: interchange, interest and fees. Although fees related to core services are generally either nonexistent or relatively low, fees associated with outstanding credit/overdraft balances in these accounts has historically been much higher. However, we believe banks have experienced an overall decline in the total revenue generated from these fees in the past few years. While part of the decline can be attributed to increase scrutiny on fee transparency from regulatory entities, we believe the emergence of alternative payment systems have also played a significant role and could potentially lead to further revenue decay.

We point out that for most personal current account structures, overdraft charges account for a substantial portion of revenue. In addition to the incremental interest charged for the outstanding balance, excess transaction and recurring services fees are commonly charged. Studies conducted by the UK Office of Fair Trading (now known as the Competition & Markets Authority) estimated total overdraft charges account for 36% of total revenue from personal current accounts (PCA) in the UK vs. interchange at 10.5% in 2013.

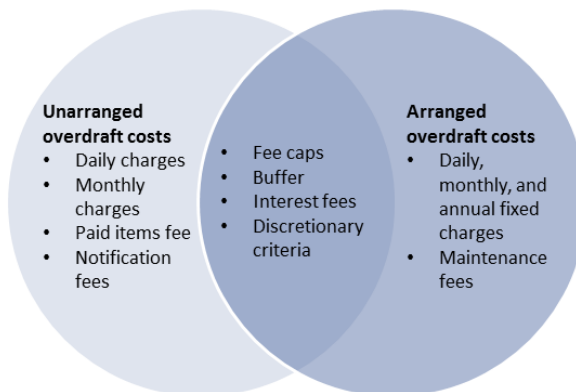
Exhibit 44: Total overdraft charges accounted for 36% of PCA revenue in 2013
2013 breakdown of UK bank revenue from personal current accounts



Source: UK Competition & Markets Authority.

We note that declines in overdraft revenue in the past years have been partially offset by adjustments in the banks overdraft fee structures. In response to increased regulatory scrutiny on banks post the financial crisis in 2008, many banks have been pressured to increase customer transparency in their fees. Banks subsequently reduced their unarranged charges (late fees, monthly interest fee, etc.), but typically combated the impact by raising arranged fees (fixed annual and maintenance fees). Nevertheless, arranged fixed fees are often far less lucrative and are still vulnerable to declines in overdraft accounts. In the UK, while revenue from arranged maintenance charges increased by approximately 14%, total overdraft revenue decline by 3% in 2013.

Exhibit 45: Comparison of arranged vs. unarranged overdraft fees

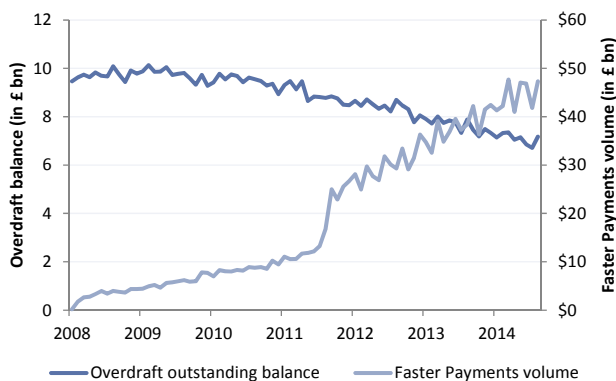


Source: UK Competition & Markets Authority, Goldman Sachs Global Investment Research.

We believe the introduction of new payment options, such as Faster Payments in the UK, as an alternative to traditional payment models have directly impacted consumer demand for overdraft services. For many newer and more consumer-friendly payment options, usage not only reduced the likelihood of incurring an overdraft/credit balance due to increased transparency, but also reduces late fees on PCA accounts through quicker processing. The implication is a direct hit to overdraft revenue for banks. In the UK, outstanding overdraft balances have declined by approximately 30% since the introduction of Faster Payments in 2008, whereas Faster Payment volume grew roughly 30% in 2013 alone. If similar advances in payment options continue to be made and overall customer usage accelerates as a result, we believe bank fees are vulnerable to further declines.

Exhibit 46: Overdraft balances have declined by ~30% since the introduction of Faster Payments...

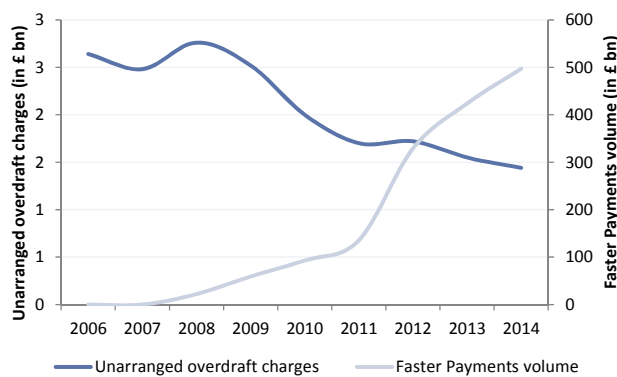
UK outstanding overdraft balance (at the end of the period) vs. Faster Payments volume



Source: BBA, Payments Council.

Exhibit 47: ...while Faster Payments volume grew 30% in 2013

Revenue from unarranged overdraft charges vs. Faster Payments volume



Source: UK Competition & Markets Authority, Payments Council.

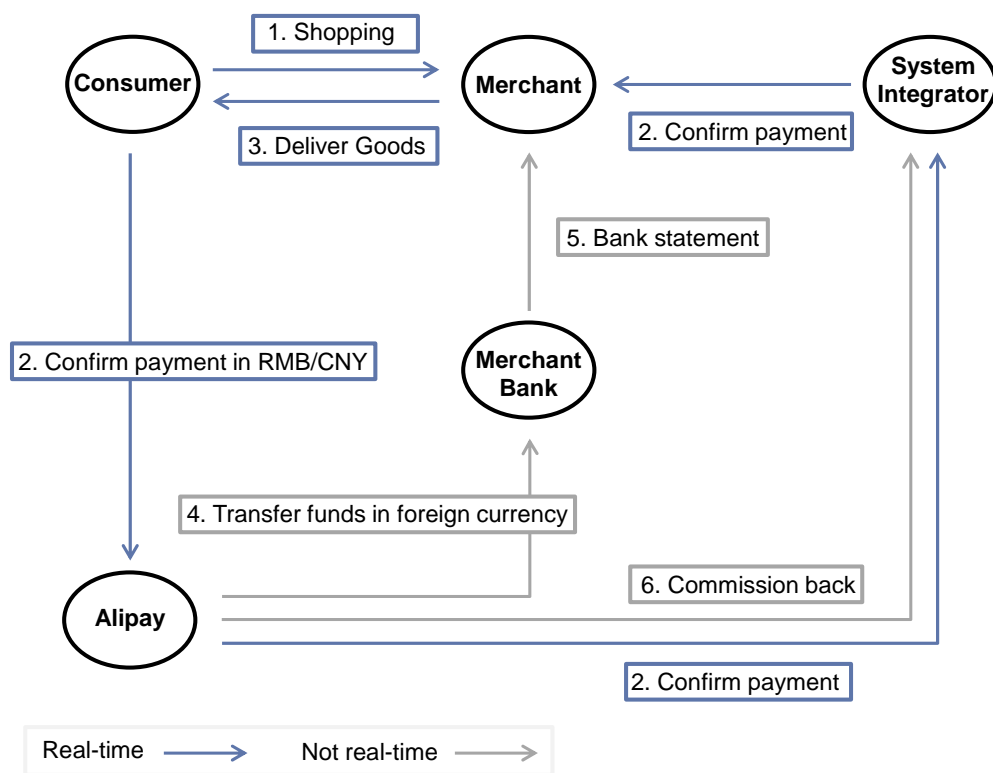
China case study: Where payment innovators are quickly gaining ground

Although the adoption of disruptive payment solutions has been relatively muted to date in the US, similar innovative payment methods have thrived in China where conventional payment methods are both less entrenched and less lucrative for consumers. Given the rapid volume growth experienced by many third party payment companies like Alipay and Tenpay, we believe China’s payment system may be better suited for disruption.

Fewer rewards by incumbents translate to less stickiness...

In contrast to the US, credit card incentives/rewards are essentially nonexistent in China – and this in part has resulted in the relatively low credit card usage (approximately 23% of card transaction volume in 2013 vs. 44% for the US). While Chinese payment innovators like Alipay and Tenpay do not substantially differ operationally from PayPal, we believe the lack of conventional rewards programs tied to credit cards in China may translate to more rapid adoption of alternative payment methods.

Exhibit 48: How does Alipay work?

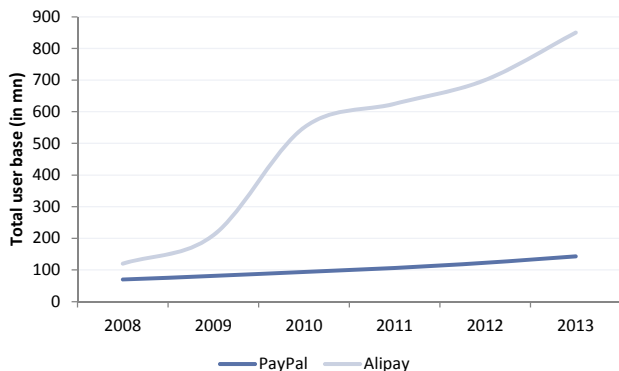


Source: Company data.

...while new incentives and rewards are driving fast adoption for innovators.

By offering incentives (such as interest-bearing escrow deposit accounts) and solid consumer protections (accounts are debited only on delivery of products), Chinese payment innovators have been able to achieve quicker and stronger consumer adoption than most foreign competitors. In addition to increased sales volumes, the ability to track customer behavior has made the payment space in China very attractive, especially to China’s ecommerce giants. According to iResearch, online third party payment GMV grew 46.8% to 5.4 tn RMB in 2013, representing approximately 15% of total consumer payments volume in China. Alipay and Tenpay lead the market with 49% and 19% market share, respectively.

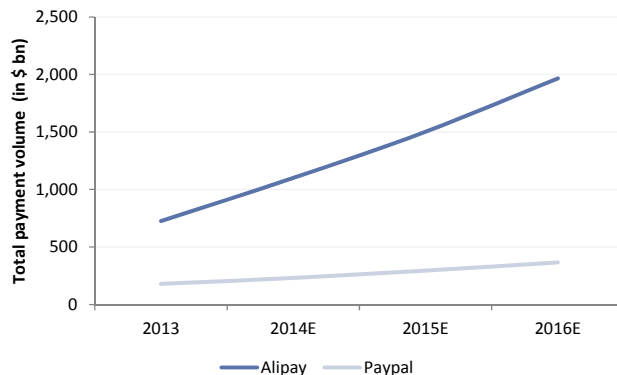
Exhibit 49: Alipay has outpaced PayPal in user growth
User count (in mn)



Note: Registered Alipay users does not mean active.
Note: "Active" PayPal users means a customer has conducted 1 transaction in the past 12 months

Source: Company data, Mercator Advisory Group.

