August 3, 2017

Future of Finance

Payment Ecosystems

Goldman Sachs

Equity Research

What happens when the world shifts online?

Payments: The next battleground in the online revolution

The world is pivoting online faster than ever—payments are no exception. Amazon is breaking barriers between online and offline, forcing traditional retailers to adapt to survive. The payments transformation is accelerating as challengers Stripe, Alipay, and Adyen become online juggernauts. Huge new online markets are being created – including B2B payments and the sharing economy. We see $28 trillion in online spending growing to $51 trillion over 10 years, driving $200 billion in new payments fee revenue.

What will the future hold? Addressing top investor questions

As battle lines are drawn in these emerging online markets, we give our views and supporting analysis on top investor questions including:

* **Is PayPal's growth sustainable?** We take a look back at what has driven PayPal's formula for success, and whether it can maintain its relevance.

* **How could Visa and Mastercard be disrupted?** We lay out the case for how Alipay and Tenpay could export China's payment systems overseas.

* **Could payments be the next industry that Amazon takes on?** We assess Amazon's payments strategy, and how it could seek to upend incumbents.

* **What's the outlook for M&A in payments?** We survey the payment processor landscape in search of potential consolidation opportunities.

Startups: Profiling the most innovative global online players

We see few obstacles to slow the momentum of emerging companies that are achieving scale, and we profile the leading private online payment companies globally. **Adyen** has established itself as an international force, crossing from online to offline. **Stripe** leads the sharing economy and is building a presence in B2B payments. **Alipay** and **Tenpay** are dominant names in China and could seek to expand overseas, while **PayU** and **Paytm** build new ecosystems amid the digitalization of cash in emerging markets. **Affirm** and **Klarna** have the potential to transform consumer credit online. ***We interview Adyen's CEO and Stripe's CFO for their insights.***

Incumbents: Can they be disrupted? Look overseas for clues

We tackle the question of disruption risk for Visa, Mastercard, and PayPal – and if China's payments model can be imported to the US. We think these risks are real. However, incumbents are expanding to new opportunities. **PayPal should sustain mid-teens volume growth to 2025** as it diversifies to online bill pay, B2B, and sharing economy. **We think Visa and Mastercard can sustain their growth rates** driven by B2B, a new $40 trillion market. **Wirecard is poised to build upon its success** as an online-first leader.

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More on the Future of Finance

This report is the latest in our series exploring the technology, new business models and regulation reshaping finance. See inside for more.

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Payment ecosystems: What happens when the world moves online?

Background: Setting the stage

The world is pivoting online, and the payments industry is no exception. We estimate there will be over $50 trillion in online payment volume by 2026, with $23 trillion shifting online over the next 10 years, driving $200 billion in new fees the payments industry can capture. We think investors underestimate the disruption of online payments outside e-commerce, and we estimate that other segments – notably B2B payments, bill payments, and the sharing economy – will drive 50% of that growth.

The battle for payments dominance will play out globally, and we expect competing ecosystems of consumers and businesses – from banks to PayPal to Amazon to Alipay – to compete based on the scale and scope of market power they represent. In this report we lay out our answers to the most common investor questions on who could be disrupted, highlighting the most promising new companies on the horizon.

Top investment conclusions

- **PayPal (Buy-CL) – We believe PayPal still has a long runway for success and can maintain volume growth of about 15% over the next 10 years.** We think investors often see PayPal's market simply as e-commerce, but we think PayPal is positioned to seed growth in new markets. To be sure, this growth is not without execution risk. But we believe the biggest driver of PayPal's success – its base of over 200mn users – will prove critical as it markets next-generation payments services to millennials and others.
- **Visa (Buy-CL) and Mastercard (Buy) – The networks face threats, but are also positioned to open new avenues of growth.** The card networks face real threats from China and elsewhere (Alipay, Tenpay), and will need to invest and partner aggressively (Apple, Square, Klarna) to ensure that faster payments stay on their rails. But they are positioning themselves to capture substantial share in greenfield markets like B2B payments, allowing them to sustain their growth rates over the next decade.
- **Payment processors – Changing of the online guard: Stripe and Adyen lead while traditional acquirers consolidate.** Online-first companies, both incumbents (PayPal, Wirecard, and startups (Stripe, Adyen) are growing unimpeded, while offerings from traditional acquirers have struggled to keep pace. **We believe Wirecard (Buy-CL) is positioned to sustain growth** as an online-first leader. **We think merchant acquirers will consolidate further** to mitigate price pressure and sustain stock multiples. **Global Payments (GPN, Buy) is our preferred name** given its M&A execution. **Square (SQ, Buy)** is positioned to grow profitability by expanding its TAM to software and services.
- **Private companies:** We profile the most promising private companies in payments including **Adyen, Stripe, Ant Financial, Tenpay, Paytm, Affirm, Klarna, and PayU.**

We interview Adyen's CEO and Stripe's CFO (pp. 38 and 42)

Top 9 investor questions addressed in this report

We estimate traditional e-commerce will be under 40% of PayPal's volume by 2026 (p. 14)

Question #1: Can PayPal sustain its growth trajectory?

In our analysis, we break down PayPal's opportunity by market segment and find PayPal has meaningful room to grow as it taps into new markets including the sharing economy, bill payment, and B2B payments. We believe this is a key point often missed by investors who expect PayPal's growth trajectory to come under pressure as Amazon consolidates the e-commerce market (estimated under 40% of PayPal volume by 2026).

Question #2: How could Visa and Mastercard be disrupted?

Emerging markets, including China and India, have developed alternative ecosystems to those in the United States and Europe. We evaluate how the Chinese model – Alipay and Tenpay – can be exported to the United States and potentially disrupt incumbents including Visa and Mastercard. We also consider "moonshots" – such as blockchain and artificial intelligence – and the long-term impacts they could have on the payments industry.

Exhibit 1: Battle of the payment ecosystems
Top global payments providers, arranged by number of users (or cards), merchants on platform, and purchase volume

Source: Company data, Goldman Sachs Global Investment Research.

We analyze over 100 Amazon Payments merchants and find that 90% also accept PayPal (p. 32)

Question #3: Is Amazon Payments a threat to incumbent payment ecosystems?
After several unsuccessful attempts, Amazon is seeing more traction with Amazon Payments (after its re-launch in 2013), which allows third-party merchants to improve checkout rates by letting shoppers pay with their Amazon account. We think Amazon can substantially expand its reach by signing new merchants. However, we do not see Amazon as an imminent threat to PayPal or the card networks. While Amazon has a large and growing base of consumers, we believe it still has substantial work to do in order to prove it can develop a broader ecosystem of merchants on par with PayPal.

Question #4: What are the most promising and disruptive startups in payments?
The term "frictionless payments" has long been used to describe a seamless and convenient user experience. E-commerce and the complexity of merchant websites have created new pain points in the payments experience that many companies have tried to remove. We highlight six payments innovators—Adyen, Stripe, Alipay, Tencent, Paytm, and PayU—that have scaled quickly, as their superior merchant and consumer experience has driven adoption. We also interview the CEO of Adyen and CFO of Stripe.

Question #5: How are Visa and Mastercard positioned for the move online?
The advent of traditional e-commerce has accelerated the structural shift to electronic payments, and e-commerce is a tailwind to volume growth for the networks. We believe Visa and Mastercard are positioned to capture substantial share of the untapped $45 trillion opportunity we see in B2B payments, bill payments, and other emerging areas. We see the networks maneuvering to become essential names, with partnerships to capture the next generation of online payments over the next10 years.

We expect merchant acquirer consolidation to continue (p. 62)

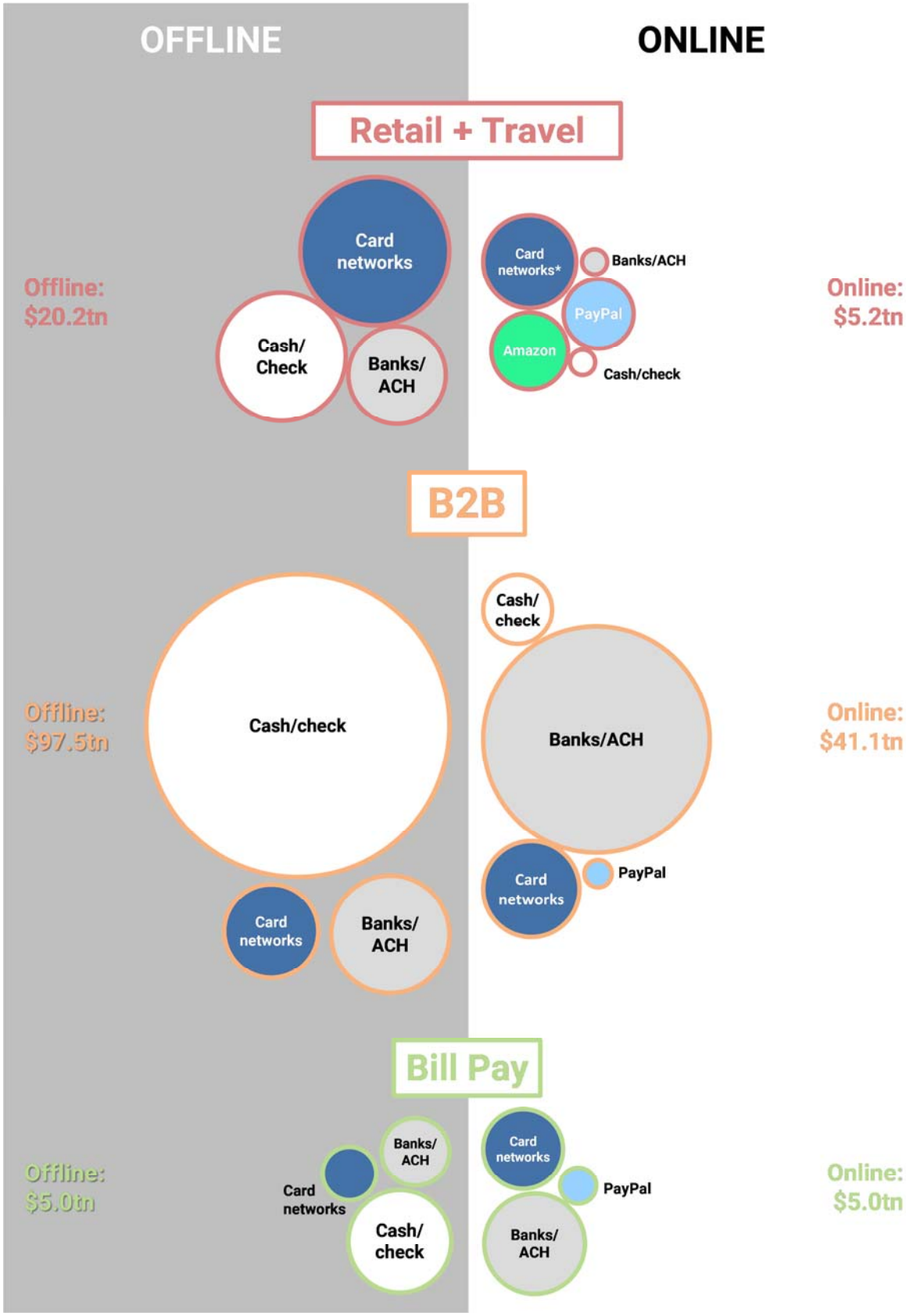
Question #6: Can payment processors still grow as the market shifts online?
We believe traditional merchant acquirers will lose online payments share to acquirers like PayPal, Adyen, Stripe, and Wirecard who have more advanced technology solutions and who serve more online-first merchants. While this phenomenon is not new and has been impacting the growth of acquirers for years, we see an increasingly narrow path to success for this group. We believe merchant acquirers will continue consolidating in order to mitigate pricing pressure and sustain stock multiples.

Question #7: How is e-commerce changing the consumer credit landscape?
Payments companies have always aimed to tackle one of two core issues in order to drive increased consumer spending: (1) make the payment experience more convenient; (2) expand consumer spending capacity. The past five years has witnessed the rise of online point of sale (POS) credit facilities – and we examine how startups like Affirm and Klarna are seeking to reduce friction and transform retail lending online.

Question #8: What role will mobile wallets play in the emerging landscape?
Mobile wallet adoption has been underwhelming to date. Apple Pay and Samsung Pay do not disintermediate the existing payment system, but instead reinforce it by relying on enhanced security technology provided by the card networks. We think mobile wallets stand a good chance of gaining traction in the long run, but expect adoption to be slow because of a lack of uniform acceptance, ease of use, and rewards.

Question #9: Why does C2C matter, and will it ever make money?
We believe scaling a presence in peer-to-peer (C2C) payments will be of greatest value in emerging markets given a large under-banked population and lack of tech-enabled banking, as it can establish a user base upon which a larger payment presence can be built. We have seen this play out with mobile money transfers in the past 10 years, and believe China and India are well down this road. In the United States, Venmo has successfully built a loyal millennial user base that can be monetized in the future.

Exhibit 2: Mapping the online payment landscape
Global market opportunity and major industry players: retail and travel, B2B payments, bill payment



Source: Company data, Goldman Sachs Global Investment Research.

Online payments: Overview and industry roadmap

In this section, we define the online payments market and map out 10 distinct sub-segments – many of which are untapped opportunities today – and we also discuss current and potential profit pools tied to each segment. We briefly review the ecosystem of providers involved in the online world, and how this system contrasts with the offline world. Using this foundation, the rest of the report is organized as a series of common investor questions that tie back to the market roadmap presented here.

What do we mean by online payments? The sum of 10 markets

Any treatment of online payments begins with a clear definition of the market. We find that many investors conflate online payments with e-commerce, for understandable reasons: e-commerce dominates the news flow around public companies, it is a key point of investor debate, and industry/government data have sized the e-commerce retail market (but the broader online payments market remains largely undefined). Our view is that traditional e-commerce (goods and services solid online through Amazon, Walmart.com, etc.) represents only a small piece of the online opportunity today, and could be even less in the future: **We estimate traditional e-commerce makes up only about 4% of global online payment volume and 38% of global payment processing fees today.**

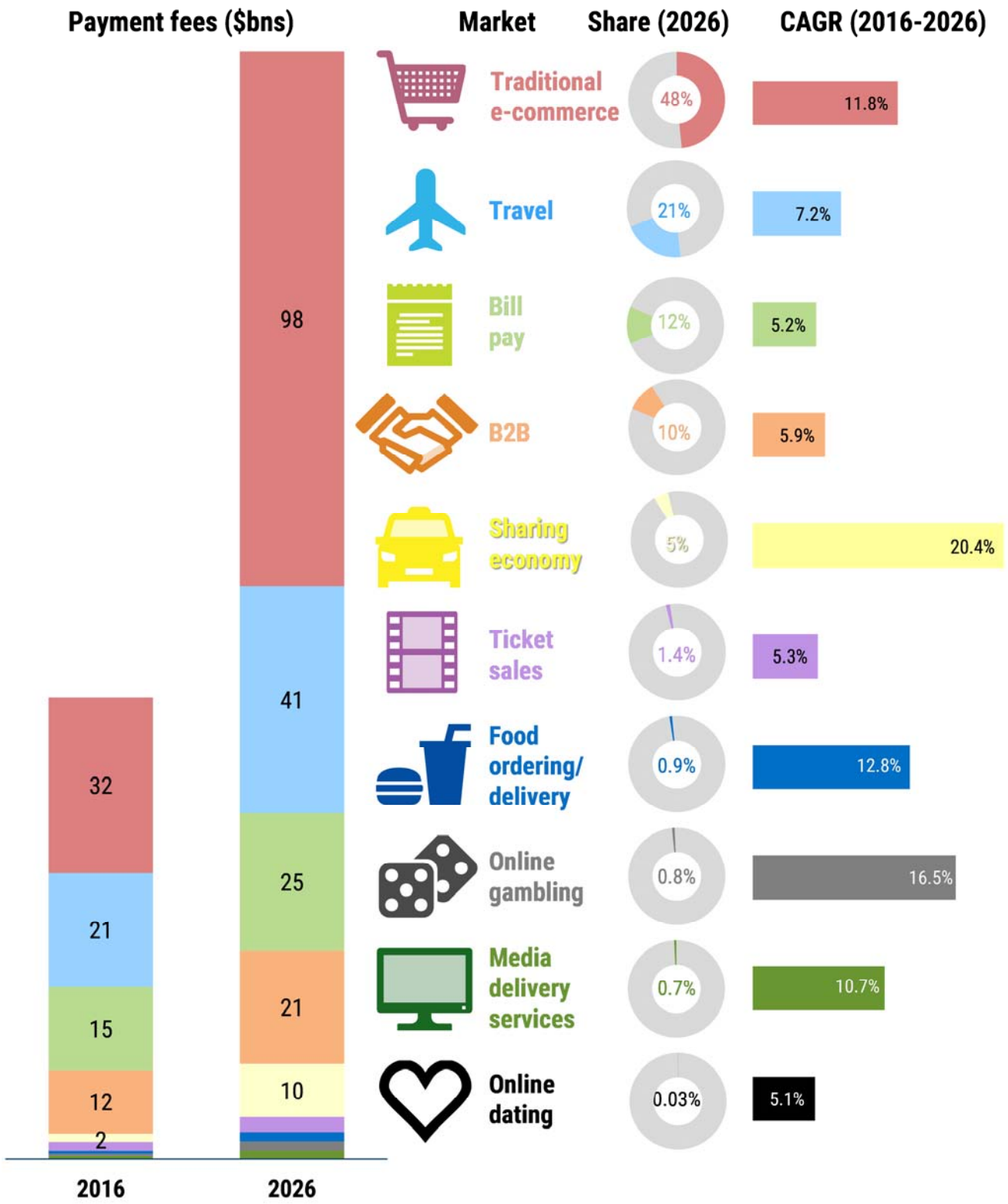
We estimate that $28tn of payment volumes are transacted online today and that this will nearly double by 2026. We estimate online payments generate $84bn in fees today, which based on current rates we project to grow at a 9.2% 10-year CAGR to $202bn in 2026. Our definition of the online payments market is comprised of the 10 different sub-segments outlined in Exhibit 3:

(1) **Traditional e-commerce ($3.3tn in volume, $98bn in fees by 2026):** This familiar category of consumers shopping for goods online is comprised of three major segments: pure online names (Amazon), omni-channel retail (Walmart.com), and specialized online retailers (Etsy). The majority of traditional e-commerce payments today (we estimate about 80%) are made with credit or debit cards. Given the higher yields associated with card-not-present payments, traditional e-commerce comprises a much larger share of payment processing fees relative to payment volumes (38% vs. 4%). We estimate that $32bn in payment fees are generated in processing traditional e-commerce volumes globally today (ex-China), and that this market will grow at an 11.8% CAGR over the next 10 years.

(2) **Travel ($1.4tn in volume, $41bn in fees by 2026):** Travel booking was one of the first markets to move online, as evidenced by the IPOs of Expedia and Priceline in 1999. Whether booking travel through an online travel agent or directly on a vendor's website (delta.com, hilton.com), the Internet has become a major booking engine for airlines, hotels, and car rental. We estimate that $21bn in payment fees are generated in processing online travel volumes globally today (ex-China), and this market will grow at a 7.2% CAGR over the next 10 years.

(3) **Bill payment ($5.0tn in volume, $25bn in fees by 2026):** Bill payment is a large market opportunity for online payments—with utility, insurance, and mortgage payments increasingly moving online. These non-retail categories are part of PCE (personal consumption expenditure), and have historically been the domain of checks – but are poised to benefit payment processors as more payments shift online. According to Aite, 50% of US bill volume is paid online in the United States today, with 30% paid through a bank's website and 70% paid directly on biller websites. We estimate $15bn in payment fees are generated in processing online bill payments globally today (ex-China), and that this market will grow at a 5.2% CAGR over the next 10 years.