Exhibit 50: Alipay TPV is expected to grow significantly faster than PayPal
Total payment volume (in \$ bn)

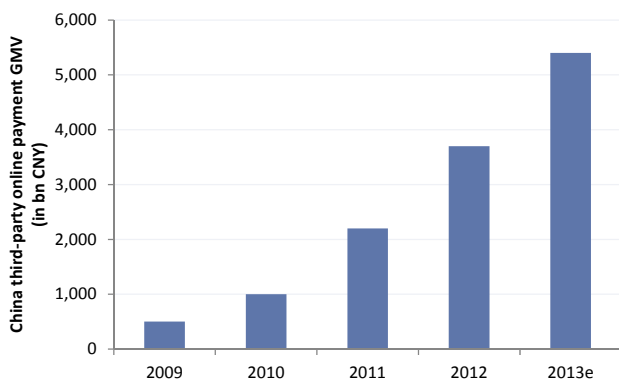


Source: Company data, Goldman Sachs Global Investment Research.

Alipay has outpaced EBay by volume, but traction outside China remains a wildcard.

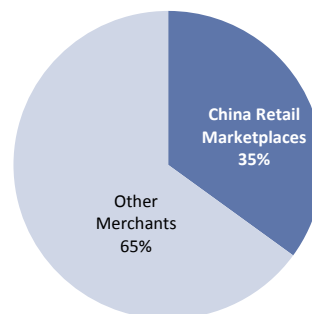
Mirroring the early success of PayPal within EBay, Alipay initially grew within China internet giant Alibaba (since its inception in 2004) as a way of facilitating payment between buyers and sellers where there is limited trust and no physical contact. Although Alipay separated from Alibaba in 2011, it remains a very significant payment mechanism both on and off Alibaba. According to iResearch Consulting Group, "third party" channels constitute about 60% of online payment volume – much higher than other geographies such as the US – and Alipay is currently capturing just over 50% of total third-party online payment volume in China (where "third party" is defined as transactions not handled by a bank, credit card network, or traditional merchant acquirer). Alipay does have significant competition in online payments, with Tenpay, UMS (the merchant acquiring arm of China UnionPay), 99Bill, and ChinaPnR all capturing at least 5% of online volume.

Exhibit 51: Online third party payments have grown rapidly in the past few years
China third-party online payment GMV (in CNY bn)



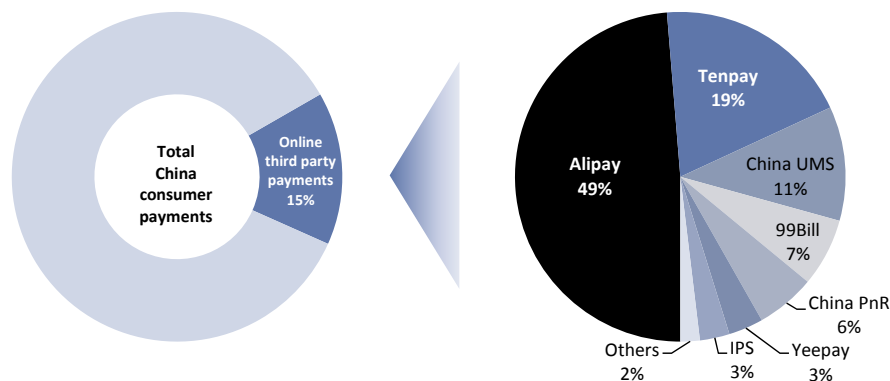
Source: iResearch Consulting Group.

Exhibit 52: Only ~35% of Alipay's volume comes from Alibaba's China Retail Marketplaces
Alipay total payment volume breakdown



Source: Company data.

Exhibit 53: Alipay and Tenpay have led the charge in online payments
 2013 online third party payment GMV share



Source: iResearch Consulting Group, Euromonitor.

On the mobile side, Alipay’s mobile wallet, Alipay Wallet, has significant mobile penetration with 136 mn mobile active users, 46% of its total user base. Perhaps more significantly, we estimate that Alipay has a significant lead with its mobile platform in China, and is currently capturing as much as 80% of mobile payment volume. While third-party payment processors and Alipay in particular have significant traction online, the adoption of these platforms have gained limited traction offline in brick-and-mortar retail. Although Alipay does not disclose the volume of its offline payments, we estimate that it remains relatively small and less than 10% of Alipay’s total volume. Alipay claims to have been integrated at 30,000 retail locations within China. Offline retailers can integrate Alipay using either a QR code or an audio code which is generated by the consumer’s smartphone. As with PayPal, it may be some time before Alipay gains significant traction with offline retailers. However, given the proportion of e-commerce relative to all retail sales in China is much greater than in most geographies like the US, we would expect Alipay to make more sizeable inroads in China rather than in the US.

Sizing the risk in B2C payments from innovators and disruptors: What does it all mean?

We see multiple potential crosswinds at play over the next 10 years that could drive risk to revenue and profit pools in the existing B2C payments market. Below we list the key assumptions driving our view that in the worst case, about \$84 billion (14%) of today’s \$590 billion B2C payments market could be at risk.

In B2C credit:

- **Credit card interest fees and charges (\$42 bn at risk):** Of the estimated \$232 bn in interest and fees charged by **global retail banks** on outstanding consumer credit card balances, we see 18% risk to the market, assuming that non-traditional lenders such as **Lending Club, Prosper, and others** could capture about 14% of the market over 10 years, with consumers also seeing some level of savings (about 4%) due to somewhat lower rates offered by these players.
- **Account fees and unscheduled overdraft charges (\$30 bn at risk):** Of the estimated \$197 bn in fixed credit card account fees (including annual fees) and unscheduled late fees charged by issuing banks worldwide, we assume a 30% reduction in late fees (with no change in account fees) as a result of faster interbank transfer

systems. This reduction is roughly in line with the ~30% reduction in overdraft fees seen in the five years following the establishment of the Faster Payments system in the UK.

- **Interchange (\$8 bn at risk):** Of the estimated \$88 bn in credit card interchange fees collected by issuing banks worldwide, we believe about 9% is at risk if lower credit card interchange rates are legislated, particularly in the US. We assume that on average, US credit interchange would come down by 15% in total (140 bps on a gross basis in line with proposed EU levels, but 40 bps net of the estimated 100 bps which consumers see today in the form of rewards programs).
- **Payment network fees (\$900 mn at risk):** Payment network fees are about \$17 bn globally. If lower credit interchange rates were to be legislated in the US over time, we believe it could result in **lower payment network fees for Visa and MasterCard over time**, which we estimate could be in the 5% range if either gross spreads decline or rebate/incentive levels to issuers move directionally higher.
- **Merchant acquiring fees (\$1 bn at risk):** We believe **increased competition from both traditional competitors and innovators such as Square and PayPal** (as well as market expansion into underserved segments like micro-merchants) could result in a shift of ~10% of merchant acquiring revenue or about \$1 bn over time.

In B2C debit:

- **Interchange (\$2 bn at risk):** Of the estimated \$37 bn in debit card interchange fees collected by issuing banks worldwide, we believe about 5% is at risk if **disruptive ACH-based providers like MCX, Seamless, and Dwolla** gain significant traction in the market. We assume that the greatest penetration could come in the ~50% of retail sales driven by big-box retailers, and assume a 30% adoption rate of these systems (vs. traditional debit, cash, and checks) over time to arrive at our estimate.
- **Merchant acquiring fees (\$700 mn at risk):** As in the case of B2C credit e believe increased competition from both **traditional competitors and innovators such as Square and PayPal** (as well as market expansion into underserved segments like micro-merchants) could result in a shift of ~10% of merchant acquiring revenue or about \$700 mn over time.

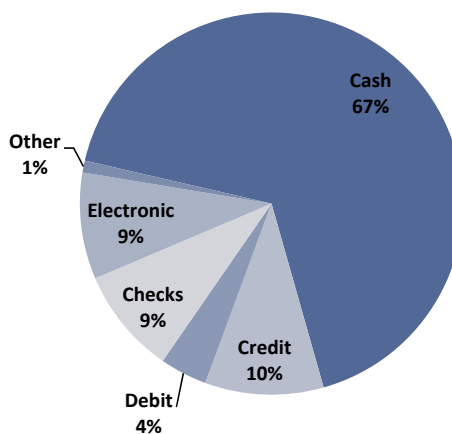
C2C Payments: Convenience reshapes consumers' payment lives

Faster and cheaper: Few economic victims in the “war on cash and checks”

Few areas of payment technology are changing as rapidly as consumer-to-consumer transactions, also known as C2C. Here we define C2C payments as any payment made from one person to another for any purpose (to split a bill, to settle a debt, to give a gift, etc.) other than in exchange for goods and services. Because cash payments between individuals are virtually impossible to track, the exact size of the C2C payment market in the US is difficult to estimate. However, according to the most recent Federal Reserve Payments study, cash dominates C2C payments today, comprising 67% of transactions – with electronic payments making up just 9% of transactions. However, C2C payments in the US made through financial institutions or money transfer organizations have grown relatively quickly over the last several years – with value transferred reaching \$92 bn in 2012 and growing at a CAGR of 26.4%. However, checks and other clearing mechanisms (including those provided by money transfer institutions) comprise nearly 80% of all transactions, followed by cash and book transfers, ACH, and credit/debit cards. About 60% of C2C transfers are originated in person (such as at a bank branch or money transfer agent), with about 30% of transfers occurring on a website and less than 5% on a mobile device.

Relative to other payment forms, we believe C2C payments have the potential to evolve much more rapidly as a result of several factors: (1) convenience and ease of use; (2) lack of “entrenched” counterparties such as businesses, which are typically much slower to adopt new business processes; (3) lack of “stickiness” for incumbent service providers such as offers and rewards.

Exhibit 54: C2C payment mechanisms continue to be dominated by cash



Source: US Federal Reserve.