Exhibit 3: We estimate online payment fees are a $200bn opportunity by 2026, growing at a 10-year CAGR of 9.2%
Online payment fees by market segment



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

(4) **B2B payments ($41tn in volume, $21bn in fees in 2026):** We believe the B2B payments market is a large and relatively untapped online opportunity (albeit at lower yields for payment processors). We believe online penetration in B2B payments is around 25% today, driven primarily by accounts payable transactions via Automated Clearing House (ACH). We estimate credit and debit cards comprise a very small share of both online and offline B2B payments today (less than 5%), and most of these volumes are associated with travel-related corporate expenses. We believe the industry transition to instant B2B payments—whether instant ACH or push payments through Visa Direct and Mastercard Send—will fuel a significant new market opportunity over the next decade. We estimate that $12bn in payment fees are generated in processing online B2B payments globally today (ex-China), and that this market will grow at a 5.9% CAGR over the next 10 years.

The "last 10%" of online payment fees: Smaller markets, but at higher yields

(5) **Sharing economy ($325bn in volume, $10bn in fees in 2026):** The sharing economy is a market that has emerged over the last few years. Payment volumes are dominated by Uber and AirBnB, plus other ride-hailing and travel competitors. Given the novelty of the space, we expect the sharing economy to be the fastest-growing market within online payments, as existing players scale rapidly and de novo businesses enter the market, and our payment volume estimate could surprise to the upside. We estimate that $1.5bn in payment fees are generated in processing sharing economy payments globally today (ex-China), and that this market will grow at a 20.4% CAGR over the next 10 years, after nearly doubling in 2016.

(6) **Ticket sales ($91bn in volume, $3bn in fees in 2026):** This online payments category combines slower-growing primary ticket sales (generally those sold by event providers such as Ticketmaster and Live Nation) and the secondary ticket market (re-sold through sites such as StubHub). We estimate that $1.6bn in payment fees are generated in processing online ticket sale payments globally today (ex-China), and that this market will grow at a 5.3% CAGR over the next ten years.

(7) **Food ordering/delivery ($57bn in volume, $1.7bn in fees in 2026):** Online takeout is a growing and competitive market, and we believe less than 10% of restaurant takeout in the United States is online today. Our food delivery segment includes online ordering models such as GrubHub and Seamless. We estimate that $0.5bn in payment fees are generated in processing online food ordering/delivery payments globally today (ex-China), and that this market will grow at a 12.8% CAGR over 10 years.

(8) **Online gambling ($56bn in volume, $1.7bn in fees in 2026):** Online gambling is a highly regulated market and is legal today in only three US states (Delaware, New Jersey, and Nevada). We estimate that $0.4bn in payment fees are generated in processing online gambling payments globally today (ex-China), and that this market will grow at a 16.5% CAGR over the next 10 years.

(9) **Media delivery services ($48bn in volume, $1.4bn in fees in 2026):** This segment combines popular consumer offerings like Netflix, Hulu, Pandora, and Spotify (but does not include single downloads from iTunes or Amazon). We estimate that $0.5bn in payment fees are generated in processing online media payments globally today (ex-China), and that this market will grow at a 10.7% CAGR over the next 10 years.

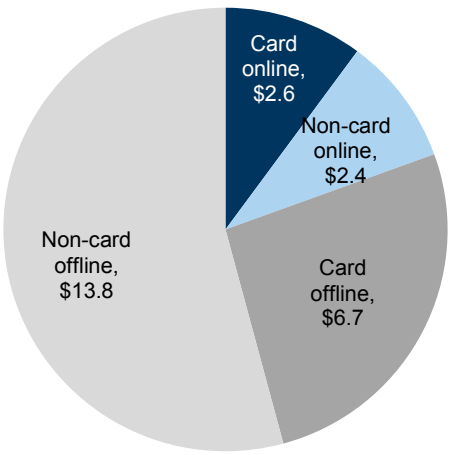
(10) **Online dating ($2bn in volume, $0.1bn in fees in 2026):** Online dating includes sites operated by Match Group (match.com, OkCupid) and Spark Networks. We estimate that $0.04bn in payment fees are generated by online dating payments globally today (ex-China), and that this market will grow at a 5.1% CAGR over the next ten years.

Defining the major consumer and business payment segments

We believe online payments is a $28tn global payments opportunity (ex-China) today growing at a 6.2% CAGR over the next ten years. We see the market as split across consumer-driven payments (B2C and C2C) and business-related payments (B2B):

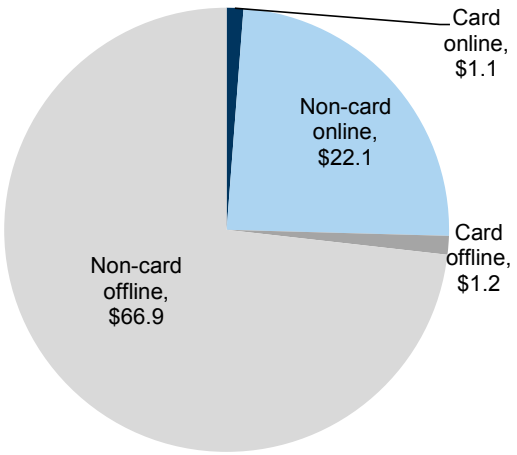
- **Consumer payments (B2C):**
    - **Online payment penetration:** We estimate $4.9tn in payment volume was online by consumers globally (ex-China) in 2016, 19% of total spend.
    - **Card penetration:** We estimate 36% of total consumer spend (both online and offline) is transacted with a credit or debit card today. Card penetration is higher online: we estimate 52% of total consumer online spending is transacted with a card today.
    - **Percentage of card volume done online:** We estimate 28% of total consumer card payment volumes occur online.
- **Business payments (B2B):**
    - **Online payment penetration:** We estimate $23tn in payment volume was online by businesses globally (ex-China) in 2016, or 25% of total spend.
    - **Card penetration:** We estimate 3% of total business spend (both online and offline) is transacted with a credit or debit card today. Checks are still the dominant form of payment, comprising 70% of B2B volume. Card penetration is only 5% of total business online spending today.
    - **Percentage of card volume done online:** We estimate 47% of total business card payment volumes occur online.
- **Peer-to-peer payments (C2C):** Our definition of online payments does not include consumer remittances, but we see it as an important related topic. We discuss the potential for monetization of digital peer-to-peer payments on p. 73 of our report:
    - **Online payment volume:** We estimate just under $1tn of online peer-to-peer payment volume was transacted globally (ex-China) in 2016.

Exhibit 4: We estimate about 20% of B2C card volumes are online payments
2016 consumer (B2C) payment volume, in $tn



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Nilson Report, Goldman Sachs Global Investment Research.

Exhibit 5: Check still dominates offline B2B payments today, and ACH is the dominant mode of payment online
2016 business (B2B) payment volume, in $tn



Source: NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

Who are the major competitors?

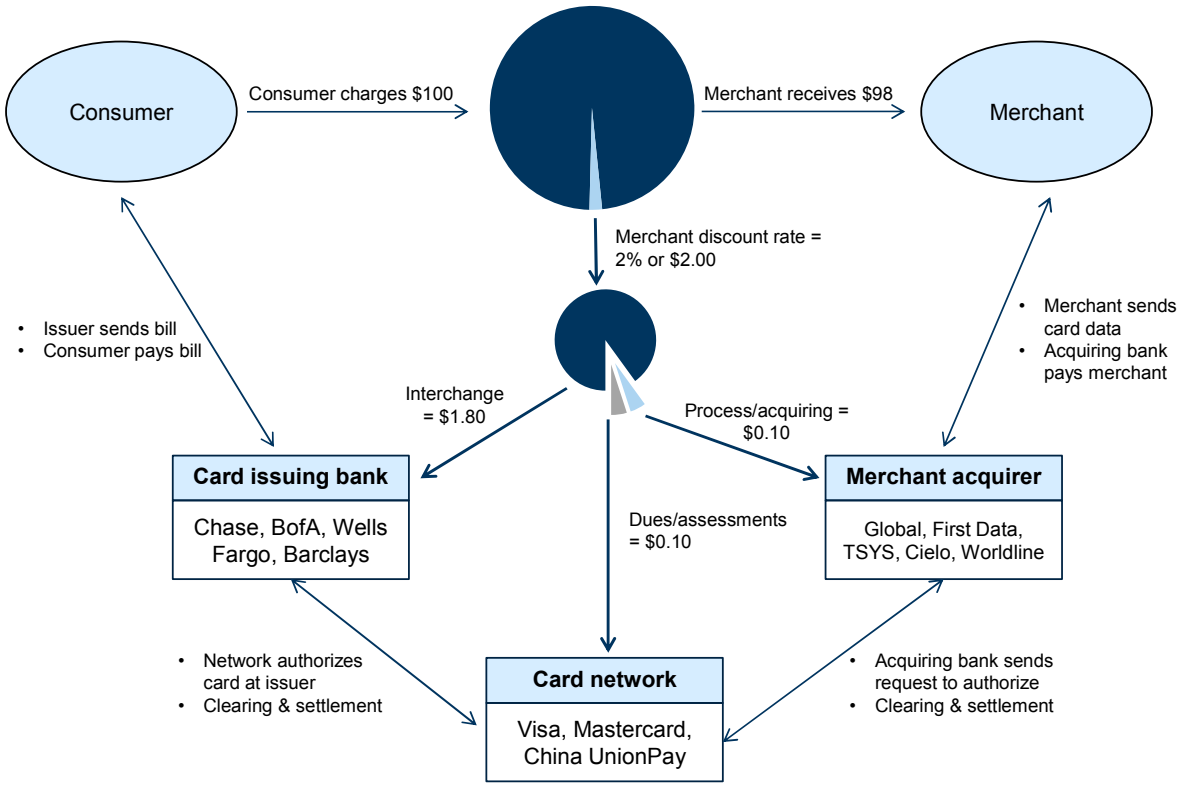
The offline card payment ecosystem in the United States, Europe, and LatAm is complex, with a number of middlemen—merchant acquirers, card networks, and issuing banks—interacting with each other to enable consumer payments. We summarize the traditional "four-party system" in Exhibit 6.

The online card payment ecosystem introduces two new participants that have innovated on the front end of online payment processing to make the transaction more seamless: **(1) the digital wallet,** so the consumer can easily input his payment information on the merchant's site; and **(2) the gateway,** so the merchant can easily accept the consumer's payment information. We summarize the online system in Exhibit 7.

The digital wallet is effectively a token representing user payment and personal information, obviating the need to re-enter this information on every website and thus increasing conversion rates for online payments. Digital wallets include Apple Pay, Walmart Pay, Visa Checkout, Amazon Payments, and PayPal. All of these wallets make the consumer experience more seamless, although digital wallet providers have different motivations for capturing market share. PayPal and Visa claim online payment success/ conversion rates 50% higher than transactions for which information is entered manually.

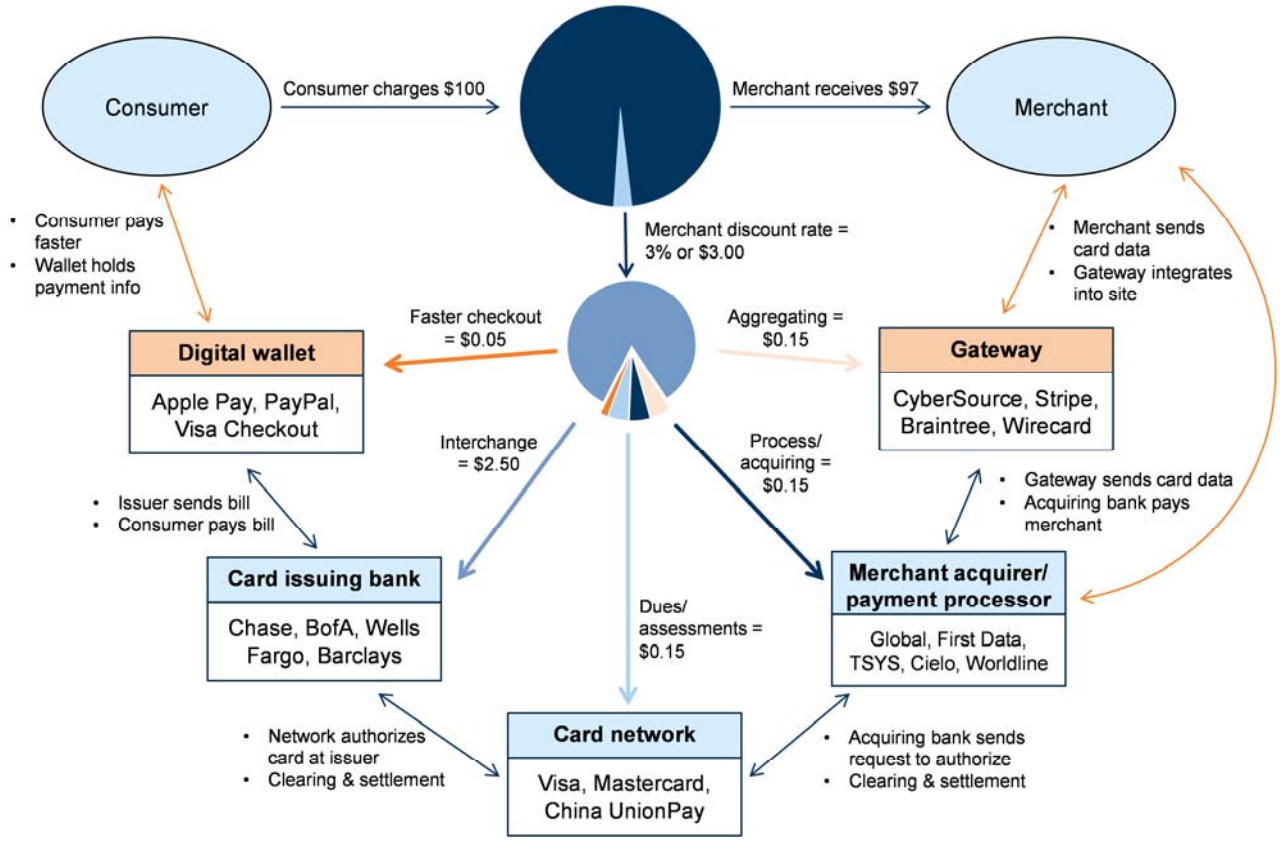
The gateway can be thought of as an online "point of sale"— a payment terminal for the Internet. With a gateway, web developers have a single point of communication to collect payment information on their websites. Gateways have become more sophisticated over time, with sleeker application programming interfaces (APIs) like Adyen, Stripe, Braintree (owned by PayPal), and Wirecard reducing the gateway implementation time (from months to hours), eliminating the need to change the user interfaces to accommodate payments.

Exhibit 6: The "four-party system" is the dominant bank-driven system used across US, Europe, and LatAm
US offline card payment ecosystem



Source: Goldman Sachs Global Investment Research.

Exhibit 7: Online card payments introduce new players, gateways and digital wallets
US online card payment ecosystem



Source: Goldman Sachs Global Investment Research.

We highlight two important online impacts on the payment ecosystem:

1) The back-end interaction between merchant acquirers, card networks, and issuing banks to complete the transaction remains unchanged.

2) Newer companies (PayPal, Stripe, Adyen) have entered the fray: these entrants believe they can address the pain points of online payments better than incumbents. These companies have heightened the competitive landscape among gateways and merchant acquirers, which is illustrated in Exhibit 8.

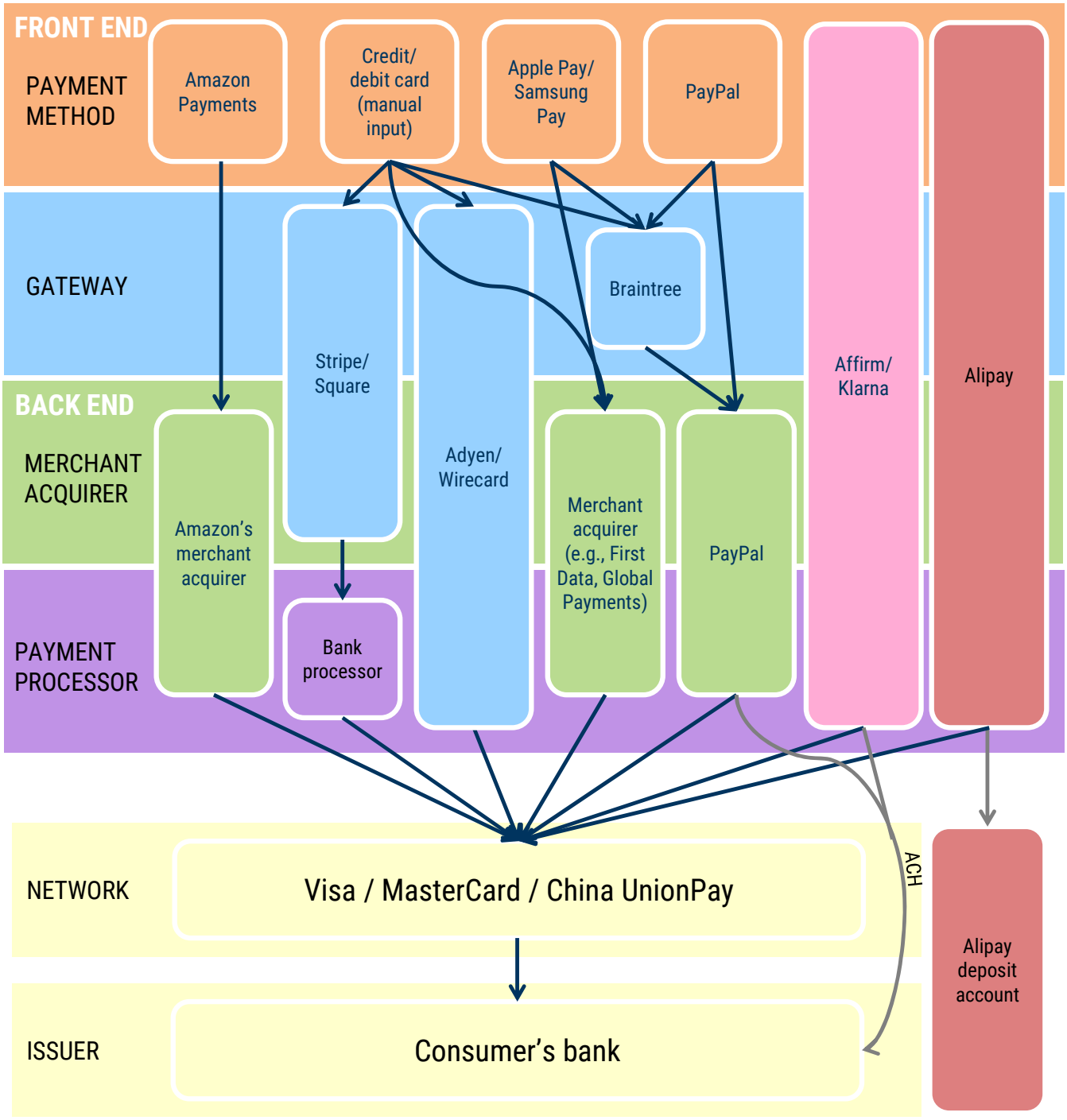
New online payment methods are inventing new ways to pay

In traditional payments, any consumer not paying with a card had paid with cash, check, or bank transfer. We are seeing wholly new online payments methods emerge that bypass much – if not all – of this payments infrastructure.

Affirm/Klarna: Affirm and Klarna are online point of sale credit facilities. These companies can offer installment loans to consumers at online checkout, in lieu of traditional credit card lending. Affirm in particular was founded with the intention of providing credit-averse millennials with a credit card alternative. Affirm and Klarna do not circumvent the card networks entirely—both companies accept debit cards, as well as bank transfers, for loan repayment.

Alipay: Alipay can process payments directly from a depository account or through a linked bank card. By offering depository accounts in China, Alipay can compete directly against card networks (i.e., China UnionPay) for volume.

Exhibit 8: Payment flows in online payments: we see greatest competition among gateways and merchant acquirers
Flow chart of payment methods



Source: Goldman Sachs Global Investment Research.

Q1: Can PayPal sustain its growth trajectory?

In our new analysis, we break down PayPal's total payment volume (TPV) by market segment and find that PayPal has meaningful room to grow as it taps into new markets including the sharing economy, bill payment, and B2B payments. We believe this is a key point often missed by some investors who expect PayPal's growth trajectory to come under pressure as Amazon consolidates the market. Traditional e-commerce is only one of PayPal's markets, and we estimate it comprises about 50% of PayPal's volume (TPV) and 40% of its TPV growth today.

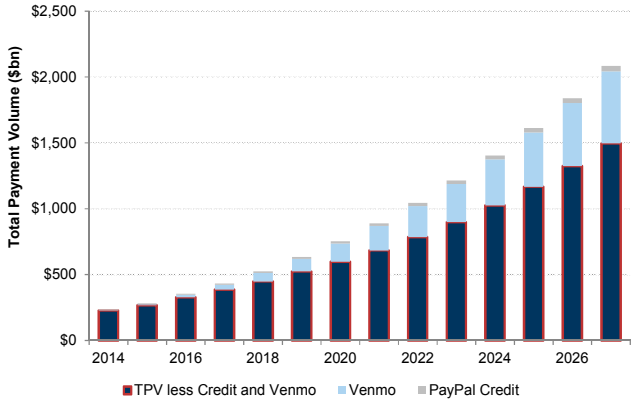
We think PayPal can sustain ~15% volume growth over 10 years

Note: We exclude PayPal Credit and Venmo from PayPal's TPV in our segment analysis in this section

In our volume analysis, we adjust PayPal's TPV to exclude PayPal Credit and Venmo in order to better understand PayPal's core transaction fee-generating volume.

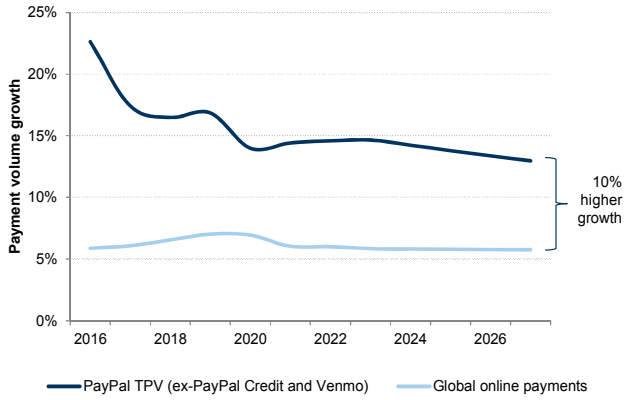
We estimate PayPal's TPV (excluding PayPal Credit and Venmo) will grow at a 15% CAGR over the next decade, totaling $1.5tn in 2027, compared to $328bn in 2016 (Exhibit 9). We expect PayPal will grow about 1000bps faster than the overall market as it leverages strategic partnerships, its two-sided network of merchants and consumers, and its international footprint (Exhibit 10). We note that, if we were to include PayPal Credit and Venmo, PayPal's TPV would grow about 300bps faster (18% CAGR) over the next decade.

Exhibit 9: We expect TPV ex-Credit and Venmo to grow to $1.5tn in 2026 from $328bn in 2016
PayPal Total Payment Volume (TPV)



Source: Company data, Goldman Sachs Global Investment Research.

Exhibit 10: We expect PayPal to drive outsized payment volume growth over the next decade
PayPal TPV growth (ex-PayPal Credit and Venmo) vs. global online payments growth



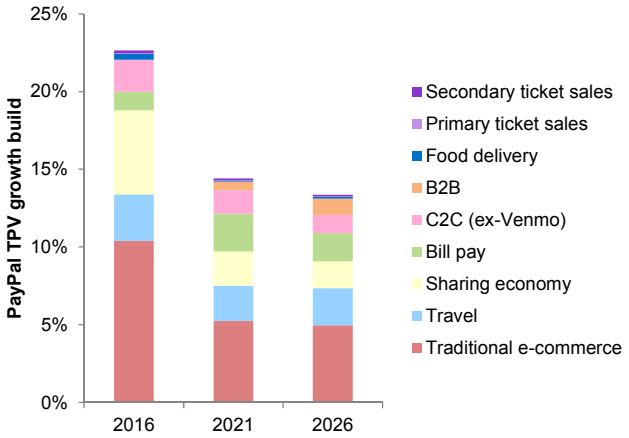
Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

We see several points that give us confidence in PayPal's growth trajectory. First, PayPal is not just about e-commerce. We estimate that today, about 50% of PayPal's volume (TPV) and 40% of its TPV growth (ex-PayPal Credit and Venmo) comes from "traditional" e-commerce, which we define as the direct sale of goods online (Exhibit 11). We see traditional e-commerce as comprised of three major segments: pure online retail (eBay), omni-channel retail (Walmart.com), and specialized online retailers (Etsy) (see the Online payments overview section on page 7 for the segment details).

In many of our client conversations, investors express concerns around PayPal's growth runway by assuming that nearly all of PayPal's TPV comes from traditional e-commerce (i.e., online retail sales). By this math, PayPal (ex-PayPal Credit and Venmo) and Amazon

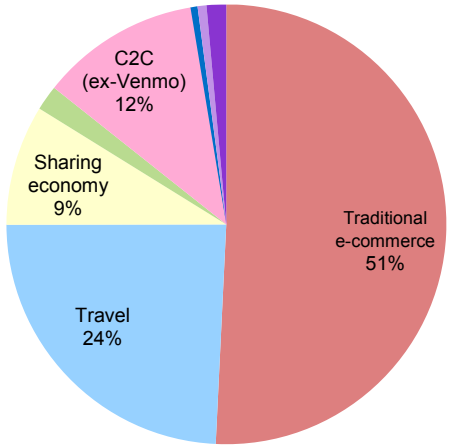
would have 31% and 23% market share in traditional e-commerce in 2016, respectively, leaving less than half the market remaining (and assuming PayPal does not convert Amazon as a customer). However, we estimate PayPal's penetration rate in traditional e-commerce is significantly lower—at about 16%—as roughly 50% of its volumes come from other areas such as travel and the sharing economy (Exhibit 12).

Exhibit 11: About 40% of PayPal's growth comes from traditional e-commerce today
PayPal TPV growth (ex-PayPal Credit and Venmo) by market



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

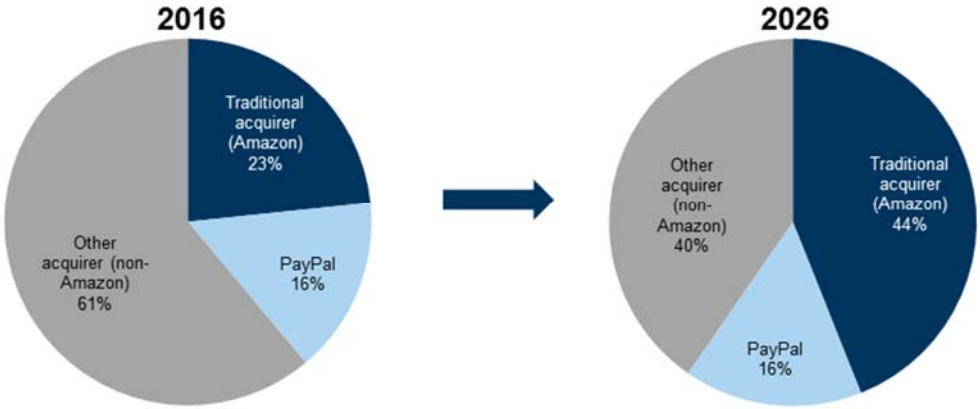
Exhibit 12: About 50% of PayPal's TPV comes from traditional e-commerce in 2016
2016 PayPal TPV volume (ex-PayPal Credit and Venmo)



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

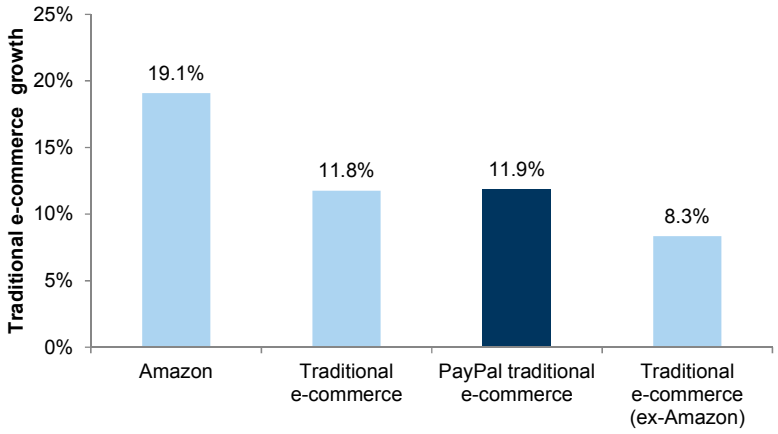
Second, we expect PayPal's traditional e-commerce TPV to grow with the overall market while gaining share excluding Amazon. We expect PayPal's traditional e-commerce share to stay roughly stable over the next decade, even as Amazon gains meaningful share (Exhibit 13). Excluding Amazon purchase volumes, we expect PayPal to grow about 350bps faster than traditional e-commerce retail sales (11.9% vs. 8.3%) over the next decade (Exhibit 14), as it leverages its two-sided network of merchants and consumers.

Exhibit 13: We estimate PayPal's market share in traditional e-commerce should remain roughly stable over the next decade as Amazon gains share
Global traditional e-commerce (ex-China) market share



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

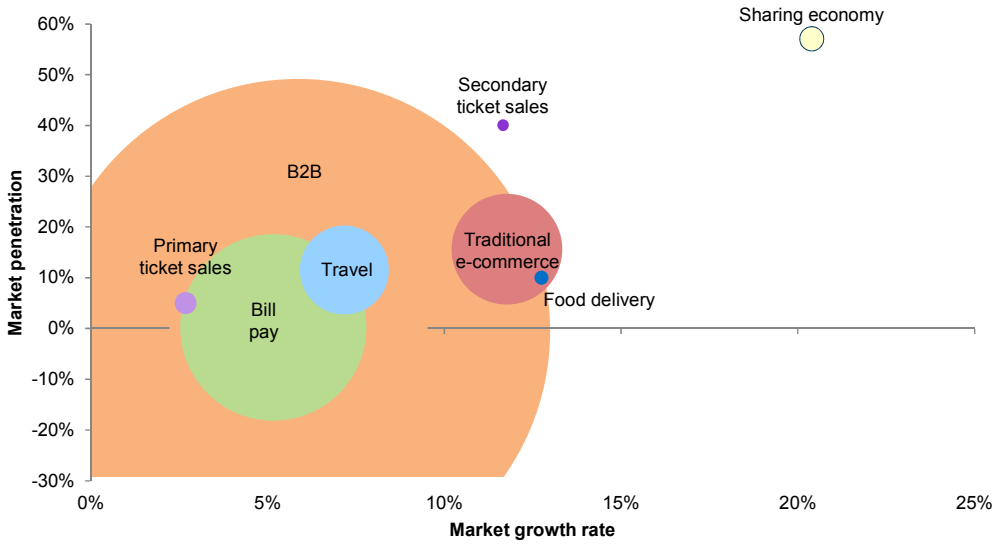
Exhibit 14: We expect PayPal's traditional e-commerce volumes to grow in line with the industry
Traditional e-commerce retail sales growth CAGR, 2016-2026



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

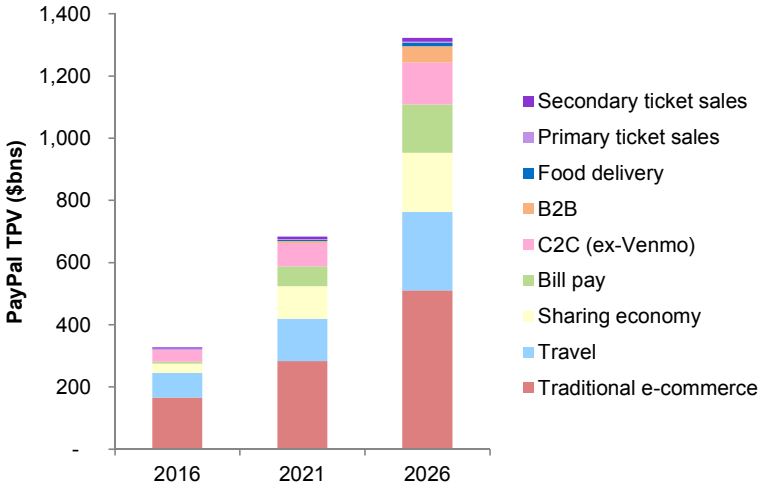
Third, we believe PayPal has substantial room to tap into large, underpenetrated markets, including bill payment and B2B (Exhibit 15). By diversifying its TPV volume, we expect PayPal (ex-PayPal Credit and Venmo) can maintain 15% TPV growth. As a result, we estimate traditional e-commerce will comprise 39% of TPV (ex-PayPal Credit and Venmo) in 2026, compared to 51% in 2016 (Exhibit 16). We view the underlying growth in broader online payments is healthy, with volume growing at about a 6% CAGR over the next decade.

Exhibit 15: PayPal remains underpenetrated in larger markets, leaving room for growth
vertical-axis: PayPal market penetration as of 2016; horizontal-axis: market growth CAGR from 2016-2026; circles are scaled to industry market size in 2016



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

Exhibit 16: We expect PayPal's expansion into new markets to drive continued growth
PayPal TPV (ex-PayPal Credit and Venmo) by market



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

We detail PayPal's positioning and opportunities by market (Exhibit 18) (references to PayPal's TPV exclude PayPal Credit and Venmo):

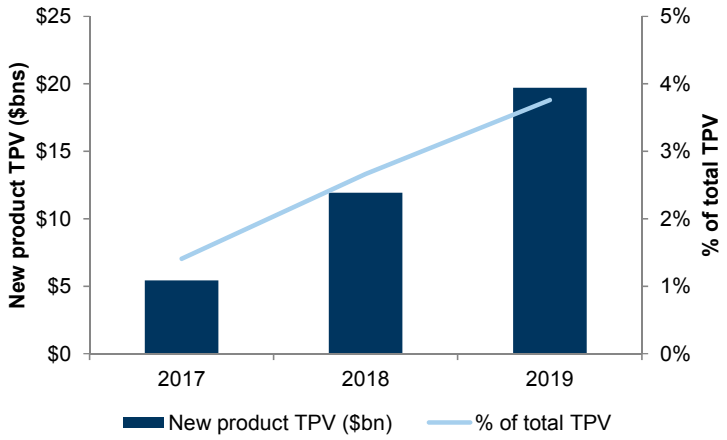
- **Online travel:** Although the travel market is fairly penetrated by traditional acquirers, we believe the shift to online bookings from agent-driven models has created an opportunity for companies like PayPal to gain share, as many airlines have adopted the company's PayPal button on their websites. We estimate online travel to be a $690bn volume opportunity globally in 2016, and we expect this to grow at a 7% CAGR over the next ten years. Given the ease of integrating PayPal's offerings, we anticipate modest share gains (from 12% in 2016 to 18% in 2026) in the online travel segment. **We expect online travel to be PayPal's second-largest market in 2026 at 19% of TPV (ex-PayPal Credit and Venmo), compared to 24% of volumes in 2016.**

- **Sharing economy:** The sharing economy is the fastest-growing online payments market in our analysis, growing at a 20% CAGR over the next ten years by our estimates. PayPal capitalized on the sharing economy trend through its acquisition of payment gateway provider Braintree in 2013, which services the two largest sharing economy companies, Uber and AirBnB. By processing these two businesses (as well as several smaller businesses like TaskRabbit), our model assumes that PayPal processes nearly 60% of global sharing economy payments today. We expect this dominant position to remain fairly stable over the next decade, but note the loss of key clients (Uber or AirBnB) as a risk. **We expect the sharing economy will be PayPal's third-largest market in 2026 at 14% of TPV (ex-PayPal Credit and Venmo), compared to 9% of volumes in 2016.**

- **Online bill payment:** About $1.5tn in bill payments are paid online in the United States today, according to the Aite Group, and PayPal has started to pursue this large market opportunity. PayPal acquired online bill payment company TIO Networks in 2017 for $233mn. The company processed about $7bn in volume in 2016, and we expect PayPal to leverage this acquisition to grow its footprint quickly. Our model assumes PayPal is able to gain about 30bps of bill payment market share per year over the next 10 years, and that PayPal will have just over 3% market share of online bill payments in 2026. **We expect bill payment will be PayPal's fourth-largest market in 2026 at 12% of TPV (ex-PayPal Credit and Venmo), despite having negligible volumes today.**

We consider a scenario in which PayPal is able to successfully roll out a bill payment offering to its consumer base of 210mn, and the implications this would have on the company's TPV. We make simplified underlying assumptions, with the company driving 5% incremental adoption among its user base in the first three years of launch, applying a 2019 penetration rate of 15%. A user paying $500 in bills on average per year using this service would yield $5bn in TPV in the first year (assuming a 2017 launch), building up to $20bn in 2019 as the company increases its penetration rate and user base (Exhibit 17). Therefore, a simple bill payment tool with a relatively low penetration could add over 1.5% to TPV growth in each of the next three years.

Exhibit 17: Given the company's large customer base, a new product can drive meaningful incremental TPV
New bill payment TPV assuming 5% penetration per year and $500 in annual payments

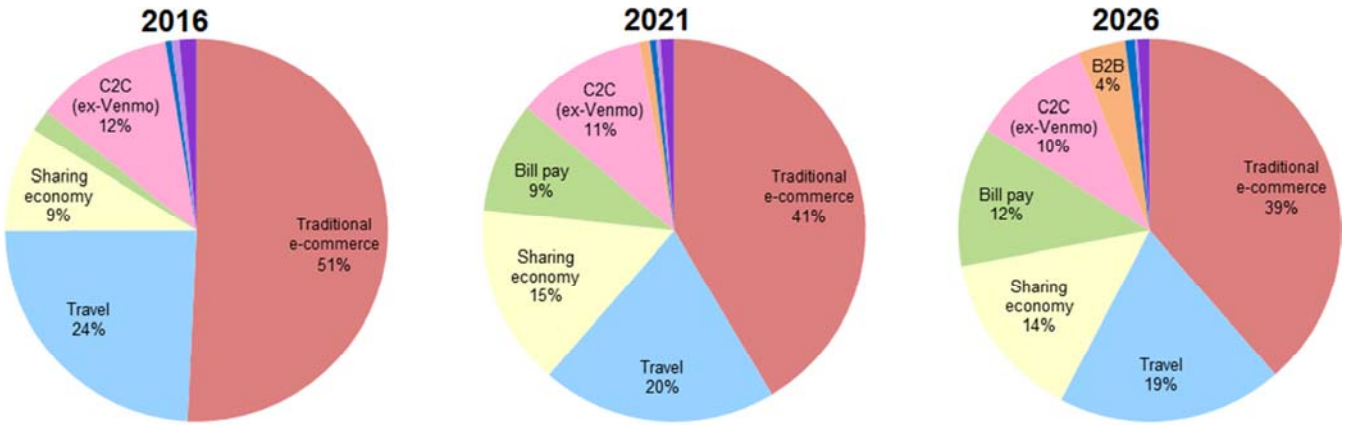


Source: Company data, Goldman Sachs Global Investment Research.