The challengers: Venmo, Popmoney, and Square among the standouts in a crowded field

A number of C2C payment services have developed over the past five years, and user adoption has grown dramatically over that period. We estimate that in 2014, about \$10 bn of value was transferred using various C2C payment services, most notably Venmo (owned

by EBay), Popmoney (owned by Fiserv), ClearXchange (owned jointly by Bank of America, Capital One, Chase, and Wells Fargo), Square Cash, Dwolla and Obopay. In most cases, these services provide users with the ability to send money to another user using a mobile app, email, or SMS message (see table below). Nearly all these services give users the ability to fund their transfer with a bank account transfer linked to their account, and many offer the ability to use a credit or debit card to fund the transfer. Given the convenience and ease of use of many of these methods, we expect rapid growth in this segment to continue. Not surprisingly, we would note that anecdotally, the heaviest adoption of C2C (especially mobile) payment services has been among younger demographic groups such as Millennials – while adoption among older users has remained relatively low.

Exhibit 55: Comparison of various C2C payment providers by features and cost

	Google Wallet	PayPal	Square Cash	Venmo	Popmoney	Dwolla	ClearXchange
Platforms	iOS, Android	iOS, Android, Windows Phone	iOS, Android	iOS, Android	iOS, Android, Windows Phone	iOS, Android, Windows Phone	iOS, Android
Credit Card Payments	2.9% fee	2.9% fee+\$0.30	N/A	2.9% fee	\$0.95	N/A	N/A
Debit Card Payments	2.9% fee	2.9% fee+\$0.30	Free	Free	\$0.95	N/A	N/A
Bank Account Transfers	Free	Free	N/A	Free	\$0.95	\$0.25 for transactions over \$10	Free
Cash out time	3-10 business days	3-4 business days	1-2 business days	1 business day	1-3 business days	2-3 business days	3 business days, depends on bank
Transfer amount limit	\$10,000 per transaction 50,000 per 5 day period	\$10,000 per transaction	\$2,500 per week	\$2,999 per transaction	\$2,000 from bank account per day \$500 from debit card per day	\$5,000 per day	\$1,000 per day \$2,500 per week \$10,000 per month
Differentiators	Can attach a payment to any Gmail message	Works overseas; most commonly used service	No account required; input debit card number to receive your money	Newsfeed lists your friends' transactions	Flat fee per transaction	Flat fee (charged to recipient)	Customer support directly from banks

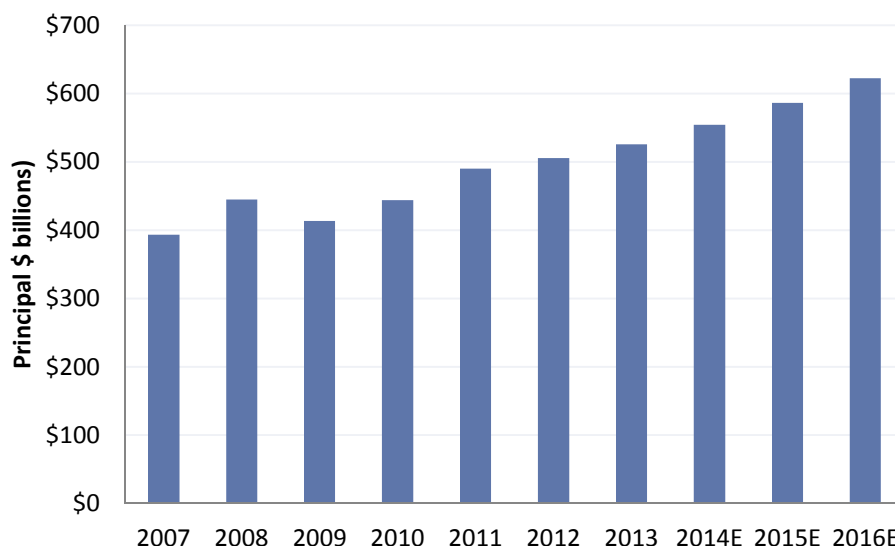
Source: Company data, Goldman Sachs Global Investment Research.

C2C Payments: International money transfer incumbents

International money transmitters: A large and complex market opportunity – but still opportunities for new entrants

Money transmission is a large, but fragmented business at \$580 bn annually. The \$580 bn money transmission market (amount of principal sent in 2014) exists mainly to facilitate sending funds 1) from traveling and migrant workers at their place of work to their families; 2) between unbanked and under-banked individuals in different geographies. Aite Group forecasts the total value of remittances to grow by 5.4% - 6.2% over the next three years. We estimate the fees generated from international money transfer today at roughly \$30 bn, which equates to roughly 6% of the total principal amount.

Exhibit 56: Principal sent via transmitters is growing steadily at 4% - 6% annually
Dollars in billions



Source: World Bank, Goldman Sachs Global Investment Research.

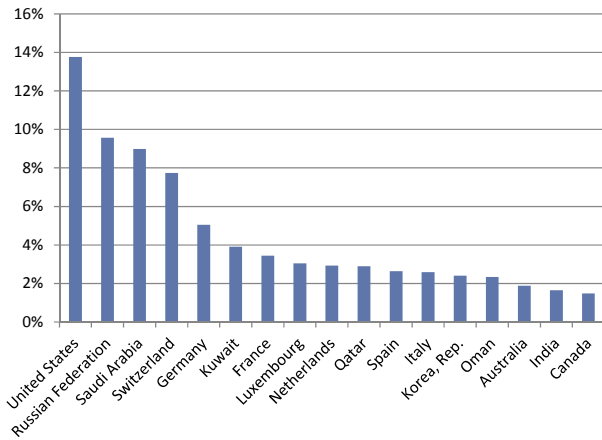
Pricing disruption led by market incumbents. Money transmitters charge a percentage commission of the transmitted value in order to cover fixed costs such as agent overhead (most money transmitters operate through independent agents), network operating costs, and compliance, as well as variable costs related to cross-border FX conversion. Pricing has become more challenged over the past several years, with a global weighted yield declining to 6.03% in 4Q14. We see pricing pressure coming from two areas:

- 1) **Aggressive pricing by incumbents.** In April 2014, WalMart announced that it will offer inter-store money transfers of up to \$900 at rates 30%-40% lower than prior rates by partnering with Ria (a subsidiary of Euronet) rather than its traditional service provider Moneygram. Although this has no impact on the international money transfer market, this highlights aggressive pricing by market incumbents.
- 2) **Global shift from unbanked to banked.** Vendors like Xoom (founded in 2001) focus on the banked population and enable international money transfer through the internet. Although transactions are initiated online (and require bank accounts), the recipient has the option to receive cash at home, collect the cash at a merchant, or have it

deposited into a bank account. For the most part, Xoom offers lower prices (~1-3% and comparable rates to WU.com) on international money transfers than agent-based Western Union transfers because it does not have the overhead of paying commissions to physical agents as does Western Union. As more people worldwide get access to bank accounts and use services from vendors like Xoom and WU.com, we expect further pricing pressure. According to the World Bank, around 50% of the world's population is unbanked, and assuming 0.5% reduction per annum (2.5% over five years), we believe 5% of the global \$29bn (~\$1.5bn) remittance market will be at risk over the next five years. According to World Bank, cutting remittance prices by at least 5 percentage points can save up to \$16 billion a year.

Exhibit 57: The US dominates the money transmission market in terms of cross-border share...

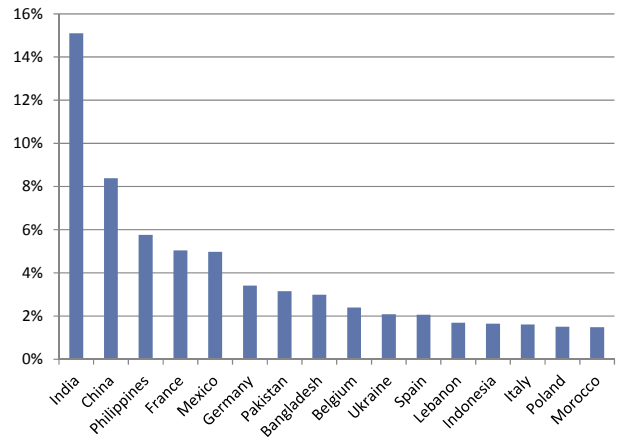
Share of outbound cross-border remittances, 2013



Source: World Bank.

Exhibit 58: ...but India and China lead the way among recipient countries

Share of inbound cross-border remittances, 2013



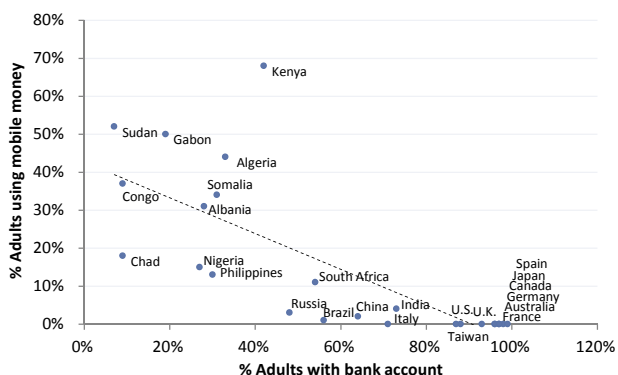
Source: World Bank.

Mobile money transfers: making inroads among the under-banked

Non-financial institutions with distribution strength are tapping into the unbanked and under-banked population. Historically, wireless telecom carriers have had a negligible role in payments, but the emergence of mobile as the primary growth channel for payments is creating interesting new opportunities for telcos. We expect telcos to successfully tap into money transfer opportunities in emerging markets. Ventures like M-Pesa serve as an example of the opportunity related to unbanked customers in emerging markets given high mobile penetration rates. M-Pesa (JV between Vodafone, Safaricom) has over 12.8 million active customers. According to the GSMA, there are 150 live mobile money deployments, and an additional 110 deployments are being planned.

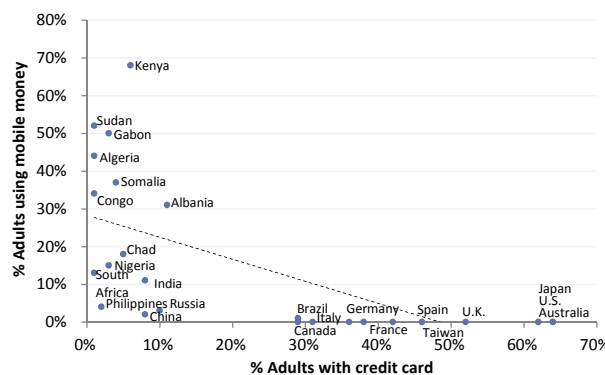
Although non-financial entities like M-Pesa have grown in part due to a lack of regulation, this situation is slowly changing as regulators in countries like India and Nigeria have put regulations in place to align mobile payment systems with existing financial systems. In countries like India, Nigeria, Ghana, Colombia and South Africa, financial regulators are reluctant to grant mobile money licenses to mobile carriers, forcing them into partnerships with banks to tap the opportunity in emerging markets.