- **C2C (ex-Venmo):** Our C2C (ex-Venmo) segment includes fee-generating C2C payments made through the PayPal wallet and Xoom. We exclude Venmo in our analysis in order to highlight the revenue impact of fee-generating volume on PayPal's growth. The remittance market has been slow to evolve, with the majority of remittances still occurring through informal channels. A smaller share of remittances are transmitted through banks or money remittance companies like Western Union and MoneyGram, which largely rely on a vast network of retail partner locations to complete the money transfer. PayPal processes C2C payments through its core PayPal wallet feature (we estimate $30bn in 2016) and through Xoom (we estimate $8bn in 2016), which was acquired by PayPal in 2015 for $890mn. While C2C remittances could be a compelling opportunity for PayPal, we see larger competitors like Western Union have compelling digital offerings with a larger geographic reach. **We expect online C2C (excluding Venmo) to be PayPal's fifth-largest market in 2026 at 10% of TPV (ex-PayPal Credit and Venmo), compared to 12% of volumes in 2016.**
- **Online B2B payments:** The B2B payments space has seen significant M&A and partnership activity as larger payments companies begin to penetrate the market. Visa and Mastercard have gained exposure to the space, with offerings including Visa Direct, the Chain Inc. partnership, the VocaLink acquisition, and the AvidXchange partnership. Payment processors have also engaged in significant deal activity, with FleetCor's announced acquisition of Cambridge Global Payments in May 2017. PayPal also announced a partnership with B2B e-commerce platform provider Oro in March 2017. We estimate the online B2B payments market represents a $23tn volume opportunity globally today, and expect this to grow at a 5.9% CAGR to $41tn over the next ten

years as businesses transform their back-end infrastructure to adopt more efficient payment methods. Our model assumes PayPal had no B2B exposure in 2016, and ultimately anticipate the company can achieve just under 0.15% market share of online B2B spend in 2026. **We expect online B2B payments to be PayPal's sixth-largest market in 2026 at 4% of TPV (ex-PayPal Credit and Venmo), despite having negligible volumes today.**

Exhibit 18: We expect PayPal to diversify into new markets over the next ten years, particularly bill payment and B2B
PayPal TPV (ex-PayPal Credit and Venmo) by market segment, 2016, 2021, 2026



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

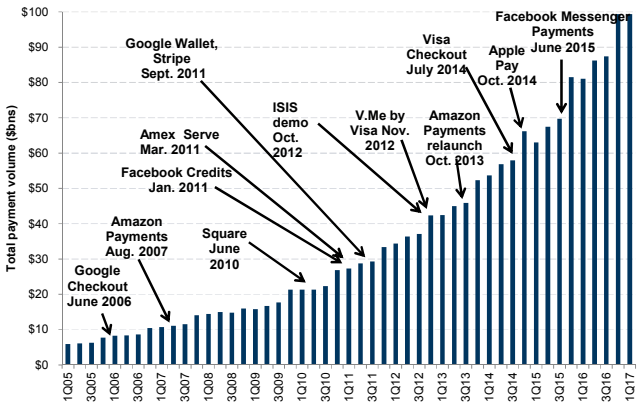
Upside and downside risks to PayPal's growth

Our TPV segment analysis estimates the composition of PayPal's TPV today and its ability to maintain growth. We briefly touch on some other upside and downside risks below:

Upside potential:

- **Venmo monetization:** We exclude Venmo and PayPal Credit from our TPV segment analysis, and currently expect Venmo-related revenues to be negligible in our forecasts. We note that Venmo has started testing merchant acceptance with several websites, including Munchery, ParkingPanda, and Poshmark, and we will follow its merchant acceptance closely.
- **Offline payment penetration:** Our TPV analysis assumes PayPal can maintain 15% TPV growth without making progress in offline payments. Therefore, offline payment penetration would be entirely incremental to our estimates. Given the limited traction of mobile wallets in the offline space, we expect PayPal to gain minimal offline traction in the medium term – but this could occur over time.
- **Powerful track record:** PayPal has grown in the face of competition and countless new entrants (Exhibit 19). While the status quo can change—especially among technology companies—we find PayPal's track record and scale reassuring. With partnerships with 14 of the largest 20 US merchants (Exhibit 20) and direct access to a large base of consumers and merchants, we believe PayPal is well-positioned to compete against new entrants.

Exhibit 19: PayPal has successfully grown TPV despite persistent market competition
PayPal TPV vs. competitive entrants



Source: Company data, Goldman Sachs Global Investment Research.

Exhibit 20: PayPal is accepted at 14 of the top 20 online merchants in the US
PayPal acceptance among top 20 US merchants

	Merchant	Volume ($mn)	PayPal accepted?
1	Amazon.com Inc	102,843	No
2	Wal-Mart Stores Inc	24,339	Yes
3	eBay Inc	22,993	Yes
4	Apple Inc	14,821	Yes
5	Valve Corp	5,702	Yes
6	Macys Inc	4,967	Yes
7	Home Depot Inc, The	4,465	Yes
8	Liberty Interactive Corp	4,379	No
9	Sears Holdings Corp	3,917	Yes
10	Best Buy Co Inc	3,782	Yes
11	Target Corp	3,699	Yes
12	Kohl's Corp	3,683	No
13	Wayfair LLC	3,484	Yes
14	Costco Wholesale Corp	3,289	No
15	Williams - Sonoma Inc	2,513	No
16	Nordstrom Inc	2,425	Yes
17	Office Depot Inc	2,382	Yes
18	Newegg.com Inc	2,368	Yes
19	Gap Inc, The	1,858	No
20	HSN Inc	1,830	Yes

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

Downside risks:

- **Need for increased investment in growth:** Technology companies cannot rest on their laurels, especially in a space as dynamic and innovative as online payments. As we see with the rise of Stripe against incumbent gateways like CyberSource, companies can gain and cede market share quickly. PayPal must continue investing in its growth—both organically to ensure its technology is best-in-class and easy to use and inorganically to gain a foothold in new markets, as demonstrated by PayPal's acquisitions of Braintree (gateway/sharing economy), Xoom (C2C remittance), and TIO Networks (bill pay) over the last few years.
- **Margin pressure:** There are risks to PayPal's model beyond volume, notably on margins. Margin compression could come on two fronts: (1) take rate compression: PayPal's take rate can come under pressure, either by virtue of mix toward lower-yielding segments or price pressure. However, with offerings like Amazon Payments and Stripe with comparable pricing to PayPal, plus healthy growth in cross-border online payments at richer fees, we expect PayPal's take rate (excluding Venmo) to remain fairly stable and see modest erosion over the next few years; (2) transaction expense growth: with a greater share of PayPal's volumes on credit and debit cards (we estimate 78% in 2021, compared to 68% in 2016), fees paid to Visa and Mastercard will continue to increase. We believe PayPal can offset these higher transaction expenses and expand margins over this period by recognizing efficiencies in SG&A and other operating expenses.
- **Security risk:** A key premise underlying the success of PayPal—and online payments in general—is security and trust. If PayPal were subject to a security breach, this could limit customer use and merchant acceptance.

Q2: How could Visa and Mastercard be disrupted?

We consider the potential for incumbent payment ecosystems to be disrupted. We examine the core elements needed to build a consumer payment ecosystem, and specifically look at how certain emerging markets like China have developed alternative ecosystems to those in the United States and Europe. We evaluate how the Chinese third-party payments model – specifically Alipay and Tenpay – can be exported to the United States and potentially disrupt the ecosystem of incumbents. Finally, we consider "moonshots" – new technologies like blockchain and artificial intelligence – and the long-term impacts they could have on the payments industry.

Building a disruptive payment ecosystem in three "easy" steps:

A successful payments system requires two basic ingredients: consumer adoption and merchant acceptance. Consumers must perceive clear value (such as easy credit financing for large purchases, better convenience, rewards) and merchants must be compelled to accept a payment type (such as fear of missing a sale, higher ticket consumer spending, lower cost of acceptance). Building consumer adoption has always been a pre-condition for merchant acceptance. In the United States and Europe, a new ecosystem aimed at disrupting incumbents will need to provide superior solutions capable of changing both consumer and merchant behavior:

(1) **Build critical mass with consumers:** We see financial incentives and improved convenience as the two main avenues for driving consumer adoption of new payment methods. Payment cards are ubiquitous in the United States and Europe due to their convenience and direct links to consumer bank accounts and services (such as revolving credit lines). As we discuss elsewhere in this report, mobile payment methods offer similar or slightly higher levels of consumer convenience (similar in-store experience, without the need to carry physical cards) – but these have failed to gain significant traction thus far. Starbucks is the main exception to this trend, achieving 29% adoption with its mobile payments app, which has been driven in large part by the company's attractive 10% rewards program. Thus, we expect any successful disruptive competitor would need to provide substantially greater convenience, significantly greater financial incentives or rewards, or both, in order to gain widespread consumer adoption.

(2) **Gain widespread merchant adoption:** Every merchant is motivated to maximize sales and minimize costs, and payments are no exception. Historically, merchants have accepted credit cards (even higher-cost cards like AmEx) as a way of driving higher sales conversion, more large-ticket sales, and higher spending levels. Merchant acceptance tends to be driven by consumer demographics—that is, they accept new payment methods only after a critical mass of consumers wants to use one. However, we believe it is also possible for merchant acceptance to be stimulated by either significantly lower acceptance cost or direct subsidies by payment providers.

(3) **Drive a "virtuous cycle":** Once a minimum critical mass of consumers and merchants is achieved, adoption rates can be increased over time by payment providers. To increase consumer adoption, the payment provider can offer ancillary services on the platform such as other financial services or concierge service that appeal to a wider demographic range. To expand the merchant base, the provider can offer merchants incentives for new signups or exclusivity.

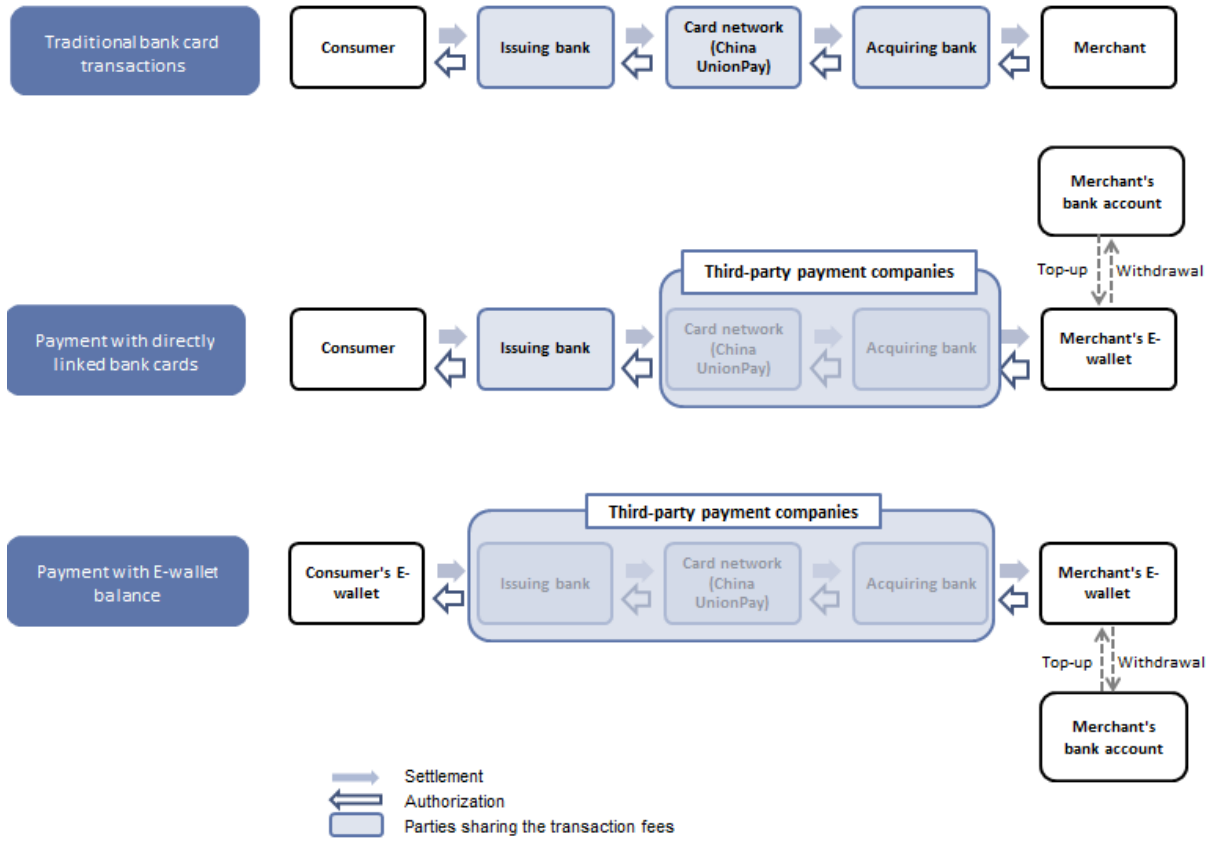
How could Chinese payments models disrupt the US and Europe?

Over the past five years, a number of potential threats to the incumbent payment ecosystems in the United States and Europe have surfaced, including Apple Pay, Google Wallet, MCX (Merchant Customer Exchange), and others. Thus far, these methods have failed to gain widespread adoption because of either modest consumer adoption or merchant acceptance. However, in China, "third-party" payment methods Alipay and Tenpay have been growing at over a 40% CAGR and comprise $2tn in payment volume today. Here, we build the case for how they could disrupt the incumbent payment systems outside of China.

Background: Growing fast by winning users and merchants. "Third party" payment methods such as Alipay and Tenpay allow consumers to pay either directly through linked bank cards (removing the role of the acquiring bank and the card network) or with an e-wallet balance (removing the role of the acquiring bank, the card network, and the issuing bank). As a result, third-party payment providers play multiple roles in a transaction and dis-intermediate portions of the payments value chain (Exhibit 21).

We believe the lack of domestic competition provided a clear opening for third-party payment providers in China to gain a strong foothold among consumers and expand rapidly. China UnionPay, the only bank-linked network in China, had failed to develop (1) e-commerce technology capability for processing online transactions, instead partnering with Alipay and Tenpay; and (2) mobile payment technology for consumers to pay with smartphones.

Exhibit 21: Third party payment companies can replace more than one traditional payment value chain player
Value chain of traditional bank card and third-party payment transactions



Source: Goldman Sachs Global Investment Research.

Below we examine how these systems have succeeded in China, and how this could be applied elsewhere:

(1) Building the consumer base: We believe Alipay and Tenpay will need to provide a payment offering that is as convenient and has better incentives than incumbents:

- **Replacing the bank by attracting deposits and cross-selling financial services:** Ant Financial launched Yu'e Bao (Chinese for "leftover treasure") in 2013, which provides interest-bearing depository accounts to both banked and underbanked individuals. By offering cash returns up to twice as high as interest-bearing accounts offered by Chinese banks (about 6% vs. about 3%, although rates have receded in recent years), Ant Financial has successfully drawn substantial deposit share away from the banks and is now the world's largest money market fund (per *Financial Times*) with Rmb1.4 trillion ($208 bn) in AUM. We believe these incentives were critical in driving consumers to the Alipay platform and have effectively helped create a viable substitute to Chinese banks (Exhibit 22). The addition of other financial services such as insurance and consumer loans has further diversified Ant's portfolio. We believe Chinese third-party payment services could potentially gain users in the United States and Europe if they are able to offer significantly higher deposit rates, along with a broad array of financial services – provided they can overcome regulatory obstacles (see below).

Exhibit 22: Ant Financial's leading breadth and scale

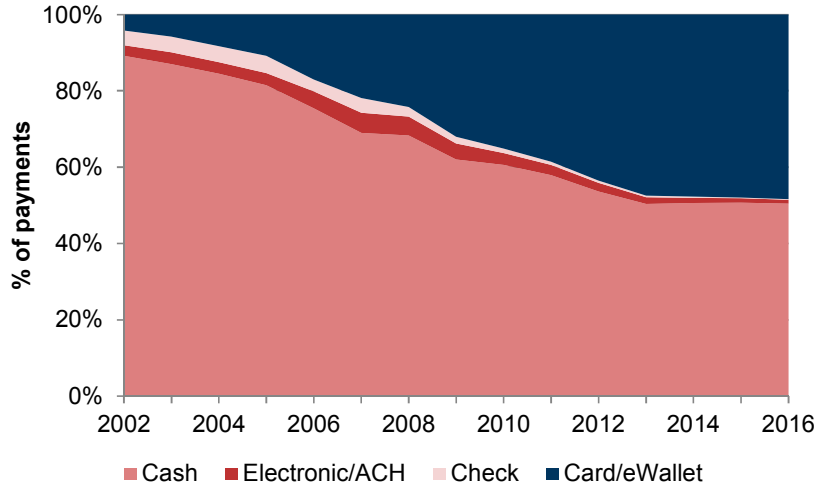
Payment	Wealth Management	Financing	Insurance	Credit System
支付宝 ALIPAY	蚂蚁聚宝 余额宝	花呗 借呗	蚂蚁保险服务 Ant Insurance Service	芝麻信用 ZHIMA CREDIT
520mn	330mn	100mn	392mn	257mn
Annual Active Users	Cumulative Users	Annual Active Users	Annual Active Users	Annual Active Users
	+17%	73%	+43%	+95%
	Yoy AUM growth per active user	use Ant Credit Pay 6+ times in 1 year	YoY premium growth per user	YoY growth

Source: Company data.

- **Improving convenience with a one-touch mobile experience:** Alipay and Tenpay succeeded in bringing an easy-to-use mobile experience to both consumers and merchants. To pay, the consumer launches the appropriate payment app, which generates an on-screen QR code (similar to a bar code) which is then scanned by the merchant at the point of sale. While technically simple and lacking in security, the consumer experience is at least as easy as Apple Pay and requires no new equipment investment by the merchant.
- **Filling an unmet need for the underbanked:** Many Chinese consumers were not historically served by banks, providing an opening for FinTech disruptors. Just 15 years ago, China was virtually an all-cash economy (Exhibit 23). Chinese consumers quickly evolved and became more sophisticated with their payment methods, and cards and eWallets make up roughly 50% of consumer spending today. Bank penetration has also increased rapidly, with 79% of individuals over 15 years old having a bank account as of 2014, up from 64% in 2011, according to the World Bank. We believe the large number of unbanked and underbanked consumers in China has provided a fertile environment for Alipay and Tenpay to introduce new payment and financial services. We believe a similar market opportunity exists in developed markets as well – and we would point to Ant

Financial's proposed acquisition of US-based remittance provider MoneyGram as an attempt by Ant to gain a foothold with this demographic in the United States.

Exhibit 23: Cards/eWallets have meaningfully scaled over the last 15 years
Payment volume mix in China, 2002-2016



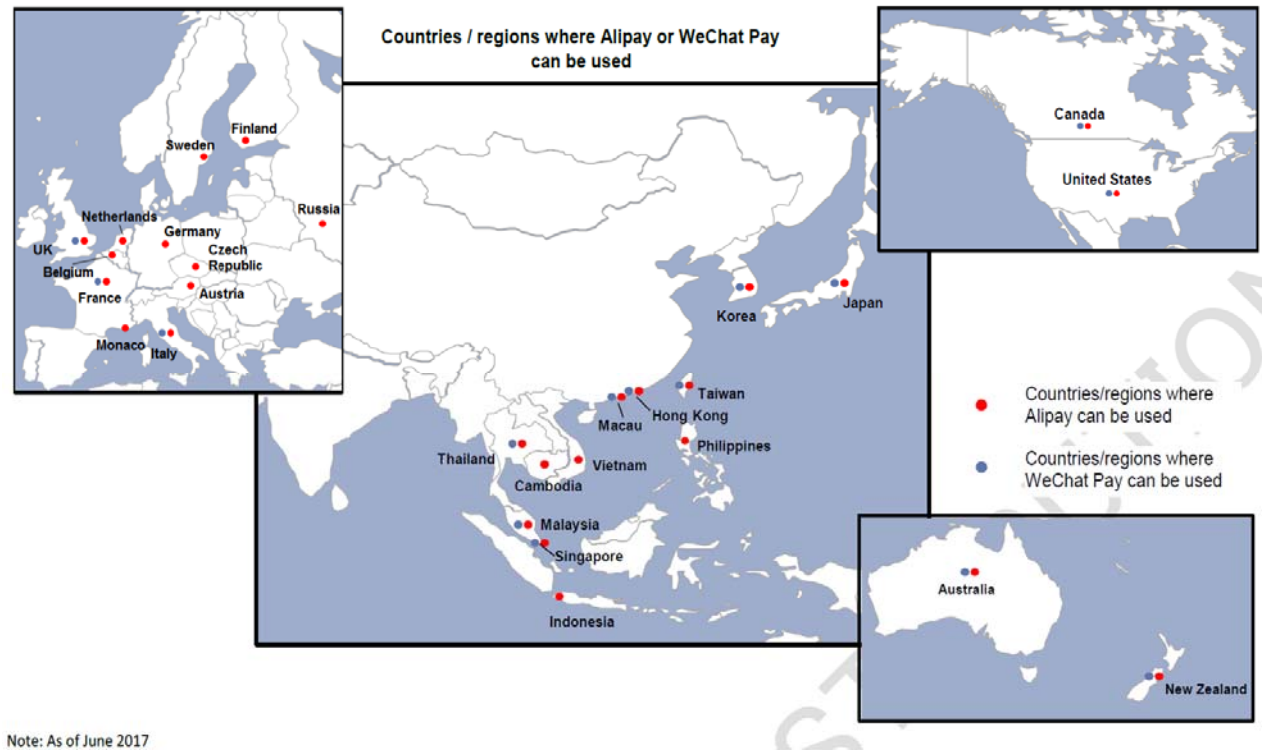
Source: Euromonitor.

(2) Building merchant acceptance at scale: While Chinese third-party payment providers will likely need to first drive consumer adoption, we believe they are already taking important steps to build a global footprint of merchant acceptance:

- **Forging partnerships to drive merchant acceptance.** Alipay and WeChat Pay (Tencent's payments platform) are leveraging their existing Chinese consumer base to gain merchant acceptance outside of China by forging global partnerships. They have announced several partnerships over the last year with Verifone (Alipay in October 2016), Citcon (WeChat Pay in February 2017), and First Data (Alipay in May 2017) to build international merchant acceptance. These services are available in 28 countries outside of China for Chinese tourists (Exhibit 24). We expect this initial merchant base will be a useful baseline for rolling out local Alipay and WeChat Pay offerings to North American and European consumers. The larger and more penetrated the consumer base, the more merchants will be convinced to offer the payment method in their stores.
- **Lowering the cost of acceptance:** As we have written previously (see our July 7, 2014 report, *Resume on Payments*), we believe there is a long-term trend toward lower merchant acceptance fees, mainly as a result of regulation (which has already been executed in the United States, Europe, and Australia). Today, we estimate that third-party payment transaction costs in China are slightly higher than debit fees in the United States and in Europe for in-store transactions (about 40bps) and online transactions (about 60bps) (Exhibits 25 and 26). However, US credit card fees remain significantly higher than third-party payment fees (which do not offer a direct credit option). We highlight that debit spreads for Alipay and Tenpay (8-28bps) are richer than those for Visa and Mastercard (5-10bps). Recent EU interchange cuts implemented in December 2015 demonstrate that pricing can impact merchant acceptance. Aldi and Lidl, the Germany-based supermarket chains that together represent about 25% of German retail sales, announced that their stores now accept credit cards after the interchange cuts took effect, and we

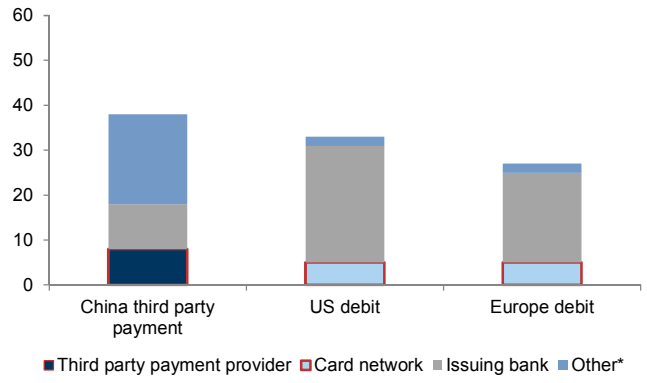
expect small merchants to follow. We believe charging comparable or lower fees relative to merchants will be necessary to gain widespread merchant acceptance.

Exhibit 24: Alipay and WeChat Pay are available in 28 countries / regions outside of Mainland China
Countries and regions where Alipay or WeChat Pay can be used



Source: Company data, Caixin, Goldman Sachs Global Investment Research.

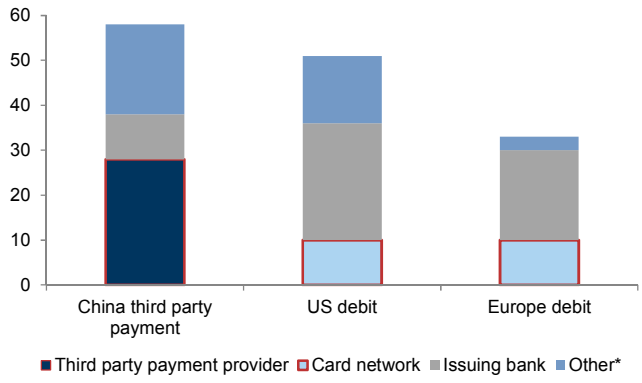
Exhibit 25: China third party payment fees are slightly higher than other regions for instore transactions…
Estimated instore transaction fees



*Other includes merchant acquirers, payment aggregators, gateways, etc.

Source: Company data, Goldman Sachs Global Investment Research.

Exhibit 26: …and for online transactions
Estimated online transaction fees



*Other includes merchant acquirers, payment aggregators, gateways, etc.

Source: Company data, Goldman Sachs Global Investment Research.

What could go wrong? Obstacles to exporting China's third party model

While we have outlined a path for China's third-party payments model to expand overseas and challenge incumbent ecosystems in the United States, Europe, and elsewhere, it is important to recognize that there are substantial challenges (regulatory, competitive, and demographic) associated with success outside China, including:

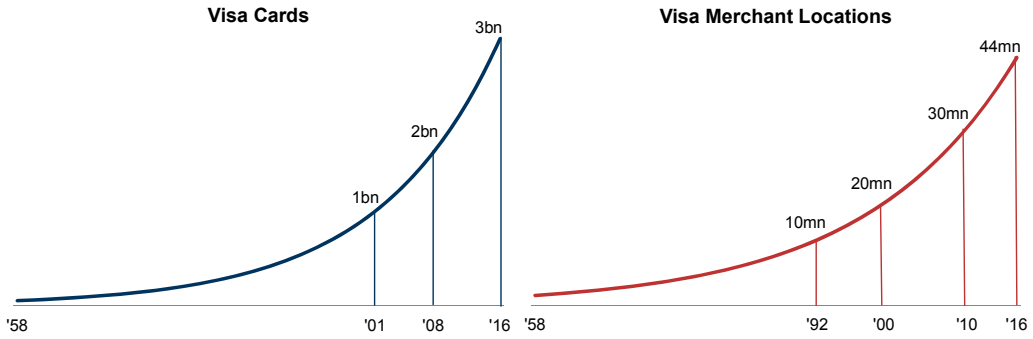
(1) **Stricter regulatory regimes:** China's FinTech industry grew with few regulatory constraints in the early days. However, there are stricter regulations governing financial institutions (particularly broad financial service providers) in the United States and Europe. If building an integrated platform tied to depository (interest-bearing) accounts is important to building scale, Chinese third-party payment companies would need to apply for bank licenses and comply with broad banking regulations, which could slow their growth and introduce more complexity.

We believe the bar to becoming a bank is lower in Europe. For example, PayPal has a bank license in Europe (and is issuing debit cards in partnership with Visa), but it does not have an equivalent license in the United States. There is also precedent for non-financial institutions (such as retailers Tesco and Sainsbury's) to become banks in Europe. Wal-Mart's efforts to obtain a special banking charter in the United States were stymied before the financial crisis. While it might be easier to obtain a license in Europe, we note the path forward is not easy – and we would point out that online-only "challenger banks" in the United Kingdom such as Atom Bank and Revolut have gained limited market traction in recent years.

In the United States, if the OCC were to issue Special Purpose National Bank Charters (as discussed in the next section), that could offer the opportunity for China's FinTechs to receive a bank license. However, there is significant uncertainty around whether these bank charters will be introduced, what the definition of them will be, and if they would be issued to non-US institutions.

(2) **Stiffer competition, with powerful incumbents backed by US banks:** Simply put, payment industry incumbents in the United States and Europe are substantially stronger than their counterparts in China. Credit cards in the United States offer rich reward plans (often with 2% or better rewards programs which directly benefit consumers and drive loyalty), and card usage in the United States and Europe is already widespread among consumers with ubiquitous merchant acceptance (Exhibit 27). In our view, this dominant market position is the main reason why tech companies like Apple and Google partnered with the card networks and banks when launching their digital wallets, rather than attempting to disintermediate them. Importantly, payments companies have driven significant technology innovations – as the core security technology underlying mobile payment services such as Apple Pay and Google Wallet was developed by Visa and Mastercard.

Exhibit 27: Visa's user base grew in tandem with merchant acceptance
Visa cards and merchant locations, 1958-2016



Source: Company data.

(3) **"High inertia" consumer base:** Consumers in the United States and Europe are arguably more widely served by existing financial institutions than Chinese consumers, with bank account penetration of about 95% (Exhibit 28). Consumers in these developed markets are slow to change their current payment method. Consumer adoption of new technologies such as Apple Pay has been disappointing over the last three years – in large part due to a lack of clear advantages in terms of convenience or rewards. At its core, we believe consumer payment is a fundamentally high-inertia market, and most consumers do not actively re-evaluate the cost-benefit of their payment choices.

Exhibit 28: China has lower bank account penetration than other large economies
GDP and bank account penetration for top 20 largest economies; countries with less than 80% bank account penetration highlighted in blue

Rank	Country	GDP ($mns, 2016)	Account penetration (2014)
1	USA	18,569,100	94%
2	China	11,199,145	79%
3	Japan	4,939,383	97%
4	Germany	3,466,756	99%
5	United Kingdom	2,618,885	99%
6	France	2,465,453	97%
7	India	2,263,522	53%
8	Italy	1,849,970	87%
9	Brazil	1,796,186	68%
10	Canada	1,529,760	99%
11	South Korea	1,411,245	94%
12	Russia	1,283,162	67%
13	Spain	1,232,088	98%
14	Australia	1,204,616	99%
15	Mexico	1,045,998	39%
16	Indonesia	932,259	36%
17	Turkey	857,748	57%
18	Netherlands	770,845	99%
20	Saudi Arabia	646,438	69%

Source: World Bank, Goldman Sachs Global Investment Research.

OCC's Special Purpose Bank Charter: Advancing FinTech breadth

In December 2016, the US Office of the Comptroller of the Currency (OCC) published and solicited comments on a paper considering whether FinTech companies should be granted Special Purpose National Bank Charters. The OCC currently grants Special Purpose National Bank Charters to trust banks and credit card issuing banks. The OCC provided

three reasons for why this may be in the public interest: (1) FinTech companies and banks will operate in the same "safe and sound manner"; (2) the OCC can provide consistency in the application of law and regulation across the country for FinTech companies and banks; and (3) the federal banking system could strengthen, as FinTechs could explore new ways to promote fair access, financial inclusion, and innovation.

There is ongoing debate as to whether these charters would be beneficial for FinTech innovation, especially for smaller companies. Some argue that smaller FinTechs would benefit from a national charter because it would provide consistent national FinTech regulation, rather than state-by-state laws. Others argue that smaller FinTechs would struggle to gain the scale necessary to apply for a national charter, ensuring a wider competitive moat around larger FinTech companies. Other opponents are concerned that OCC oversight could slow down innovation—because the pace of regulatory change is slower than the pace of technological change.

Potential risks to Visa and Mastercard: In the existing payment ecosystem, the banks and card networks work in tandem. Therefore, Visa and Mastercard have two competitive moats: (1) the card network moat, whereby Visa and Mastercard have achieved a level of convenience and ubiquity in most developed markets that is difficult to disrupt; and (2) the bank moat, whereby FinTechs struggle to disrupt the role of banks as credit facilities (although there have been efforts—see our discussion on point of sale credit (p. 65)), and Visa and Mastercard have deep partnerships with the banks. If FinTechs are granted Special Purpose National Bank Charters, it could give rise to a business model that offers a greater breadth of offerings (similar to those of an Alipay or Tenpay) that has the potential to disintermediate banks and eliminate one of these competitive advantages. However, with consumers satisfied with their current payment method, we believe it could be challenging to uproot the status quo without offering the same scale, convenience, and incentives as the card networks.

Blockchain: Limited use cases consumer payments; opportunities in cross-border

See our report, *Profiles in Innovation: Blockchain, Putting Theory into Practice* (May 24, 2016) for more on applications of blockchain technology.

Blockchain has captured the imagination of Silicon Valley and Wall Street alike over the past few years, and is in the early stages of being tested across different industries, such as security, capital markets, and compliance. It is fundamentally a new type of database technology that is optimized to tackle a unique set of challenges. Blockchain is a shared, distributed database of transactions among parties that is designed to increase transparency, security, and efficiency.

We believe blockchain technology will have limited use cases in traditional payments (i.e., retail sales, bill pay, etc.). We think Visa and Mastercard are too cheap and too convenient to be displaced for conventional debit transactions. From a cost perspective, we estimate that Visa and Mastercard break even at about 2bps of transaction value when processing a transaction on their debit rails; with Bitcoin, we estimate it costs 450-500bps as it is computationally intensive. On convenience, Visa and Mastercard can authorize transactions in 20ms, compared to 18 hours of verification on the public Bitcoin network today.

Blockchain offers an enticing opportunity in cross-border payment settlement, an estimated $25tn addressable market (according to Ripple). Cross-border FX settlement currently takes several days, and near real-time cross-border payment and FX settlement systems can reduce working capital needs, maximize liquidity, and minimize settlement risk. Ripple is a promising innovator in this field and uses customized protocols based on blockchain technology and transactional ledger technology that is bilateral in nature to provide real-time cross-border payment functionality. Similar to SMTP (Simple Mail Transfer Protocol), which allows emails to be sent seamlessly from one email system to

another, Ripple aims to remove the friction of moving money from one banking system to another. The company provides payment solutions to both corporate customers (treasury operations) and banks (both large and small) and is currently working with over 90 global banks. Chain Inc., another blockchain company focused on transforming back-end processes with software, plans to launch a cross-border B2B payments initiative with Visa called Visa B2B Connect in 2017.

Artificial Intelligence: Complementary to the current ecosystems

See our report, *Profiles in Innovation: Artificial Intelligence* (November 14, 2016) for more on the applications of machine learning and deep learning.

The leap from computing built on the foundation of humans *telling* computers how to act to computing built on the foundation of computers *learning* how to act has significant implications for every industry including payments. **We believe artificial intelligence (AI) will be complementary to existing payments applications—particularly with respect to fraud and customer service—rather than disruptive.**

Fraud: Mastercard announced the acquisition of Brighterion, a software company specializing in artificial intelligence, in July 2017. Brighterion allows Mastercard to evaluate the likelihood of fraud for each transaction. Similarly, Stripe and Adyen use machine learning to identify transaction fraud and merchant fraud. Other gateways, merchant acquirers, and networks also use machine learning to identify fraud.

Customer service: Machine learning can also be used to resolve customer complaints. Ant Financial launched an AI-powered chatbot in 2015 in order to reduce its number of customer service calls. Given its fast pace of growth, Ant would not be able to hire customer service representatives quickly enough, and its 300-person AI team has developed a chat assistant to reduce service times.

Q3: Is Amazon Payments a threat to the existing ecosystem?

Amazon has maintained payment initiatives in the market since 2007, navigating through a number of product launches and re-configurations. With the re-launch of Amazon Payments product in 2013—which allows third-party merchants to improve their checkout rates by letting shoppers pay by using their Amazon username and password—Amazon is seeing more traction in the market. However, we do not see Amazon Payments as an imminent threat, particularly to PayPal. We continue to believe that PayPal will remain dominant in online payment processing as a result of its two-sided network of direct consumer and merchant relationships. While Amazon Payments has a large consumer base, we believe it still has substantial work to do in order to sign up Marketplace merchants for its Amazon Payments offering.

How Amazon Payments works

Amazon Payments allows consumers to use their Amazon username and password to transmit payment and delivery details onto a third-party website. The core rationale for merchants accepting Amazon Payments is to increase sales conversion and reduce cart abandonment (due to the time required to enter payment details or to decline card transactions). The key features of the offering are as follows:

- **Transaction economics:** The merchant fee structure is simple, and similar to PayPal's wallets. The domestic fee is 2.9% plus $0.30 per transaction, and the international fee is 3.9% plus $0.30 per transaction. Amazon Payments does not change the payment economics for acquirers, card networks, or issuing banks.
- **Partners:** Amazon Payments has partnered with hundreds of online retailers, including Gogo air, Nine West, and Merrell. In April 2016, Amazon expanded Amazon Payments by launching its Global Partner program, which allows e-commerce platform providers, not just individual merchants, to integrate Amazon Payments. The Global Partner program boasts at least 50 service providers today, including PrestaShop, Shopify, and Future Shop.
- **Security:** Although consumer identity and credit card information is not stored on merchant systems, payment through Amazon Payments is not biometrically secure (as is Apple Pay) and thus remains susceptible to counterfeit card fraud.

Amazon Payments' growth trajectory and estimated TPV

Following the re-launch, Amazon Payments has posted impressive growth:

- **Transaction volume** grew 150% in 2015 and nearly 100% in 2016.
- **Merchants** grew by 200% in 2015 and more than 120% in 2016.
- **New verticals** were introduced beyond traditional online retail, including government payments, travel, digital goods, insurance, entertainment, non-profits, and charities.
- More than 50% of Amazon Payments' customers are **Prime Members**, and 32% of transactions using Amazon Payments were made on a mobile device in 2016.