Exhibit 59: Higher access to a bank account reduces the propensity to use mobile money



Source: World Bank's Global Findex Database, 2012

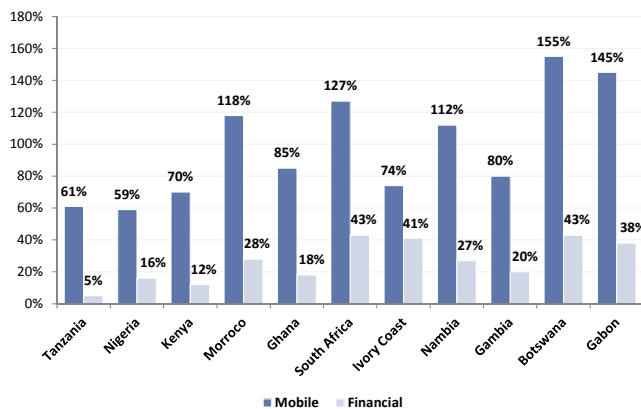
Exhibit 60: Customers with better access to financial instruments are limited users of mobile money



Source: World Bank's Global Findex Database, 2012

Exhibit 61: Significant gap between mobile and banking penetration creates attractive opportunities

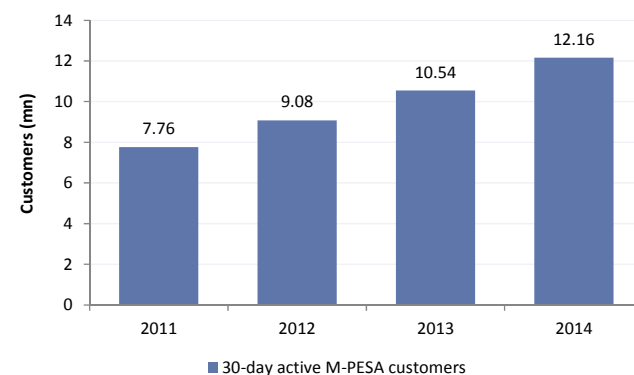
Mobile penetration (%), access to financial services (%)



Source: GSMA Mobile Money Tracker.

Exhibit 62: M-Pesa has seen strong growth over the years supporting growth of other non-financial initiatives

M-Pesa active customers



Source: Safaricom.

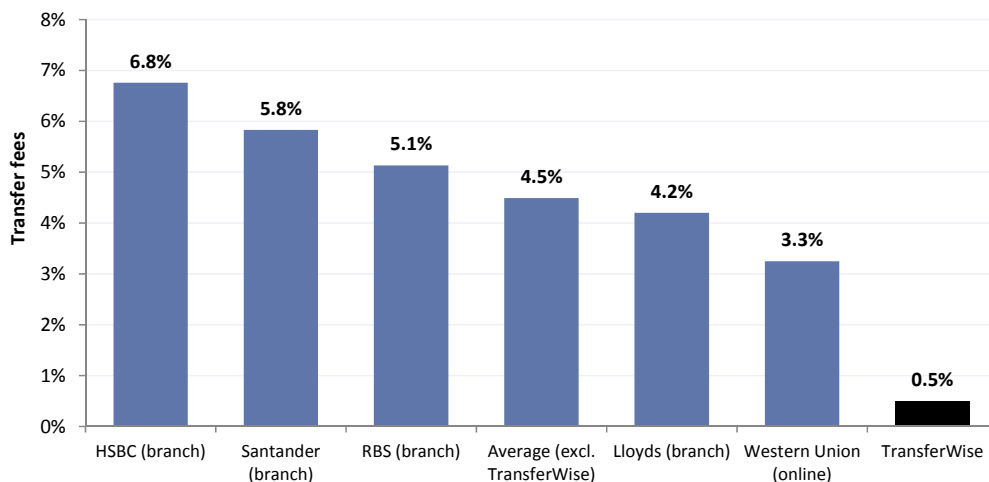
C2C Payments: International money transfer innovators & disruptors

We see two primary areas of potential disruption in the cross-border C2C remittance market. One group of innovators is taking advantage of two-way remittance flows between certain corridors (taking advantage of lower FX risk) in order to deliver lower rates to consumers. Bitcoin and other virtual currencies offer the promise of lower rates by maintaining commodity value independent of fiat currency, and converting to fiat currency only when funds are needed.

Money transmitter innovators in the US and Europe

New C2C money transfer players are operating currency marketplaces which match users who seek to buy or sell the same currency. By matching one user selling currency to another user buying it, emerging C2C providers are able to offer attractive transfer rates comparable to retail bank rates. Money destined for transfer never actually “leaves” the country, resulting in lower international bank and intermediary fees. If no internal match is available, most platforms will provide the required liquidity to make up the shortfall and complete customer orders. Notable vendors in the space include **CurrencyFair, TransferWise, Midpoint and Kantox** (focused more on medium to large organizations). Since C2C FX vendors (who roughly charge ~0.5%) still rely on traditional rails to transfer money, we see marginal impact on vendors like Western Union in the near term. However, we see potential threat to mainline retail banks which charge 2% - 5%.

Exhibit 63: C2C FX vendors reduce transaction costs using a currency marketplace
Total cost of sending £1000 from UK to Germany



Source: TransferWise (survey conducted by Charterhouse Research).

Exhibit 64: Key C2C with significant European exposure

Listing of key C2C vendors

Vendor	Year founded	Amount exchanged	User savings	Geographical presence	Business description
CurrencyFair	2009	Euro 1,200 mn	4% - 5%	37% UK, 20% Australia	Online peer-to-peer currency exchange market place
TransferWise	2010	--	4% - 5%	UK, Germany, France, Spain	P2P money transfer service, which charges 0.5% per transfer
WeSwap	2012	--	2% - 7%	15 currencies across the globe	Multi currency account and prepaid MasterCard
Weeleo	2013	--	--	USA, U.K., Belgium, Switzerland, Brazil	P2P cash currency exchange (free)
Midpoint	2013	--	2% - 5%	UK, Europe, USA + more	P2P international currency matching & payments platform
Kantox	2011	\$1,000 mn	2% - 5%	35 countries	Comprehensive FX management solution for SMEs

Source: Company data.

Cryptocurrencies: A potential value proposition for international FX

In 2014, the European Banking Authority (EBA) defined "virtual currencies" as "a digital representation of value that is neither issued by a central bank or a public authority, nor necessarily attached to a fiat currency, but is accepted by natural or legal persons as a means of payment and can be transferred, stored or traded electronically" (see also our section on key technology shaping trends and Bitcoin earlier in this report). Most virtual currencies are based on distributed networks, and are not owned or controlled by anyone. Distributed networks are, in principle, more secure and reliable due to their open source nature, and there is no single point of failure.

Exhibit 65: Bitcoin and Ripple are the major virtual currencies in use today

List of world's top 10 biggest virtual currencies

Name	Market Cap (mn)	Price	Available Supply	Volume (24h)
Bitcoin	\$3,782	\$271.88	13,910,575 BTC	\$40,816,500
Ripple	\$353	\$0.01	99,999,325,327 XRP	\$1,673,550
Litecoin	\$70	\$1.89	37,023,804 LTC	\$1,893,060
BitShares	\$25.3	\$0.01	2,502,967,184 BTS	\$68,688
PayCoin	\$9	\$0.65	13,799,140 XPY	\$65,488
Dogecoin	\$14	\$0.0001	98,508,011,200 DOGE	\$28,317
Stellar	\$11	\$0.003	3,624,283,900 STR	\$24,158
MaidSafeCoin	\$13	\$0.03	452,552,412 MAID	\$7,973
Darkcoin	\$18	\$3.41	5,177,888 DRK	\$106,141
Nxt	\$13	\$0.01	999,997,096 NXT	\$13,605

Updated as of 3/6/15

Source: Coinmarketcap.com

With a significant opportunity in the form of the existing \$580bn money transmission market, remittance is an attractive market opportunity for virtual currencies.

According to the World Bank, most conventional money transfer services charged 6.03% on average (weighted) in 4Q14 (inclusive of FX translation and service fees) to send \$200 in most major international corridors. Given the low transaction fees associated with money transfer using virtual currencies, there is potential for significant dislocation in the profit pools associated with money transfer. **More than 100 virtual currencies exist today with Bitcoin and Ripple being the largest.**

Bitcoin offers the potential for lower international money transfer fees

Bitcoin and other cryptocurrencies enable the potential for faster transactions with lower transaction fees. Any two users with access to the internet and appropriate software can send bitcoin to each other for a zero or minimal fee. The Bitcoin network can charge as little as zero for processing transactions if there is no time constraint for confirmation. However, for transfers to be confirmed in a matter of minutes, miners typically charge fees of approximately 5 - 20 bps. However, converting fiat currency to bitcoin (and vice versa) does carry associated fees.

For sophisticated users with bank accounts, money transfer involves the following key steps:

- **Buying bitcoin (sending user)** – One can buy bitcoin from exchanges like **Coinbase, itBit, Circle, Trucoin and CoinCorner** using a bank account or debit/credit cards. Typically, these exchanges verify the transaction first and charge ~1% for converting cash to bitcoin. In the most mature markets competition has driven the cost to less than 1%, and vendors like Circle have begun offering conversion between bitcoin and US dollars at no cost.
- **Storing and transferring bitcoin** – Once one receives bitcoin, it can be stored on a computer or in an online wallet. Trading and transfer services are provided by exchanges or simple wallet services including Coinbase (US), Bitfinex (Hong Kong), Bitstamp (US), CoinJar (US) and BTC China. The Bitcoin network can charge as little as zero for processing transactions if there is no time constraint for confirmation. However, for transfers to be confirmed in a matter of minutes, miners typically charge fees of approximately 5 - 20 bps.
- **Selling bitcoin (receiving user)** – If the user receiving bitcoin wishes to convert it back to fiat currency for use offline, she will typically need to pay a 1% charge.

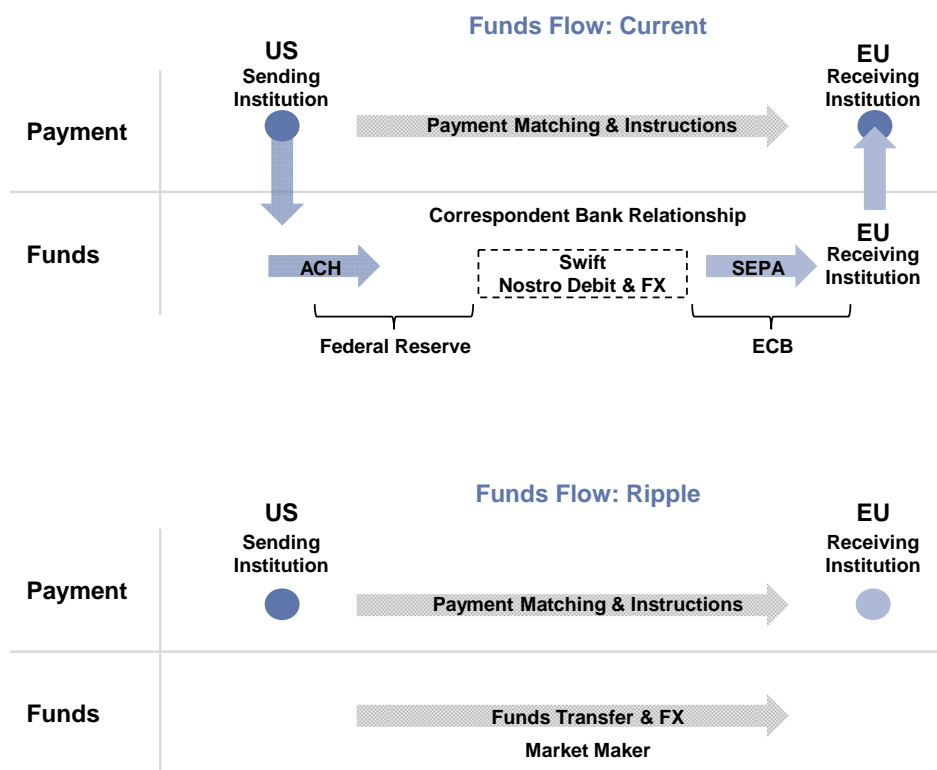
For customer without bank accounts, vendors can take care of the process for a small fee. Bitcoin-based remittance vendors like Bitspark (Hong Kong) are solely focused on the remittance market and charge around ~1% of the transaction for transferring money. They further simplify the process by taking cash and handling bitcoin for those customers without the necessary technology or skills.

Customers can deposit cash with these vendors, who convert the cash into bitcoins which gets re-converted to local currency by partners in receiving countries. Receiving customers can pick cash at various locations through banks, pawnbrokers, and remittance agent locations. The potential for fluctuations in bitcoin price are less of a concern in these models as the transactions happen quickly and customers are given an agreed rate in advance.

The key concerns related to using Bitcoin for money transfers are related to lack of traceability and high volatility associated with Bitcoin. Despite the proof of identity requirements, exchanges and wallets are not regulated as banks are and hence there is no security for one's account if the exchange goes out of business or is robbed by hackers, such as may have been the case with Mt. Gox.

Exhibit 66: Cryptocurrencies like Ripple have significant potential to disrupt the international money transfer market

How monetary flow systems work using Ripple



Source: *Cryptoinnews.com*

Ripple network enables real time international payments

At its core, the Ripple protocol is a shared public database. This database includes a ledger, which tracks accounts and associated balances. It is continually and automatically updated by the Ripple Transaction Protocol (RTXP) so that an identical ledger exists on thousands of servers around the world. When changes are made to the ledger, computers connected to the Ripple protocol will mutually agree to the changes via a process called “consensus”. The Ripple protocol reaches “consensus” globally within seconds of a change being made.

Ripple Labs (formerly OpenCoin) developed the Ripple protocol. The company provides a network that enables real-time cross-border payments in different currencies, including in fiat currencies, its own ripple currency, as well Bitcoin and ad hoc currencies created by users. As evident by the recent partnerships announced by Ripple labs with UK based technology vendor Earthport and banks (Germany based Fidor, Kansas-based CBW Bank and New Jersey based Cross River Bank), the Ripple protocol is finding acceptance by financial institutions and other enterprise clients. **Most small banks which rely on larger partner banks for international money transfer can now use virtual currencies to facilitate international money transfer.**

Sizing the risk in C2C payments from emerging players: What does it all mean?

We see a number of secular factors at in the international money remittance market over the next 10 years that could drive risk to revenue and profit pools in the existing C2C payments market. Note that we do not provide risk estimates for domestic money transfer, as most incumbents receive little or no fees for account transfers, as these as typically included in retail banking fees. Below we list the key assumptions driving our view that about \$6 billion (20%) of today's \$30 billion C2C money transfer market could be at risk:

- **Lower rates from the move to account-based international remittance:** As the world's population gradually becomes more penetrated with traditional banking services and more remittance recipients gain access to bank accounts, we believe money transfer will shift from agent-to-agent transfers to account-to-account services, which carry lower fees. We expect up to a 20 percentage point market share shift in the coming 10 years, with average remittance rates moving from 6.0% of principal (current average) to 2.5% (average for online-based services like **Xoom and WesternUnion.com**). We assume the remaining 10% - 12% of the market accrues to consumers in the form of lower fees.

B2B Payments: Driving efficiency for the enterprise – A rare greenfield opportunity for the payments industry

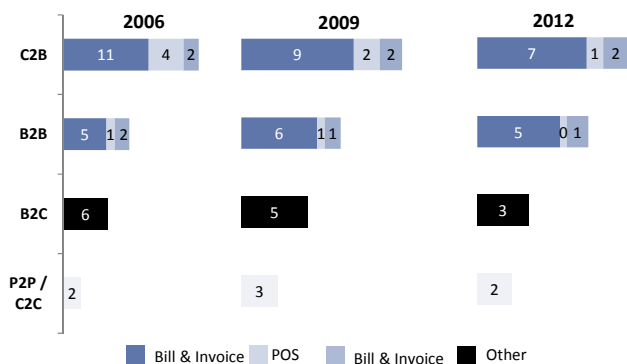
Business to business (B2B) payments refers to payments made between companies for goods or services rendered. Paper checks remain the dominant payment form for B2B payments today, with nearly 50% of payments still made by check in the US. We estimate the cost of reconciling expenses and processing payments at roughly \$550 bn globally today, which is largely in the form of operating expenses borne by businesses of all sizes. However, electronic forms of payment offer the potential for significant cost savings for businesses – and increased revenue for payments companies. We believe electronic formats of B2B payments such as virtual cards, payment cards (known as PCards) and ACH transfer will see significant adoption over the next 10 years, resulting in significant cost savings.

Waste, fraud, and abuse: The cost penalty that corporations endure today from the use of paper checks

Paper checks remain the dominant form of B2B payments in the US. One of the implications of the financial crisis has been the increasing need for automated systems which improve traceability and enhance working capital efficiencies. B2B payments are typically disconnected from underlying commercial transactions, creating problems for reconciliation and increasing the time needed to process transactions.

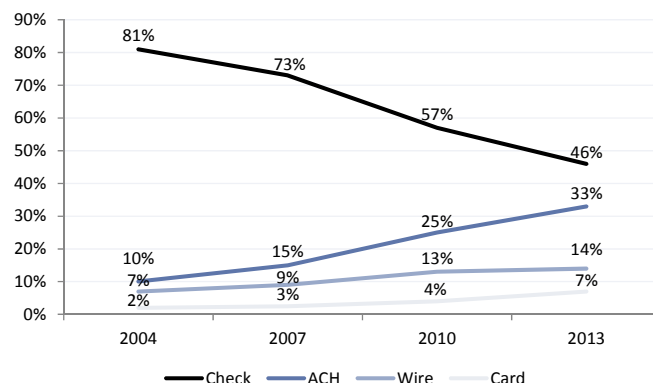
Nearly 50% of the B2B payments in the U.S. still made by check (according to the Association of Financial Professionals), in part because many businesses have been slow to adopt electronic systems. Paper processes are expensive, time consuming, and subject to significant errors – the direct cost of writing a check includes supplies, postage costs and bank charges for processing. According to the National Clearing House Association (NACHA), the true cost of processing a paper check is about \$8 (ranging between \$3 and \$9), not including the cost of processing paper, hardware, exception handling, or fraud. Creating payments automation that replaces paper processes is beneficial but requires up-front investment to implement. The cost to process a card payment is ~\$2 compared to the \$3 - \$9 needed to process a check – and thus the potential savings that can be derived from automating payments is significant.

Exhibit 67: Checks are most prevalent in C2B payments
Number of checks written by counterparty (billions)



Source: 2013 Federal Reserve Payments Study.

Exhibit 68: Paper checks continue to decline, with ACH and cards largely replacing checks
U.S. B2B payment mix % of total number of transactions



Source: BOK Financial Corporation.

Exhibit 69: ACH and Virtual/Pcards are the most effective B2B payment options

Types of B2B payment formats

	ACH	Check	Virtual/Pcard	Wire
Payment Float	none	1 day	20 days	none
Process/Effort	Auto/Low	Manual/High	Auto/Low	Manual/High
Payment cost	Free-\$0.25	\$3.67-\$8.00	Interchange refund to sender	\$20-\$35
Payment set-up	Yes	No	Yes	Yes
Payment maintenance	Either	Buyer	Either	Buyer
Payment risk	Low	High	Very low	Low
Payment Details/Accounting	Matching details	None	Very detailed	None

Source: AOC Solutions Inc.

Electronic purchasing cards, ACH, and wire transfers are gaining traction to help reduce overhead with electronic payments

Automating the accounts payable process with electronic payments helps optimize working capital management by improving visibility into cash flow using a combination of real time data updates, error and fraud reduction, administrative cost savings, and the opportunity for early payment discounts. According to Ardent Partners, most organizations (51% of those surveyed) see cost savings as the key benefit of electronic payments.

There are numerous ways to implement automated payments, but one of the simplest and most effective is commercial purchasing cards.