We estimate Amazon Payments processed about $6bn in 2016

To understand the degree of traction behind Amazon Payments, we consider a scenario analysis to estimate Amazon Payments' Total Payment Volume (TPV). We estimate that Amazon Payments' TPV was about $6bn in 2016 (Exhibit 29). This compares to PayPal's TPV (excluding Venmo) of $336bn. We arrive at this estimate based on the following

assumptions: **(1) Number of users:** Amazon has stated that more than 33mn customers have used Amazon Payments to make a purchase as of February 2017, and 23mn customers had used Amazon Payments as of early 2016. Because Amazon Payments is a fast-growing platform, our scenario analysis assumes that 60-90% of the 33mn cumulative customers used the Amazon Payments platform in 2016; **(2) Transactions per user:** We assume the transactions per user are between 1 and 5. As Amazon Payments is still building its merchant base, we believe people are primarily using the service on a one-off basis. We expect Amazon Payments' average transaction per user to be much lower than PayPal's—even over a decade ago—given PayPal's partnership with eBay and other larger merchants; **(3) Average purchase size:** Amazon disclosed that the average Amazon Payments purchase was $80 in 2016.

Exhibit 29: We estimate Amazon Payments' volume was ~$6bn in 2016
Amazon Payments' estimated 2016 TPV for a range of users and transactions per user ($mns)

Transactions per user	Number of users (in mns)			
	20	23	26	30
1	$1,584	$1,848	$2,112	$2,376
2	$3,168	$3,696	$4,224	$4,752
3	$4,752	$5,544	$6,336	$7,128
4	$6,336	$7,392	$8,448	$9,504
5	$7,920	$9,240	$10,560	$11,880

Source: Company data, Goldman Sachs Global Investment Research.

Does Amazon Payments pose a threat to PayPal? Not for now

Amazon Payments competes more directly with PayPal than nearly any other participant in the payments universe. Both products charge similar fees and have similar fee structures, and they both address the same pain points for consumers and for merchants – simplifying the payment process to increase purchase conversion and reduce cart abandonment (Exhibit 30).

Exhibit 30: PayPal dwarfs Amazon Payments in size, although Amazon is growing quickly
Amazon Payments and PayPal comparison (2016)

	Amazon Payments	PayPal	PayPal vs. Amazon
TPV ($mns)*	$5,940	$354,015	59.6x
Transactions (mns)	74	6107	82.2x
Average purchase size	$80	$58	0.7x
Accounts (mns)**	33	197	6.0x
Transactions per account	3	31	10.3x
Domestic fee	2.9% + $0.30	2.9% + $0.30	
Cross-border fee	3.9% + $0.30	4.4% + $0.30	

*Amazon Payments' TPV is GS estimate based on midpoint of sensitivity.
**Amazon figure applicable for last three years ending 2016; PayPal is last 12 months ending 2016.

Source: Company data, Goldman Sachs Global Investment Research.

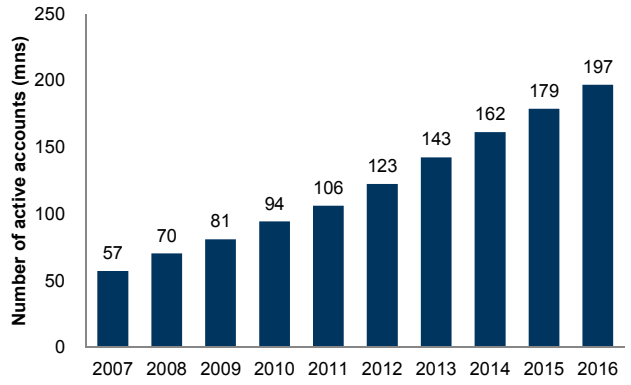
However, we do not think Amazon Payments poses an imminent threat to PayPal for three core reasons:

(1) **PayPal's significantly greater scale.** We estimate PayPal processes 60X more payment volume and 82X more transactions (Exhibit 30).

(2) **Large online merchants.** 14 of the top 20 US online merchants accept PayPal, including Wal-Mart, Macy's, and Home Depot. Only one company on this list lets customers pay through Amazon: Amazon. Given the competitive dynamic between Amazon and brick-and-mortar retailers, we do not expect most large online merchants to offer Amazon Payments as a checkout option. While Amazon has a larger customer base (we estimate roughly 340mn account holders), we believe it will struggle to scale its payments business to compete with PayPal given this competitive dynamic.

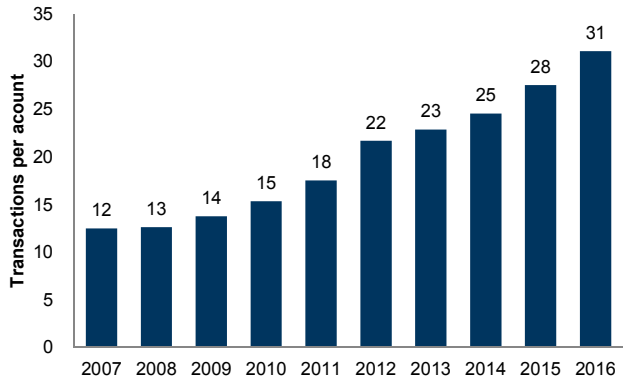
(3) **PayPal's compelling user statistics.** Amazon has been trying to compete in the payments space for a decade, and even after the Amazon Payments' re-launch in 2013, PayPal's user base and user activity continues to grow at a healthy pace (Exhibits 31 and 32). We will be watching these metrics carefully to see if Amazon Payments is impacting PayPal's account growth or activity.

Exhibit 31: PayPal added 19mn active accounts in 2016…
Number of active accounts (mns), 2007-2016



Source: Company data.

Exhibit 32: …and transactions per account continues to grow as PayPal expands its merchant base
Transactions per account, 2007-2016



Source: Company data.

What could Amazon do to pose a greater threat?

We see two competitive differentiators Amazon could leverage to pose a greater threat:

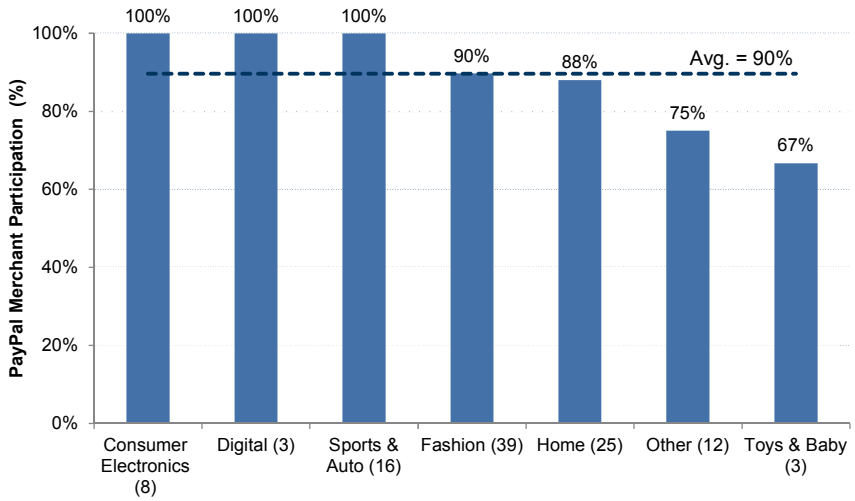
(1) **Offer amazon.com promotions for paying with Amazon Payments.** We believe the rationale behind Amazon Payments is to increase Amazon's mindshare and stickiness among customers, and ultimately grow volumes on its own site and through Marketplace. We believe Amazon could start offering promotions for customers to pay with Amazon Payments, such as Amazon gift cards or Prime membership discounts, that are not available to PayPal users today. Separately, Amazon (outside of Amazon Payments) launched 2% back rewards on purchases when customers first load funds into their Amazon balance using a debit card in June 2017.

We analyzed over 100 merchants that accept Amazon Payments and found that 90% of them also accept PayPal (Exhibits 33 and 34). We believe all of these merchants are fairly small (as Amazon Payments has not partnered with top online retailers), and customers would be fairly indifferent between paying through Amazon Payments or PayPal given the similar customer experience. Therefore, we think

Amazon would pose the greatest risk to PayPal's TPV if Amazon Payments offered financial incentives that would also ultimately drive more traffic back to the Amazon website.

(2) **Tap into Amazon's large third-party online network.** Amazon has an extensive partnership with third-party websites through Amazon Marketplace (over 60% of Amazon's total purchase volumes) and Fulfillment by Amazon (Amazon's service to help streamline logistics). While these merchants might be willing to accept Amazon Payments on their websites, we estimate that total Amazon Payments volumes are 25X smaller than Amazon Marketplace volumes today (Exhibit 35), thus leaving a potential runway for Amazon Payments.

Exhibit 33: We found that 90% of Amazon Payments merchants also accept PayPal
PayPal merchant participation rate at 106 Amazon Payments merchants



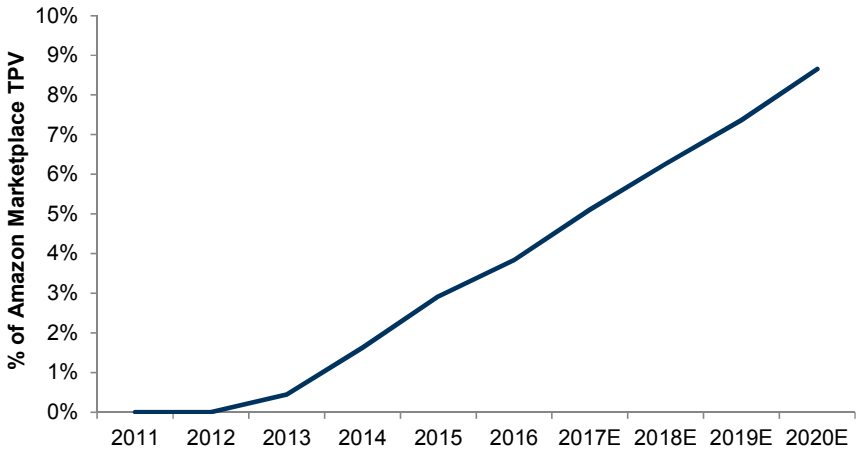
Source: Goldman Sachs Global Investment Research.

Exhibit 34: Over 90% of Amazon Payments merchants also accept PayPal
Amazon Payments merchants that also accept PayPal

Amazon Merchants that Accept PayPal							
Consumer Electronics		**Digital**		**Fashion**		**Fashion Cont.**	
47st.Photo	✓	CityPass	✓	Beauty Encounter	✓	Red Dress Boutique	✓
Adafruit	✓	FactSpring	✓	Bellami Hair	✓	Schuler Shoes	✓
Colamco	✓	Gogo Air	✓	Bling Jewelry	✓	Shinola	✓
Coveroo	✓	**Home**		BlueFly	✓	Simple Wishes	
Monoprice	✓	123Stores	✓	Bombas	✓	Stadium Goods	✓
Pro Audio Star	✓	As We Change	✓	CupShe	✓	Studio Gear	✓
Scuf Gaming	✓	Bed Bath Home	✓	Current Elliot	✓	Super Jeweler	✓
Vizio	✓	Build	✓	Crazydog Tshirts	✓	ThredUP	✓
Toys & Baby		Cymax		Designers Studio Store	✓	UNIF	✓
Bambi Baby	✓	HomeSquare		Dr Jays	✓	Unique Vintage	
Hobby Works		Discount Filters	✓	Equipment	✓	**Other**	
ToyWiz	✓	Dogids	✓	Fashion Nova	✓	Banza	✓
Sports & Auto		Easy Comforts	✓	Filson	✓	Blick	✓
Auto Parts Warehouse	✓	eFaucets	✓	Guess	✓	Comixology	✓
Auto Truck Toys	✓	Exposures	✓	Joie	✓	Dr Vita	✓
Autoplicity	✓	Fabric	✓	Julianna Rae	✓	From You Flowers	✓
CarParts	✓	Goedekers		Karen Kane	✓	Personal Trainer Food	✓
Cycleplicity	✓	Grizzly	✓	Kuru		Pike Place Fish Market	
Divers-Supply	✓	Homeclick	✓	L'Occitane	✓	Supply	✓
DJBennet	✓	Miles Kimball	✓	Lulus	✓	Swanson	✓
Evike	✓	Rockler	✓	MantraBand	✓	The Washington Post	✓
Hockey Giant	✓	Ruglots	✓	Merrell	✓	Ting	
Horseloverz	✓	Shindigz	✓	Moda Operandi		Woot	
JC Whitney	✓	ShoppersChoice	✓	MVMT	✓		
Midwest Sports	✓	Startup Vitamins	✓	Nine West	✓		
Optics Planet	✓	TGL Direct	✓	Orthotic Shop	✓		
Redsgear	✓	US Mattress	✓	Palm Beach Jewelry	✓		
Sports Memorabilia	✓	Walter Drake	✓	Puravida Bracelets	✓		
Sports Unlimited Inc.	✓	Wise Company	✓	Rebel Circus	✓		

Source: Goldman Sachs Global Investment Research.

Exhibit 35: Tapping into the Amazon Marketplace network is an interesting opportunity for Amazon Payments
Amazon Payments TPV as % of Amazon Marketplace TPV



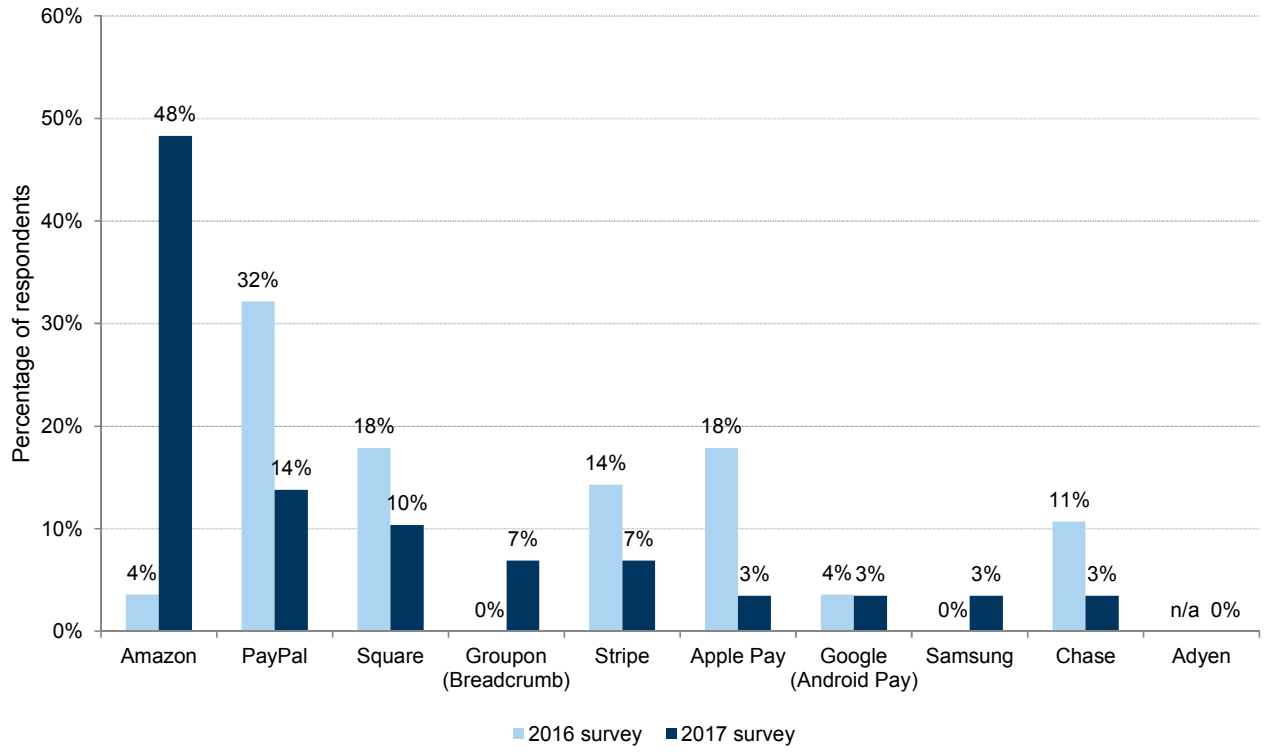
Source: Company data, Goldman Sachs Global Investment Research.

Amazon Payments: Small today, but survey data raises concerns

In our survey of over 100 US merchant acquirers, ISOs, and ISVs in Spring 2017, we asked participants to provide their view on which existing payment provider or technology company might have a disruptive impact on the payment ecosystem. **Amazon was viewed as the most likely potential disruptor in 2017, with 48% of respondents ranking Amazon as their top perceived threat –** a substantial uptick from a year earlier, when only 4% of respondents viewed Amazon as the biggest potential disruptor (Exhibit 36). We note that the data normalizes somewhat when expanding the dataset to look at respondents' top 3 threats out of 10 potential disruptors, but Amazon still showed a large uptick from spring 2016 (45% in 2016 vs. 63% in 2017), whereas PayPal dropped off slightly (63% in 2016 vs. 59% in 2017). The question also did not specify about the threat of Amazon Payments vs. any other Amazon product.

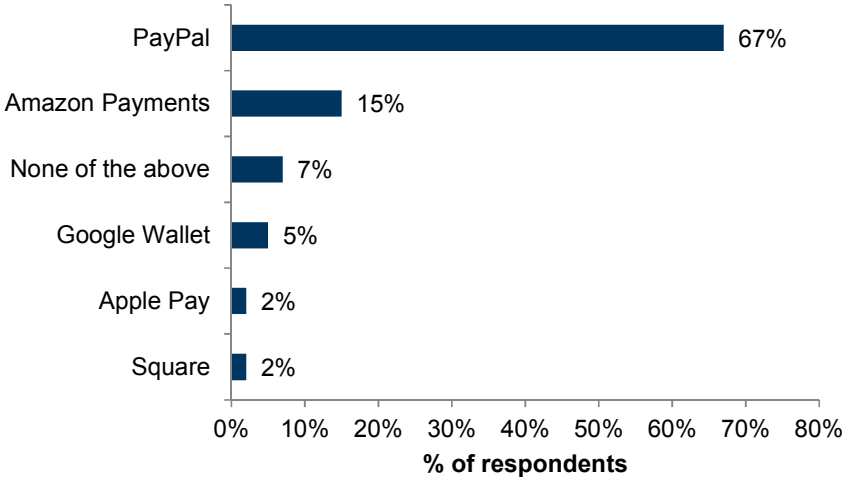
A ChannelAdvisor Online Retail Survey of 200 online retailers (100 in the United States, 100 in the United Kingdom) in mid-2015 also suggested Amazon Payments was gaining early traction. The survey asked online retailers which alternative payment method was most commonly used by customers after credit and debit cards. While PayPal was the dominant payment option selected by 67% of respondents, we were surprised Amazon Payments garnered 15% of the vote. This was well ahead of mobile wallets provided by phone companies (Google Wallet at 5% and Apple Pay at 2%) (Exhibit 37).

Exhibit 36: Amazon is viewed as the biggest threat to the existing payment ecosystem
Which of the following do you view as the biggest potential threat to the existing payment ecosystem? Percentage of respondents that ranked the company #1 is shown below.



Source: ETA, Goldman Sachs Global Investment Research.

Exhibit 37: We were surprised that Amazon Payments showed some traction in mid-2015
After debit/credit cards, what is the most popular payment method used by your customers? (Respondents include 200 online retailers (100 in US, 100 in UK))



Source: ChannelAdvisor Online Retail Survey (August 2015).