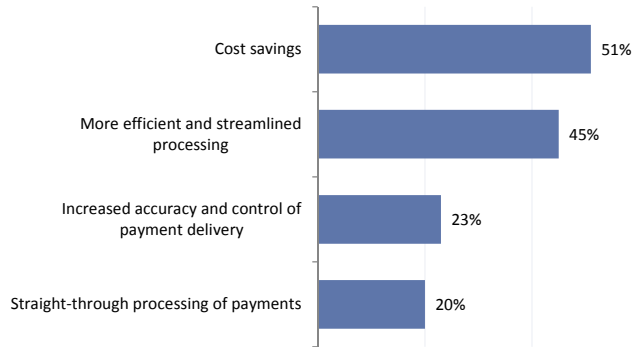
A basic **Purchasing Card (P-Card)** is a debit-like replacement for petty cash for low-value goods, and can simplify everyday purchases. P-Card programs help reign in everyday spending levels, provide transparency on reporting and controls as well as provide a basis for improved supplier negotiation.

Automated Clearing House (ACH) transfers are aggregated into batches by a third party, allowing banks to process them more efficiently and inexpensively relative to paper checks. Companies which have undertaken the integration of ACH transfers with their accounting systems typically see significant cost reduction, and ACH is seeing very strong traction in B2B payments. However, ACH transfers typically take 2-4 days to process and clear, and thus do not result in the same level of working capital improvement as other electronic payment methods.

Wire transfers are one of the most common ways for businesses to pay each other, but are expensive to process (typically incurring a fee over \$10) since banks have to deal with each transfer individually. Wire transfers typically clear on the same day they are sent, and thus companies who are willing to pay wire fees (typically for urgent, high-value transfers) typically see working capital early payment benefits. We would point out that in the US, both ACH and wire transfers could move to an “instant ACH” system over the next 10 years if the US Fed implements its payment modernization roadmap.

Exhibit 70: The top benefits of ePayments for AP departments

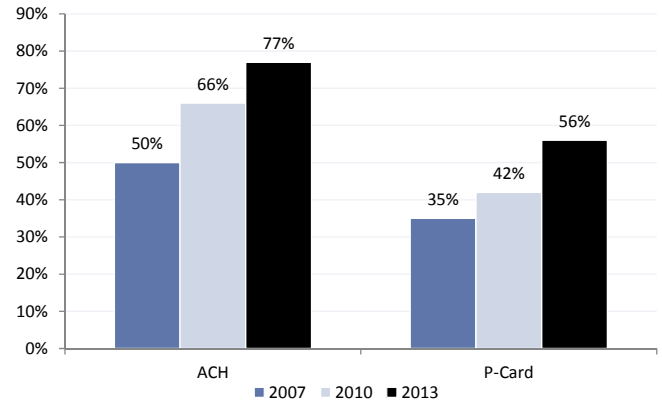
The top benefits of ePayments for AP departments



Source: Ardent Partners.

Exhibit 71: ACH and PCards are being increasingly adopted commercially for enhanced cost savings

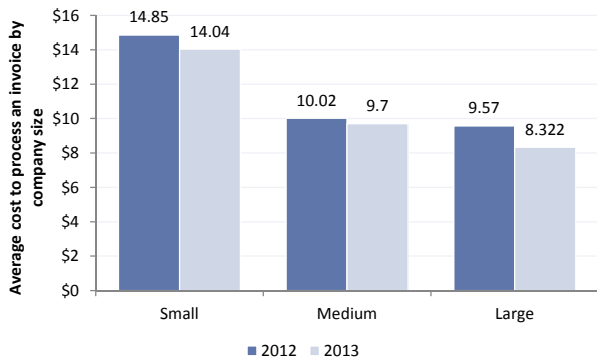
Payment integration with A/P (%)



Source: BOK Financial Corporation.

Exhibit 72: Cost of processing increases with decreasing size

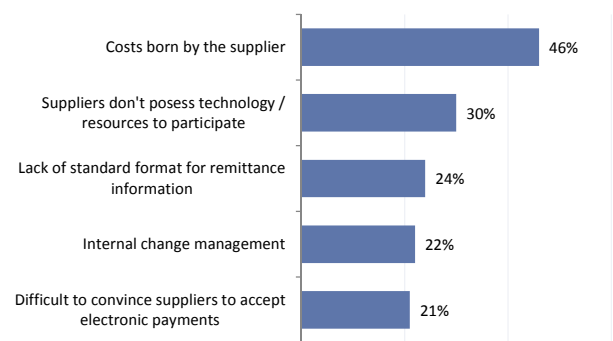
Average cost to process by company size



Source: PayStream Advisors.

Exhibit 73: Costs and lack of IT resources are key reasons for slow adoption of ePayments

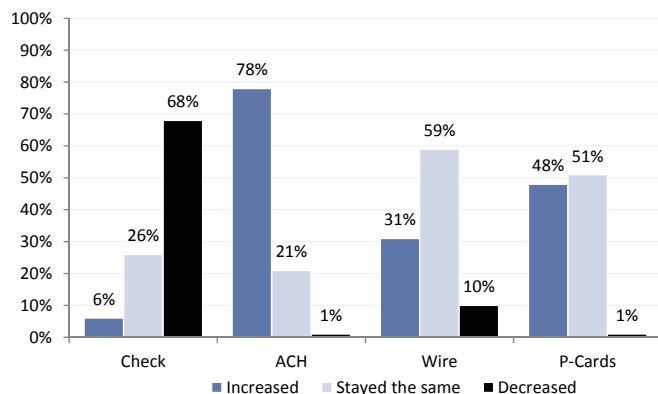
Top barriers to ePayment adoption in 2014



Source: Ardent Partners.

Exhibit 74: Increased demand for electronic payments

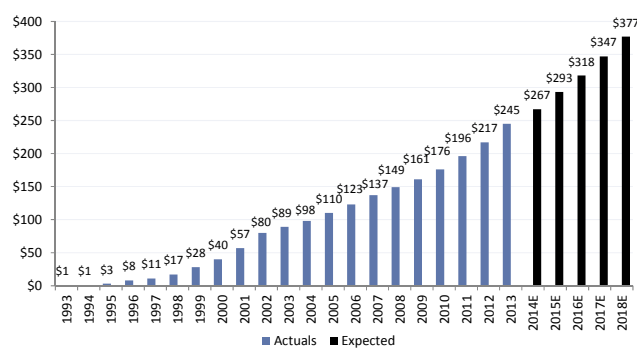
Payment split across various formats



Source: BOK Financial Corporation.

Exhibit 75: Purchasing card spending in North America

Purchasing card spending in North America (\$bn)

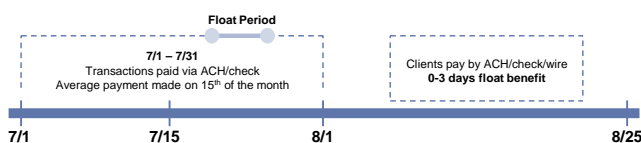


Source: Purchasing Card Benchmark Survey, RPMG Research.

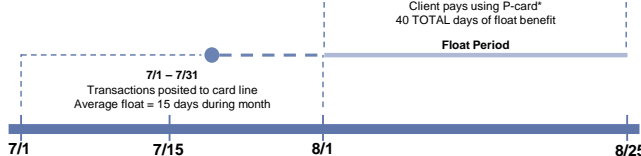
Exhibit 76: P-card enables float improvement for clients

Float improvement due to P-card usage

A/P paid by ACH / Check / Wire



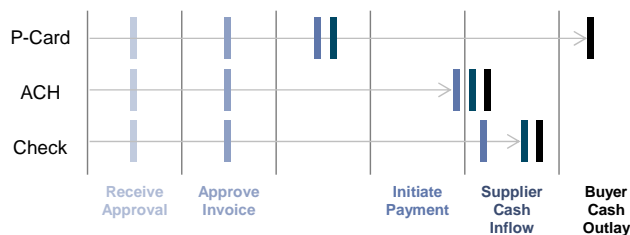
A/P paid by P-Card



Source: First National Bank of Omaha.

Exhibit 77: P-card growth has been driven by process and working capital savings for clients

Days following request of goods/services



Source: First National Bank of Omaha.

Exhibit 78: P-Card/One card acceptance by B2B suppliers by geographic market

Acceptance Rate	U.S.	Canada	Latin America	Europe	Middle East	Africa	Asia Pacific
75% of more	47%	11%	2%	4%	0%	0%	3%
50 to 74%	19%	8%	1%	3%	0%	0%	2%
25 - 49%	12%	5%	4%	8%	4%	1%	2%
Less than 25%	7%	15%	3%	10%	3%	4%	5%
2013 Average	68%	47%	42%	38%	26%	17%	43%

Source: 2013 NAPCP supplier acceptance survey, First Annapolis.

Virtual cards: Gaining ground quickly & outweighing costs by delivering value

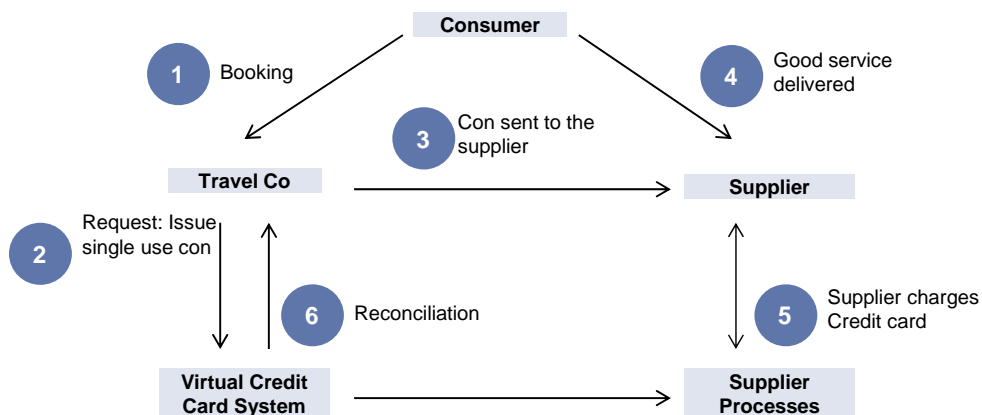
For larger, more sophisticated purchasing, virtual cards are particularly attractive. Virtual card payments are a way to automate the accounts payables process by using non-physical credit card numbers – or “virtual cards” for payments. A virtual card is a single-use account number that processes against a master card account. The virtual card is created by an application that can be hosted by the bank or the card networks. The virtual card application provides a secure, convenient, and smart way for users to sign in, request a card and specify how it will be used (including things like amount, timeframe, supplier name, number of transactions). While virtual payments have been in existence for the last 10-15 years, the market is seeing an inflection in growth driven by increased focus on cash management, product maturity and regulation driven demand in verticals like healthcare.

Virtual cards, specifically single-use ghost accounts (SUGA), are a secure payment method that can create pre-determined closure for orders/invoices for the merchant. As evident in their name, single-use ghost accounts can only be used once. There are two popular forms of virtual or e-payments that are used to pay merchants – pull pay and push pay. Pull pay is a merchant-initiated electronic payment method that allows for the processing of payments on SUGA accounts, and the merchant controls when and how to process the payment. Push pay or “straight-through processing” is a buyer-initiated purchase similar to ACH.

Virtual cards have gained significant traction in online travel. A virtual credit card offers a secure payment method by which online travel agents pay their suppliers, such as hotels, car rental agencies or tour operators. It provides global supplier acceptance via their existing credit card terminals. Each authorization request is evaluated against a range of transaction controls that provides additional security, but can also generate processing complexities.

Exhibit 79: The travel sector has seen strong adoption of virtual cards

Virtual credit cards for travel suppliers



Source: Company data.

IT Services and BPO providers: An incremental opportunity to transform the enterprise with IT in the “last bastion of paper”

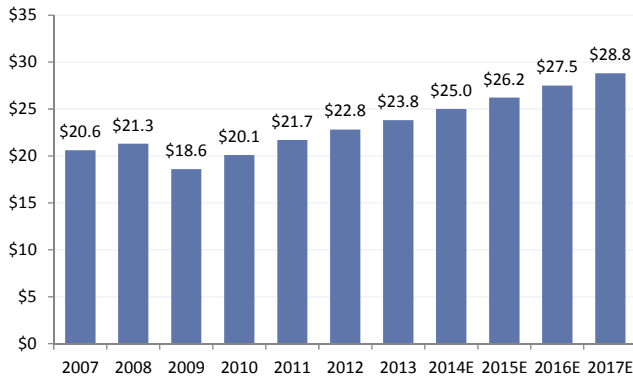
The key challenge for a much wider adoption of virtual payments has been suppliers’ reluctance to accept virtual payments and the associated costs. Integration challenges and shortage of IT resources for implementation are cited as other key reasons for slower adoption. We believe as products mature and more vendors like **WEX, FleetCor and IT services/BPO vendors** accelerate their focus and investments in the space, integration and IT staff concerns should subside and further accentuate the demand in the segment. We

would point out that the earliest market traction made by these vendors has been in verticals with significant payments complexity and cash usage currently, such as construction and hospitality.

Other notable vendors include **NVoicePay, Paymode-X, US Bank, Ariba (with Discover) and Basware (with MasterCard).**

Exhibit 80: Commercial Expenditure is growing at 5% CAGR

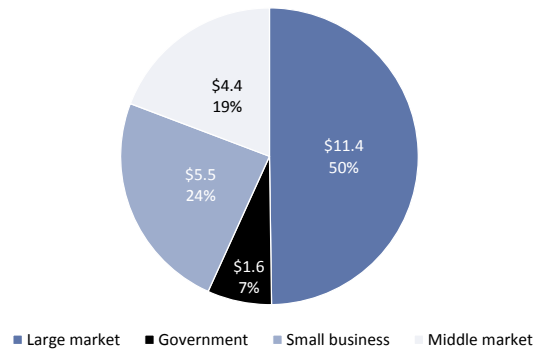
U.S. Commercial Opportunity



Source: Visa Commercial Consumption Expenditure Index

Exhibit 81: Small and mid-markets remain significant opportunities

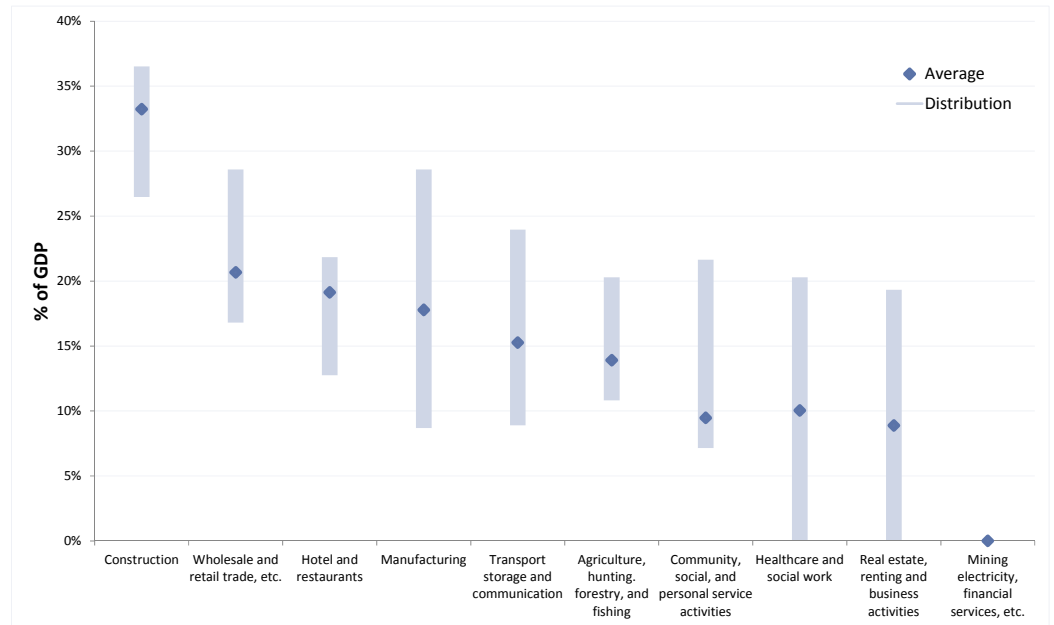
Segmentation by revenue



Source: Visa Commercial Consumption Expenditure Index

Exhibit 82: Construction, wholesale, retail trade, and hotels are the sectors with highest shadow economies – represent the most attractive segments for electronic payments

Shadow economies as a % of GDP by sector



Note: Examples are based on data for six focus countries: Germany, Spain, Italy Poland, Romania and Turkey

Source: A.T. Kearney "The Shadow Economy in Europe," 2013.

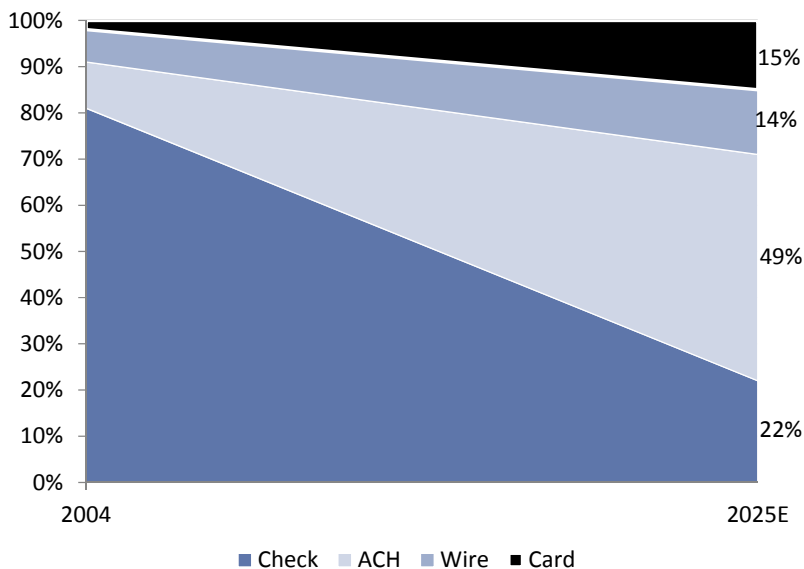
We estimate the US B2B virtual card market to grow to \$6.9bn by 2025

Checks as a percentage of the total US commercial payments mix have declined from 81% in 2004 to 46% in 2013, implying a decrease in mix of 3.9% per year. ACH has been the biggest gainer and contributed to 33% of the total US commercial payments mix in 2013 compared to 10% in 2004. Virtual/PCards has been the other gainer and accounted for 7% of the payments mix in 2013.

We assume the shift in payments mix continues to move in favor of ACH and cards going forward. Assuming, the proportion of checks continues to decline at roughly half the pace of previous 10 years (given the significant shift in recent years); we estimate checks to represent 22% of the payments mix by 2025. We expect ACH to be the main beneficiary of this trend and account for 2/3rd of the gains with cards making up for the remaining 1/3rd. Based on the above assumptions, we forecast \$16 bn of cost savings in the US from a shift to electronic payments over 2013 to 2025. On a global basis, \$74 bn of cost savings can be realized if the structural shift to electronic payments continues.

Assuming the cost per transaction for virtual/PCards is \$2.78 for an average transaction size of \$2,186 transaction, we estimate a \$6.9 bn market opportunity for virtual/PCards by 2025E. On a global basis, this represents a \$31bn market opportunity.

Exhibit 83: We expect ACH and cards to gain at the expense of checks
Payments mix as a % of total B2B transactions



Source: Goldman Sachs Global Investment Research.

Sizing the nascent B2B opportunity for card-based payments: What does it all mean?

As we have laid out above, we believe a significant opportunity exists for corporates to cut both transactional and OpEx costs through a move to increased use of electronic payments, including card-based payments, ACH, and wire transfers. We believe this could result in a cost savings of \$16 bn in the US and \$74 bn globally. In addition, we believe the B2B payments space represents a **significant opportunity for emerging card-based B2B payment vendors like FleetCor, WEX, NVoicePay, Paymode-X, US Bank, Ariba (with Discover) and Basware (with MasterCard)**. We size the incremental card-based payment

Appendix I: Index of Emerging Payment Companies

Exhibit 85: Comprehensive list of innovative and incumbent payment vendors globally