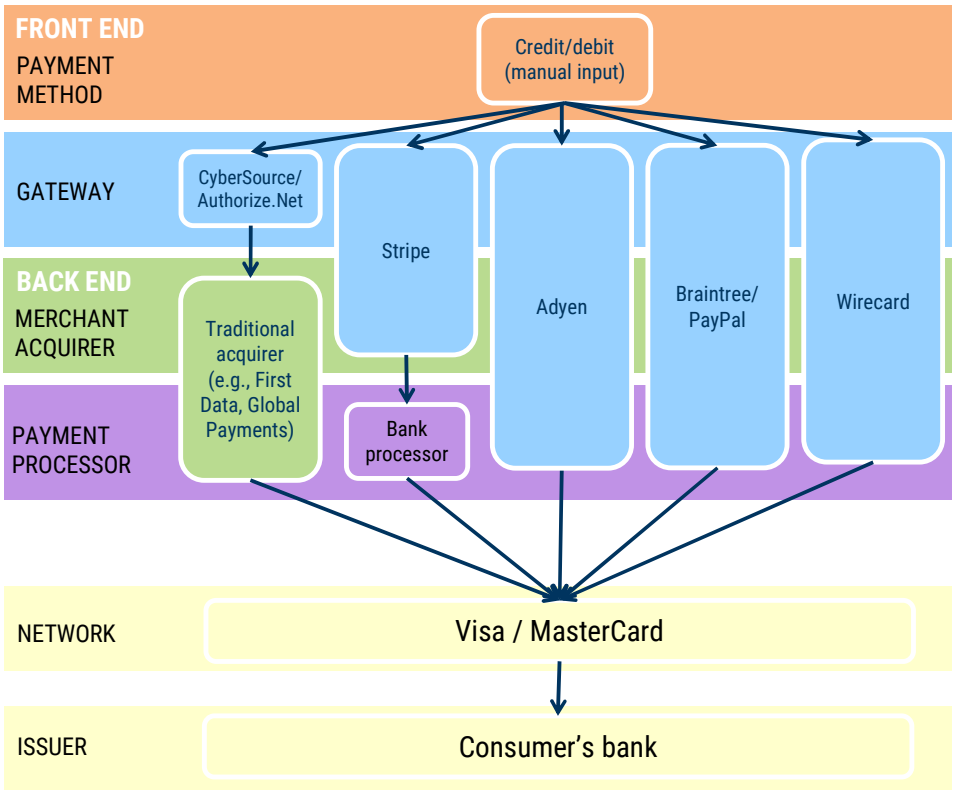
Q4: What are the most promising & disruptive payments startups?

The term "frictionless payments" has long been used in the industry to describe a seamless and convenient user experience. E-commerce and the complexity of merchant websites have created new pain points in the payments experience that many companies have tried to remove. These challenges relate not just to the consumer experience, but also to the ease of integration for merchants. We highlight six payments innovators—Adyen, Stripe, Alipay, Tencent, Paytm, and PayU—that have scaled quickly, as their superior merchant and consumer experience has driven adoption. We also interview the CEO of Adyen and the CFO of Stripe.

Adyen and Stripe have gained share in the gateway market by re-inventing and streamlining the application programming interface (API) for payments, making payment integration much easier. Stripe's website states, "We believe that payments is a problem rooted in code, not finance." Stripe and Adyen's APIs give the merchant more control over the user interface. Customers do not have to visit an outside site to check out—a pain point that could increase the likelihood of cart abandonment—and merchants do not have to redesign their sites to accommodate payments. Stripe and Adyen are more vertically integrated and therefore easier to implement compared to early gateway leaders like CyberSource (acquired by Visa in 2010), where implementation time could be up to six months.

Alipay, Tencent, Paytm and PayU have accelerated the shift to digital payments in emerging markets. Alipay and Tenpay are dominant names in China and could seek to expand overseas, while PayU and Paytm build new ecosystems amid digitalization of cash in emerging markets.

Exhibit 38: Gateways are becoming more vertically integrated
Flow chart of payment methods



Source: Goldman Sachs Global Investment Research.

Interview with…Pieter van der Does, CEO of Adyen


Pieter van der Does


James Schneider


Mohammed Moawalla

GS Research Payments analysts James Schneider and Mohammed Moawalla spoke to Pieter van der Does, founder, President, and CEO of Adyen. Since its founding in 2006, Adyen has grown from startup to online juggernaut. In 2016, Adyen processed $90bn in total payment volume.

James Schneider: Adyen has gained impressive scale, reporting $90bn in payment volume and 80% growth in 2016. What are the key differentiators that have allowed you to grow quickly in such a competitive space?
Pieter van der Does: I think initial decisions about the way to build our company have helped us grow quickly. First, we are a single platform. Everyone uses that term, but we mean that we move the payment data directly from the merchant to the payment rail such as Visa or Mastercard. That gives us a lot of advantages in terms of high conversion rates, high uptime, quicker response rates, and more data. We get access to the direct core data from all of the card networks, so we can help merchants understand better what's going on. Second, we built Adyen as an international company, so we almost immediately started opening offices in other countries. It is not a company that was active in one market and then tried to add other markets. Third is unified commerce—mobile, in-store, and online are all on one platform and a single interface. That way, merchants can have a view of their shoppers independent of the channel. It's nice to be in an environment where, if a merchant says, "I'm an international merchant, who can help me?" the list of answers is very short.

Schneider: Can you walk us through the process for a new client to implement Adyen's solution in terms of coding and integration complexity, and typical timeframe to convert?
van der Does: With us, as with some others, you can connect and process your first transaction in minutes. Incumbents often have several—if not dozens—of systems. But I must say that for our large international merchant base, implementation time is not the issue. The main topic for these merchants is typically around unlocking specific data, protecting against fraud, or optimizing certain settings. These merchants have all sorts of requirements, and we often work with an implementation team to really unlock everything that you can do on our platform.

Schneider: You've mentioned data a couple times now. What are the most common types of data or capabilities which clients demand?
van der Does: A big issue is how we can lower false transaction decline rates online. If we have seen a purchase in a store, we know the shopper was physically present with that card. If she shops online with that store, then you know so much about that individual card so you can reduce the transaction error rate radically. You lower the fraud threshold and make it easier for that consumer to shop because they're less likely to see a transaction being declined. It's also about store payment details which you can use over multiple channels. We know how certain card issuers have implemented their systems, and therefore what the optimal setting is for us to get the cards effectively authorized. Another part is to get feedback to merchants and let them know this is the seventh time you have seen this shopper back in their store this week. So: how often do people come into the store, are the people in my store the same people online or are they different? If I open a store somewhere, does that mean that I get a new base of clients, or does that mean clients who were shopping online now will shop online less – and how does this affect our merchants' marketing?

Mohammed Moawalla: What proprietary data do you have, and how are your analytics tools differentiated?
van der Does: All our systems are built in house. For fraud detection, a lot of companies claim to be able to do the same but those systems usually stand alone. If we say that the transaction is likely to be fraudulent and it's actually not, then the system learns. And because we also handle the money, we can see the effect of our predictions so we can see how good we are. Most of those systems don't have that feedback cycle so they never really know how good they are. So that gives an enormous network effect because there are volumes of data and there are enormous benefits to being a self-learning system.

Schneider: Are most of your clients de novo businesses, or do they switch from a different merchant acquirer?
van der Does: Most of our merchants already exist. Most of them already have volume, and often the reason to come to us is because they are dissatisfied with their current provider, perhaps because they want to move into a region or have some other issue. We tend to gain share from banks and European merchant acquirers.

Schneider: You've referred to Adyen's partnerships with 8 of the 10 largest US Internet companies. How much of this is processing payments in markets outside the US, and what's your strategy to gain regional wallet share at these companies?
van der Does: Historically, US companies gave us international volume in Europe, LatAm, and Asia—but not the domestic volume in the US. The US is now a growth market for us because we are now getting domestic volumes. If you look at our volume based on invoice (i.e., an Uber ride in Europe counts as European volume), our volumes would be about 70% Europe, 10% US, 10% LatAm, and 10% Asia. If you look at our volume based on legal entity (i.e., an Uber ride in Europe is US volume since it's a US company), then our volume is about one-third US, one-third Europe, and one-third rest of world.

Moawalla: Is there a way to characterize your wallet share gains at some of your larger customers?
van der Does: For most of our merchants, we typically start in one region and then get more wallet share. We are not very concentrated, so our top 10 merchants constantly change based on which merchants are giving us more volume. We are in airlines, we are in travel, we are in retail, and we are in the sharing economy—we are so well divided over the different industries, and we're not overexposed to any given industry.

Schneider: You've been vocal about pursuing in-store (offline) payments growth, and have suggested a target of 50% in-store over the next few years. How much of your offline volume comes from getting new in-store clients vs. converting business at existing online clients to physical stores (omni-channel)?
van der Does: Our first in-store merchants were new merchants like Burberry – not existing online clients. They encountered problems and were looking for long-term solutions. Now, many of our existing online clients see our track record in the physical world and are joining us in store as well. Merchants can be working with as many as 50 acquirers to cover their service globally, and they want to reduce that footprint. With so many different providers, you don't have a single system, consolidated overviews, or streamlined reporting—and we're trying to make our clients' lives easier.

Moawalla: What is the benefit or ROI your customers have cited using Adyen relative to legacy providers in terms of their IT footprint or operating cost going forward?
van der Does: It's interesting – we don't need to be the cheapest in those RFPs [requests for proposal] to win the business, since we solve so many problems for our clients. But it's all very merchant specific so it's difficult to be precise.

Schneider: In which regions do you expect to grow the fastest over the next 3-5 years?
van der Does: I think Asia and the US will grow as a percentage of volumes. Asia is a very strong growth region, as we expand our geographical coverage and number of payment methods supported. We are also seeing more volume in the US as we win domestic volume, but that is a less technical investment.

Schneider: Across the payments industry we've seen a great deal of consolidation, both in the US and cross border. Do you think this makes the competitive environment easier or more difficult for Adyen, and do you see Adyen as a natural consolidator in the market?
van der Does: Adyen has never done an acquisition, and we don't intend to. We believe that once you start moving away from a single platform toward owning multiple platforms, it starts to become a distraction and introduces integration problems. From where we stand, it looks like incumbents still believe they will benefit if they have more volume, whereas for us the game is about innovation and doing things that make it easier for our merchants to grow their business.

Schneider: In June, Adyen announced that it had received a pan-European banking license to process cross-border payments directly for merchants, bypassing banks. Why did Adyen apply for the license, and how will it help you differentiate your offering and gain share?
van der Does: I think there are two really good reasons for it. First, we have historically relied on banks to do settlement. Rather than doing instant settlements, we were relying on the bank and that would delay our settlement by a day, and sometimes more. This gives us more control and lets us really operate a single system. Second, we wanted to be a part of the banking system. Being under the supervision of the European Central Bank gives us a better position to help those markets.

Moawalla: Is your focus still on larger merchants, or do you have any intentions of moving down to SMEs?
van der Does: We are moving down a step, but we are not going for the long tail—that is not our focus. We have only approximately 4,500 merchants, and we don't want 300,000 merchants. That requires a different kind of company. That doesn't mean that we will never do it, but for now it is not on the agenda. We are more specialized in merchants doing one transaction per second than merchants doing one transaction per month.

Schneider: What do you believe is the long-term role of products like PayPal or Apple Pay in the market, and do you see them as partnership opportunities or competitors?
van der Does: I think those payment methods will get some traction. And it's not just those methods—it's also WeChat, Alipay, Android Pay, and other local variants. They all have traction, and they create complexity for the merchant because they are new methods to support. There is a lot of innovation in payment methods, which means there are more payments methods for us to support – so we work together with those companies. We work well with those companies and we are also specifically can make them work with physical terminals. We intend to cover all the methods that are relevant for the merchant, so for us it's actually a way to help our customers. Our role would be more limited in a world where everybody only had a Visa card.

Schneider: What keeps you up at night?
van der Does: As good as things are, we need to make sure that we use this window of opportunity. We need to make sure we don't become an organization that is used to everything being easy.

Adyen

Company snapshot

Year launched: 2006

Headquarters: Netherlands

Countries: worldwide

Employees: 500

Funding to date: > $265mn

Last disclosed round: Venture

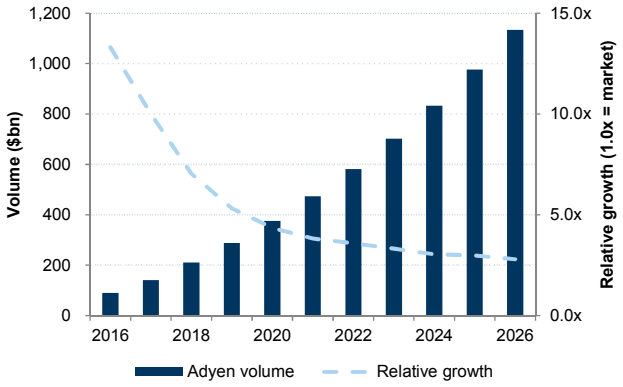
Last funding amount: $250mn

Company overview

Adyen enables payment acceptance for merchants integrated across e-commerce, physical point of sale, and in-app platforms, and provides ancillary services including analytics, risk scoring, and optimization. The company offers its solutions to merchants globally across verticals including retail, airlines, gaming, hospitality, and ticketing. We expect Adyen's volume growth to continue outpacing the market as it expands its geographic footprint and expands its reach into the offline payments market (Exhibits 39 and 40).

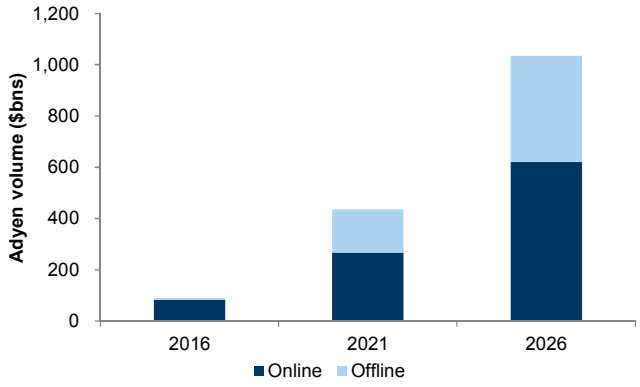
- **Key merchants:** Over 4,500 merchants including Uber (international), Etsy, Netflix, Booking.com, LinkedIn, Spotify, KLM, and Groupon.
- **Pricing:** Adyen's pricing generally follows a tiered processing fee (per transaction) plus commission (typically interchange plus) which bundles ancillary services including risk management and payment optimization.
- **Competitors:** Because Adyen offers both online gateway and offline payment processing services, key competitors include traditional merchant acquirers, as well as newer technology companies including PayPal/Braintree and Stripe.

Exhibit 39: We expect Adyen's volume growth to consistently outpace the market
Adyen volume ($bn) and relative growth rate



Source: Company data, Goldman Sachs Global Investment Research.

Exhibit 40: Offline payments are set to approach 50% of Adyen's payment mix by 2026
Adyen payment volume by channel



Source: Company data, Goldman Sachs Global Investment Research.

A brief history and drivers of success

Adyen was founded in 2006 in Amsterdam, and has expanded beyond Europe to serve over 4,500 customers across North America, LatAm, Asia/Pacific, and Europe. It has raised over $250mn in funding, and been valued at $2.3bn as of 2015. In 2016, Adyen processed $90bn in total payment volume, growing substantially from $50bn processed in 2015 and $25bn in 2014. Adyen has translated this strong volume growth into revenue, reporting revenue of $727mn in 2016, more than doubling the $350mn in revenue it reported in 2015. In 2016, Adyen reported that it has added key merchants in the United States including Microsoft, Sephora, and Symantec.

A key driver of Adyen's path to success has been the company's single platform approach to payments. As the line between e-commerce and brick and mortar begins to blur, it is becoming increasingly important for payment processors to offer an easy-to-integrate solution across offline and online commerce which enables cross-border transactions. Adyen's single platform model has enabled it to quickly win new, multinational clients.

Core product offerings

Adyen's core product offering involves payment enablement online, in-app, and at the physical point of sale. Along with its payments offerings, Adyen provides merchants with risk and optimization services to better run their businesses.

(1) **Payment processing:** Adyen's core payment processing offering helps merchants accept electronic payments in store, in app, and online. The company's brick & mortar and online offerings help merchants achieve an integrated omni-channel payment solution. Adyen offers its POS solutions to merchants across the United States and Europe, and has partnered with VeriFone to distribute hardware solutions.

(2) **Risk and optimization:** Adyen's integrated risk management solutions including RiskProtect and ShopperDNA offer merchants enhanced fraud defense to minimize chargebacks.

Differentiation and growth strategy

Adyen has successfully scaled worldwide despite its original regional presence in Europe. Its key differentiator is its all-in-one offering (gateway, risk management, and processing) which enables cross-border payments for international online businesses. Adyen also received a pan-European banking license in June 2017 that allows it to bypass banks and process cross-border payments directly to its merchant customers.

Adyen recently expanded its strategy to physical POS systems that deliver a seamless omni-channel experience. We believe Adyen's ability to gain scale in offline payments will be critical to its future growth trajectory. We estimate that offline payments as a share of total payment volumes could expand from 8% in 2016 to 47% in 2026. We believe Adyen's easy-to-integrate API, geographic expansion, and offline growth will allow the company to grow its card payment volumes faster than the market over the next decade (29% CAGR vs. 6% for the overall market).

Interview with…Will Gaybrick, CFO of Stripe


Will Gaybrick


Heath Terry


James Schneider

GS Research Internet analyst Heath Terry and Payments analyst James Schneider spoke to Will Gaybrick, CFO of Stripe. Since its founding in 2010, Stripe has built a sleek technology stack that helps over 100,000 businesses accept online payments and expand their global reach.

Heath Terry: When Stripe wins, what's the most common reason? When Stripe's competitors prevail, why is that usually the case?

Will Gaybrick: Stripe is the overwhelming choice for extremely fast growing companies, "innovation divisions" at large incumbents, and any internet or mobile-first company doing anything complex with funds flows.

While payments is at the core of Stripe, we've also built an entire suite of products that sit atop our deep financial and technological infrastructure. The result is a comprehensive set of software tools for starting and running an online business. This is everything from incorporating a company and managing fraud to business analytics and handling pay-ins and pay-outs globally. In this vein we've launched Stripe Sigma, Radar, and an updated version of Connect in the past year.

Stripe makes moving money as easy as spinning up a server on AWS—and all this functionality is integrated into one stack that's constantly improving under the hood.

Terry: Some of your leading-edge competitors are increasingly emphasizing omni-commerce solutions that include brick-and-mortar payment acceptance. Is that part of Stripe's strategy, and if so, how big could the brick-and-mortar business be over time?

Gaybrick: Internally we say our goal is to increase the GDP of the internet. That may sound lofty, but we mean that in a very practical way. We aim to help more businesses get started and to help them grow more quickly, no matter where they are in the world, or what their business model is. It's pretty unusual that a brick-and-mortar coffee shop or a hair salon wouldn't get started because they couldn't accept money from their customers. So we focus on the online companies selling to a global audience.

Particularly for more complex internet business models like marketplaces, companies have to build serious treasury infrastructure to be able to carry out basic operations. These are the types of problems we're most interested in solving and where you'll see us devote continued effort in the coming months and years.

That said, we already support many customers using Stripe as an omni-channel solution. These are typically larger customers consolidating their payments onto the Stripe platform.

James Schneider: How important is international expansion to Stripe's growth outlook, and which countries do you see as being the most promising opportunities?