List of payment vendors

Company Name	Domicile	Year Founded	Business Model	Latest Financing	Series Round	Capital Raised (mn)	Total Capital Raised (mn)
Direct bank debit transfer system							
Dwolla	U.S.	2008	Electronic payments platform using ACH	Sep-14	Series D	\$9.7	\$32.5
Euronet (public, uncovered)	U.S.	1994	Offers EFT processing and money transfer services using ACH	N/A	N/A	N/A	N/A
MoneyGram (public, uncovered)	U.S.	1998	Offers omnichannel money transfer services using ACH	N/A	N/A	N/A	N/A
NVoicePay	U.S.	2009	Electronic accounts payable solution using ACH	Jan-15	Series E	\$6.0	\$10.3
Paymode-X	U.S.	2000	Electronic accounts payable solution using ACH	N/A	N/A	N/A	N/A
PayPal (public, uncovered)	U.S.	1998	Digital wallet / money transfer solution using ACH	N/A	N/A	N/A	N/A
Popmoney (part of FIServ)	U.S.	2010	P2P money transfer solution in partnership with banks using ACH	N/A	N/A	N/A	N/A
Xoom (public, uncovered)	U.S.	2001	Digital money transfer services using ACH	N/A	N/A	N/A	N/A
International money transfer							
CrowdTransfer	Chile	2014	Social network for peer-to-peer international money transfer	Jun-14	Seed	\$0.04	\$0.04
CurrencyFair	U.S.	2009	Peer-to-peer FX money transfer	Nov-13	Seed	\$2.5	\$4.8
Earthport (public, uncovered)	U.K.	2010	Cross-border remittance solution	N/A	N/A	N/A	N/A
Kantox	U.K.	2011	Comprehensive FX management solution for SMB	Feb-14	Series A	\$8.7	\$10.2
Midpoint	U.K.	2013	Peer-to-peer FX mobile matching platform	N/A	N/A	N/A	N/A
TRANSFAST	U.S.	1988	Mobile international money transfer	N/A	N/A	N/A	N/A
TransferWise	U.K.	2010	Peer-to-peer FX money transfer	Jan-15	Series C	\$58.0	\$94.4
WeSwap	U.K.	2010	Peer-to-peer money transfer product using network rails	Oct-14	Series A	\$7.5	\$10.0
WorldRemit	U.K.	2010	Online and mobile money transfer platform	Feb-15	Series B	\$100.0	\$147.7
Loyalty & rewards							
Cardlytics	U.S.	2008	Advertising technology connecting buyers/ sellers via online banking channels	Oct-14	Series C	\$70.0	\$143.0
Cartera commerce	U.S.	2005	Delivers performance-based platform of offers for card issuers	May-12	Series D	\$12.2	\$44.1
Free Monee	U.S.	2009	Card-link personalized loyalty and reward offerings	Jan-13	Series C	\$11.0	\$45.0
Reward Insight	U.K.	2001	Card-link reward offerings focused on retailers and financial institutions	N/A	N/A	N/A	N/A
SavingStar	U.S.	2010	Shoppers earn savings with offers linked to retail loyalty cards	Apr-13	Series D	\$9.1	\$18.3
Shopkick	U.S.	2009	Mobile app with reward offerings for patrons of participating vendors	Jul-10	Series B	\$15.0	\$20.0
Truaxis (part of parent)	U.S.	2007	Provider of loyalty rewards and personalized statement solutions	N/A	N/A	N/A	N/A
Mobile payments solution							
LevelUp	U.S.	2011	Mobile network with QR codes and loyalty/rewards offerings	Aug-12	Venture	\$21.0	\$40.0
MCX	U.S.	2014	Merchant-owned mobile commerce network	N/A	N/A	N/A	N/A
Obopay	U.S.	2005	Mobile money transfer solution via mobile, online, email or text	Jul-11	Series F	\$8.8	\$144.8
Seamless (public, uncovered)	Sweden	2001	Mobile network using QR codes/NFC chips that offers loyalty / rewards	N/A	N/A	N/A	N/A
SoftCard	U.S.	2011	Mobile wallet with NFC chip and loyalty/rewards offerings	N/A	N/A	N/A	N/A
Znap	Hong Kong	2010	Mobile platform using QR codes for omnichannel payments	N/A	N/A	N/A	N/A
M-Pesa (part of parent)	U.S.	2007	Mobile based money transfer and microfinancing services	N/A	N/A	N/A	N/A
edo	U.S.	2007	Personalized offers connected to mobile wallet	Feb-14	Series D	\$7.5	\$73.5
Venmo (part of parent, uncovered)	U.S.	2009	Peer-to-peer payments application for iPhone and Android using ACH	Aug-11	Series A	\$1.2	\$1.3
ClearXchange	U.S.	2011	Peer-to-peer payments application through the networks	N/A	N/A	N/A	N/A
99Bill	China	2005	Provides e-mail and mobile payment solutions	Dec-12	Series E	27	81.6
Payment service provider							
Alipay	China	2004	Online payment solution in China	N/A	N/A	N/A	N/A
Amazon Payments (public, uncovered)	U.S.	2007	Payment processing and inline checkout services integrated into Amazon	N/A	N/A	N/A	N/A
Ariba (part of parent, uncovered)	U.S.	1996	Provider of collaborative business commerce solutions	N/A	N/A	N/A	N/A
Basware (public, uncovered)	Finland	1985	Offers enterprise software for financial processes	N/A	N/A	N/A	N/A
Cardspring (part of parent, uncovered)	U.S.	2012	Platform enabling app developments for payments	Jan-12	Series A	\$10.0	\$10.0
ChinaPnR	China	2006	Provider of integrated payment services	Sep-11	Series B	\$6.7	\$6.7
Faster Payment	U.K.	2011	Payment network between banks to facilitate faster remittance	N/A	N/A	N/A	N/A
Justpay	China	2011	Provider of web solutions to enhance e-commerce infrastructure	N/A	N/A	N/A	N/A
PayNearMe	U.S.	2009	E-commerce platform for consumers without credit or debit cards	Feb-14	Series E	\$20.0	\$56.5
Paytm	India	2010	E-commerce platform that offers mobile wallet solutions	N/A	N/A	N/A	N/A
Square, Inc.	U.S.	2009	Payments aggregator / POS provider for micro merchants	Oct-14	Series E	\$150.0	\$590.5
Stripe	U.S.	2010	Provider of online payments infrastructure	Dec-14	Series C	\$70.0	\$190.0
TenPay	China	1998	Online payment solution in China	N/A	N/A	N/A	N/A
WePay	U.S.	2008	Provider of payments API for platform businesses	Jan-14	Series C	\$15.0	\$34.2
POS /analytics solution							
GoPago (part of Amazon)	U.S.	2009	Mobile POS system that allows for outside-store payments	N/A	N/A	N/A	N/A
Izettle	Sweden	2010	Mobile payment POS solution compatible with EMV	Jul-14	Series C	\$6.8	\$108.5
Powa Technologies	U.K.	2007	Mobile POS solution and payment enablement application (PowaTag)	Nov-14	Series C	\$80.0	\$176.7
Revel Systems	U.S.	2010	POS solution provider compatible with EMV	Nov-14	Series C	\$100.0	\$115.0
ShopKeep	U.S.	2008	POS solution provider designed for SMB	Apr-14	Series C	\$25.0	\$37.2
Womply	U.S.	2011	Offline to-online card processing service and analytics solution	N/A	N/A	N/A	N/A
SumUp	U.K.	2011	POS solution for mobile devices	Aug-14	Series C	\$13.0	\$33.0
Payleven	Germany	2012	Mobile POS device that attaches to smartphone	Feb-13	Series B	\$2.7	\$15.2
Virtual currency solution							
Bitcoin.de	Germany	2011	Bitcoin marketplace in Europe	N/A	N/A	N/A	N/A
BitPay	U.S.	2011	Largest merchant processor for Bitcoin currency	May-14	Series A	\$30.0	\$32.5
Bitstamp	U.K.	2011	Bitcoin marketplace (third largest by volume globally) in UK	Dec-13	Seed	\$10.0	\$10.0
BTC China	China	2011	Bitcoin marketplace (second largest by volume globally) in China	Nov-13	Series A	\$5.0	\$5.0
Circle	U.S.	2014	Product suite designed to facilitate the exchange of Bitcoin	Mar-14	Series A	\$17.0	\$26.0
Coinbase	U.S.	2012	Bitcoin marketplace with bank transfer capabilities	Jun-12	Series C	\$75.0	\$106.7
CoinCorner	U.K.	2014	Online source where once can purchase Bitcoin currency in UK	N/A	N/A	N/A	N/A
CoinDesk	U.K.	2013	News and analytics database for virtual currency investors	N/A	N/A	N/A	N/A
CoinJar	U.K.	2013	Bitcoin marketplace in UK	Dec-13	Seed	\$0.5	\$0.5
Coinsetter	U.S.	2012	ECN for foreign exchange trading	Oct-14	Series B	\$1.3	\$3.1
FastMatch	U.S.	2014	ECN for foreign exchange trading	N/A	N/A	N/A	N/A
itBit	U.S.	2012	Global exchange platform for institutional and retail Bitcoin investors	Nov-13	Series A	\$3.3	\$5.5
Ripple Labs	U.S.	2012	Open source payment network (second largest virtual currency after Bitcoin)	Nov-13	Seed	\$3.5	\$9.0
Stellar	U.S.	2014	Non-profit, decentralized currency system	Aug-14	Seed	\$3.0	\$3.0
TruCoin	U.S.	2014	Online source where once can purchase Bitcoin currency in US	N/A	N/A	N/A	N/A
VirtEx (Canada)	Canada	2011	Bitcoin marketplace in Canada	N/A	N/A	N/A	N/A

Source: TechCrunch, company data.

Disclosure Appendix

Reg AC

We, James Schneider, Ph.D., S.K.Prasad Borra, Ryan M. Nash, CFA, Heath P. Terry, CFA, Eric Beardsley, CFA, Richard Ramsden, Greg Dunham, CFA, Jeffrey Chen, Jordan Fox and Margarite Halaris, hereby certify that all of the views expressed in this report accurately reflect our personal views about the subject company or companies and its or their securities. We also certify that no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

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The precise calculation of each metric may vary depending on the fiscal year, industry and region but the standard approach is as follows:

Growth is a composite of next year's estimate over current year's estimate, e.g. EPS, EBITDA, Revenue. **Return** is a year one prospective aggregate of various return on capital measures, e.g. CROCI, ROACE, and ROE. **Multiple** is a composite of one-year forward valuation ratios, e.g. P/E, dividend yield, EV/FCF, EV/EBITDA, EV/DACF, Price/Book. **Volatility** is measured as trailing twelve-month volatility adjusted for dividends.

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Disclosures

Coverage group(s) of stocks by primary analyst(s)

James Schneider, Ph.D.: America-IT Consulting and Outsourcing, America-Transaction Processors. S.K.Prasad Borra: America-ATM/POS and Self-Service, America-IT Consulting and Outsourcing, America-Transaction Processors. Ryan M. Nash, CFA: America-Credit Cards, America-Regional Banks. Heath P. Terry, CFA: America-Internet. Eric Beardsley, CFA: America-Specialty Finance. Richard Ramsden: America-Large Banks. Greg Dunham, CFA: America-Analytics & Infrastructure Software, America-Software-as-a-Service.

America-ATM/POS and Self-Service: NCR Corp., VeriFone Systems, Inc..

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