Gaybrick: Despite how it sounds, the "global online economy" in 2017 is still anything but global. Only around 5 percent of global commerce happens online today, and of that 5 percent, most is still fairly local. You mentioned our recent launches in Europe. Today only about 16 percent of online commerce happens across borders – even within the EU.

In Europe we've shipped 65 major improvements to the Stripe platform over the past 18 months, including adding support for new countries, Apple Pay, 3DSecure, local payment methods like iDeal and Sofort, and more. In the past year we've also launched operations in Singapore, Japan and Hong Kong, as well as new global partnerships with Alipay and WeChat Pay, which were both industry firsts.

It would be relatively easy for us to launch the same US-centric product everywhere – it would certainly be faster. But we deliberately push against that, and our conception of payments is different. Stripe is a fully integrated payments platform that helps internet businesses start, run, and scale.

Stripe

Company snapshot

Year launched: 2010

Headquarters: San Francisco

Countries: 25

Employees: >700

Funding to date: $440mn

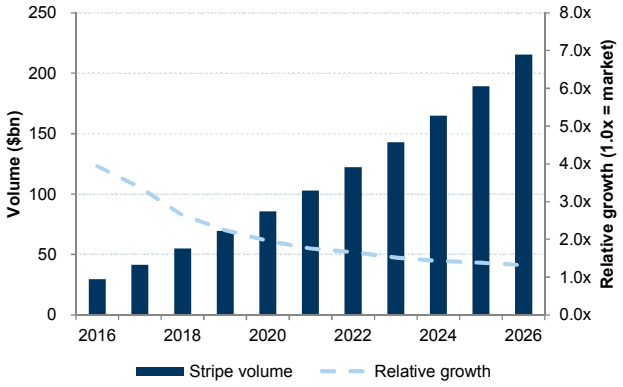
Last disclosed round: Series D

Last funding amount: $150mn

Operating in more than 25 countries, Stripe enables payment acceptance for internet businesses online and in mobile applications via its APIs. Stripe helps enable payment acceptance for early-stage businesses, and typically focuses on mobile commerce, sharing economy companies, SaaS businesses, nonprofit companies, and software companies seeking to add payment functionality to their websites. We expect Stripe to continue growing at a rapid pace as de novo businesses launch and scale (Exhibits 41 and 42).

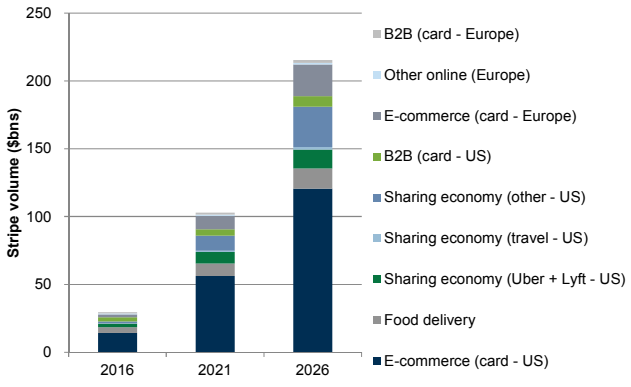
- **Key merchants:** Over 100,000 businesses including Target, Lyft, TaskRabbit, Splunk, Facebook, and Salesforce.
- **Pricing:** Stripe offers two forms of pricing for its customers, depending on the size of the business. Smaller businesses can set up a "pay as you go" model, which charges 2.9% + $0.30 per card transaction (0.8% with a $5 cap on ACH and Bitcoin), which is consistent with domestic fees charged by PayPal and Amazon Payments. Enterprises receive customized pricing with additional services including account management, migration assistance, and dedicated support. The company's core payment product includes the Subscriptions service as well.
- **Competitors:** Stripe faces competition from both traditional acquirers and their gateways and newer technology companies like PayPal/Braintree.

Exhibit 41: We expect Stripe's volume growth to outpace the market over the next ten years
Stripe and relevant market volume growth rates



Source: Company data, Goldman Sachs Global Investment Research.

Exhibit 42: We expect Stripe to target e-commerce and international expansion to continue its growth trajectory
Stripe payment volume by channel



Source: Company data, Goldman Sachs Global Investment Research.

A brief history and drivers of success

Stripe, based in San Francisco, launched in 2011 (though a private beta was available earlier) with its core payments product. The United States is the company's largest market, although Stripe operates in over 25 countries. The company has received over $440mn in funding to date, with an implied valuation of $9bn in November 2016.

Although Stripe was not the first company to enable online payments, the company's focus on simple, easy-to-implement APIs has driven its success. Stripe is focused on shortening the payment implementation time, which could take up to 6 months with legacy gateways. Stripe's gateway does not change the website's user interface, so merchants do not have to make last-minute adjustments to website aesthetics in order to accept payments. In some cases, Stripe has integrated its APIs on behalf of the merchants, providing a high level of customer service compared to competitors.

Core product offerings

Stripe's flagship product is a suite of payment enabling offerings, which quickly helps merchants accept payments online. The company has since expanded its offerings with products such as Atlas and Connect that help companies launch and grow. We highlight Stripe's core offerings:

(1) Payments and Subscriptions: Stripe's core Payments offering is comprised of its commerce toolkit. Developers are able to build customized experiences or select pre-designed options. Stripe's Subscriptions offering, an automated billing system that allows merchants to send customers their bills, is complementary. This core offering is built to ensure ease of use, short implementation time, and security.

(2) Connect: Stripe's Connect offering allows businesses and consumers to connect their Stripe accounts to the merchant's account in order to enable the routing of payments and recipients. Connect also offers an instant payout option for users for an additional fee.

(3) **Sigma:** One of the company's newest products, Sigma offers merchants the ability to analyze business data in order to develop key insights. Businesses including Slack and Harri have used Sigma to reconcile their card transactions.

(4) Relay: This offering allows one merchant to list its products on the app of another merchant via Stripe's API.

(5) Atlas: Another recent offering launched by Stripe, Atlas helps entrepreneurs set up their online businesses, from opening a bank account to becoming incorporated and establishing a tax ID.

(6) Radar: With its Radar product, Stripe offers data-driven tools that use machine learning in order to detect and prevent credit card fraud.

Differentiation and growth strategy

Stripe's easy-to-implement payments APIs have allowed the company to build a strong book of business. By offering ancillary products like Connect (disbursements), Sigma (data and analytics), and Atlas (business set-up), Stripe is able to cross-sell other offerings into its existing client base. We believe these product offerings will improve client retention levels and provide a steady pipeline of new customers through its Atlas product. The company has grown its global footprint, with active beta/preview launches in 12 countries along with full support for 12 countries.

Stripe has also secured some important partnerships to facilitate its growth and expand into new geographies. Most recently, Stripe struck global partnerships with Alipay and WeChat Pay (Tencent) that enable Stripe's merchants to integrate the ability for Chinese users to pay with these Chinese payment apps on their websites in July 2017. Stripe also partnered with Visa and Mastercard in 2015 and 2016 to facilitate fund disbursements.

We expect Stripe's growth strategy to consist of three elements: (1) continue gaining market share by targeting de novo businesses that will scale over time; (2) expand into new geographies and new markets; (3) cross-sell complementary software offerings. Given its playbook of core payments functionality coupled with ancillary software offerings, we believe Stripe is in many ways an online version of Square. Although Stripe's public disclosures are limited, we estimate Stripe processed about $30bn in 2016, up roughly 50% from about $20bn in 2015, and we expect Stripe's growth to continue to outpace the overall market. By market, we estimate Stripe has the greatest market penetration in food delivery and the sharing economy, but we believe traditional e-commerce is the largest contributor to overall volume given its sheer size.

Alipay

Company snapshot

Year launched: 2004

Headquarters: Hangzhou, China

Countries: 110

Employees: >3,600

Funding to date: >$6bn

Last disclosed round: Series B

Last funding amount: $4.5bn

Alipay is the payment arm of Ant Financial Services Group, and operates a third-party online payment platform that serves 520mn active users annually. According to Analysys, Alipay is the largest player in China's third-party payment market with about 37% market share. Beyond payment processing and escrow services to Alibaba's ecosystem, Alipay's mobile payment app serves as an important entry point for its users to access other services provided by Ant Financial, Alibaba Group, and their business partners.

- **Key merchants:** Taobao, Tmall, Ctrip, Weibo, Didi Chuxing, millions of offline merchants (per People.cn), and millions of SMEs in Alibaba's ecosystem.
- **Pricing:** Alipay offers various payment services for merchants, including PC online payment, mobile online payment, in-app payment, offline payment, and QR-code payment designed for small offline merchants. The pricing of these services is set from 0.0% to 1.2% of transaction value (Exhibit 43). Alipay is currently promoting QR-code payments to small offline merchants, and this service is offered for free. SME customers are entitled to a lower rate of 0.55%, with the exception of those in the online gaming business. Individuals and merchants are also charged from 0.1% to 0.2% for transferring money from Alipay to their bank accounts (Exhibit 44).
- **Competitors:** Alipay competes mainly with Tencent's Tenpay and China UnionPay, as well as smaller platforms such as JD Pay, Baidu Wallet, Lakala, and Wanda Group's 99Bill.

Exhibit 43: Pricing for transaction services

Alipay transaction services	Cost	Term
PC online payment	0.6%	1 year
Mobile online payment	0.6% - 1.2%	1 year
In-App payment	0.6% - 1.2%	1 year
Offline payment	0.6%	1 year
QR-code payment	Free	In promotion
For SME merchants*	0.55%	In promotion

*: SME promotion excludes SMEs in online gaming businesses

Source: Company data.

Exhibit 44: Pricing for transfer to bank account

Alipay transfer to bank account	Cost	Note
Individual (real-name verified)	0.10%	Cumulative Rmb20k free transfer
Individual (not real-name verified)	0.10%	N/A
Merchants (same day transfer)	0.20%	Rmb50k/100k transfer limit to individual/enterprise account; Rmb2mn daily transfer limit.
Merchants (next day transfer)	0.15%	

Source: Company data.

A brief history and drivers of success

Alipay was established in 2004 as an escrow service provider to Alibaba's Taobao marketplace. Alipay allows consumers to verify the receipt and quality of goods before releasing money to sellers, which solved the lack of counterparty trust in the early days of e-commerce and helped Alibaba to emerge as China's leading e-commerce platform. In 2005, Alipay expanded its operation to external payment scenarios including online gaming, transportation ticketing, public utilities, other e-commerce platforms, and mobile payment, and has established itself as the leading third-party payment platform in China. In 2014, Ant Financial Services Group was founded, and Alipay became their payment arm and important entry point for Ant's other four pillars: wealth management, financing, insurance, and credit.

Core product offerings

Alipay, together with other services by Ant Financial, provides comprehensive financial services for consumers (Exhibit 45):

- **Payment**: Alipay's payment function enables transactions between 520mn annual active users and millions of merchants and organizations, both online and offline. Consumers top up their Alipay account with a linked bank account, after which they

can transfer money to friends and family, or purchase products and services through PC, mobile, in-app, and offline payment channels.

- **Wealth management**: Alipay allows users to access Ant Financial's wealth management products including Ant Fortune, an online marketplace for investment products, and Yu'e Bao, the world's largest money market fund (per *Financial Times*) with Rmb1.4 trillion ($206 bn) AUM. According to Alibaba, Ant Financial's wealth management products have attracted 330mn cumulative users by the end of March 2017.
- **Financing**: Alipay users can also access consumer financing product Ant Credit Pay and Ant Cash Now, which now have 100mn annual active users. Ant Credit Pay allows users to buy on credit and repay next month, and it supports Taobao, Tmall, and several other external platforms. Ant Cash Now provides consumer credit to creditworthy users, and can loan up to Rmb50k (about $7.4k) for up to 12 months.
- **Ant Insurance Service**: Ant Financial's insurance arm operates an online marketplace for Alipay users to purchase insurance products from various insurance companies, including Cathay Insurance and Zhong An Insurance, two companies in which Ant Financial has invested. Insurance products on the platform cover accidents, health, life, property, car and travel, and the platform now has 392mn annual active users.
- **Credit system**: Ant Financial also provides Alipay users with a personal credit system called Zhima Credit, which calculates a credit score by leveraging cloud computing and deep learning technology. Users with high Zhima Credit scores are entitled to greater credit lines from Ant Credit Pay and Ant Cash Now, riding shared bicycles without deposits, among other privileges.

Exhibit 45: Ant Financial's leading breadth and scale

Payment	Wealth Management	Financing	Insurance	Credit System
支付宝 ALIPAY	蚂蚁聚宝 ANT FORTUNE 余额宝	花呗 ANT CREDIT PAY 借呗 ANT CASH NOW	蚂蚁保险服务 Ant Insurance Service	芝麻信用 ZHIMA CREDIT
520mn	330mn	100mn	392mn	257mn
Annual Active Users	Cumulative Users	Annual Active Users	Annual Active Users	Annual Active Users
	+17%	73%	+43%	+95%
	Yoy AUM growth per active user	use Ant Credit Pay 6+ times in 1 year	YoY premium growth per user	YoY growth

Source: Company data.

Differentiation and growth strategy

Alipay's role as the payment infrastructure of Alibaba (and Ant Financial's ecosystem) differentiates itself as being more commercially relevant than competitive offerings. According to Alibaba, 70% of Alipay's transactions are commercial transactions (30% money transfer and red packets). This has allowed Alipay to gain 61.5% market share in the monetize-able third party payment market, as per iResearch.

Alipay has launched the **Cashless Society** initiative in February 2017, aiming to convert China to digital payments in five years. With this initiative, Alipay has pushed its offline applications into more use cases, including public transportation and small offline merchants (with free QR-code payment). Alipay is also rapidly **expanding overseas**: it now has members from 110 countries, and recently signed a strategic cooperation with Monaco to build a cashless country.

Company snapshot

Year launched: 2005

Headquarters: Shenzhen, China

Countries: 15

Employees: N/A

Funding to date: N/A

Last disclosed round: N/A

Last funding amount: N/A

Tenpay

Tenpay is Tencent's third-party payment platform; it provides technical infrastructure support for WeChat Pay and QQ Wallet, two products based on Tencent's dominant social and communication platforms, WeChat and QQ. According to Tencent, its mobile payment function has surpassed 600mn month active users and 600mn daily payment transactions in December 2016. Per Analysys estimates, Tenpay has 25.5% share in China's third-party payment market, second only to Alipay.

- **Key merchants:** JD, Didi Chuxing, Meituan Dianping, Watsons, 7-Eleven, eLong, and more than 700k offline merchants (per "Cash-Free Day" on August 8, 2016).
- **Pricing:** Tencent charges WeChat Pay merchants 0.6% of transaction volume, with the exception of virtual online services, which are charged 1.0%. For enterprise accounts that subscribe to Tenpay's instant transfer services, Tencent charges 0.4% to 1.5% of transaction volume, depending on the plan and transaction volume. To transfer money to bank accounts using WeChat Pay, merchants can transfer for free, while individuals are subject to a 0.1% fee (each individual is entitled to Rmb1,000 (about $150) cumulative free transfer amount) (Exhibit 46).
- **Competitors:** Tenpay mainly competes with Ant Financial's Alipay and China UnionPay, as well as smaller competitors such as Baidu Wallet, Lakala, and Wanda Group's 99Bill.

Exhibit 46: WeChat Pay and Tenpay cost structure

WeChat Pay

Industries	Cost
Online virtual services	1.00%
Other industries	0.60%

Tenpay

Tenpay Plan fee (Rmb)	Plan limit (Rmb)	Implied cost within plan	Cost exceeding plan limit	Term
1,200	100,000	1.20%	1.50%	1 Year
2,000	200,000	1.00%	1.50%	1 Year
4,000	500,000	0.80%	1.50%	1 Year
6,000	1,000,000	0.60%	1.50%	1 Year
11,000	2,000,000	0.55%	1.50%	1 Year
25,000	5,000,000	0.50%	1.50%	1 Year
40,000	10,000,000	0.40%	1.50%	1 Year

Source: Company data.

A brief history and drivers of success

Tenpay was established by Tencent in 2005 along with its e-commerce platform Paipai, and served a similar escrow function as Alipay. Tenpay subsequently expanded its usage to other use cases, marked by strategic cooperation with China Southern Airlines (2007), China Unicom (2009) and Deppon Logistics (2010). Tenpay and WeChat launched WeChat Pay in August 2013, and gained strong momentum with its red packet feature, the rapid advancement of its online-to-offline (O2O) model, and the rise of online taxi hailing and Didi Dache (backed by Tencent). WeChat Pay has developed into a critical pillar in Tencent's "Connect" strategy by commercially connecting its 938mn MAUs with WeChat Official Account, strategic partners (JD, Meituan Dianping, Didi, Mobike), and offline merchants.

Core product offerings

Other than payment processing for merchants, Tenpay's main product offerings are WeChat Pay and QQ Wallet, which provide similar features on different platforms.

- **Peer transfer and red packet**: This feature leverages and reinforces WeChat's social feature, allowing users to transfer money to WeChat friends (can be in red packet format), send probability-based red packets to group chat, and request payment in a

group chat. QQ Wallet also developed "Password Red Packet," giving red packets only to those who repeat a password, making money transfer more social and engaging.

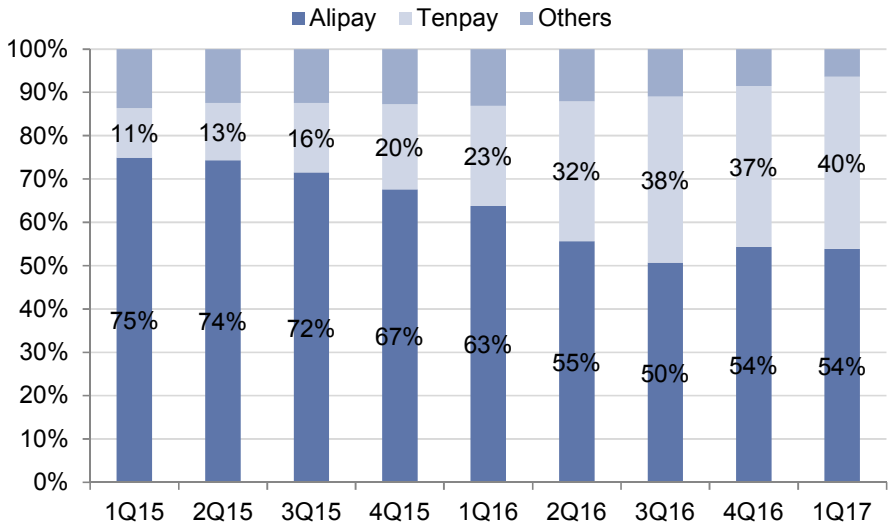
- **Products/services by partners and merchants**: Tencent connects its social network users with strategic partners and other merchants, with WeChat Pay and QQ Wallet serving as critical infrastructure and entry points. Through these services, users can access JD (e-commerce), Meituan Dianping (O2O), Didi Chuxing (ride hailing), Mobike (bicycle sharing), eLong (hotel), and 58 Home (local services). In addition to existing mobile and offline payment functions (bar code and QR code payment), WeChat Pay also provides payment services for WeChat Mini Program, empowering offline SMEs and connecting offline services to online users.
- **Wealth management**: WeChat Pay and QQ Wallet provide entry points to Tencent's wealth management platform Li Cai Tong, which is a marketplace for wealth management products such as money market funds and index funds. According to Li Cai Tong, they have 100mn total users and Rmb140bn (about $20bn) assets invested.

Differentiation and growth strategy

Tenpay's key advantage lies in the ubiquity of Tencent's social and communication assets, WeChat (938mn MAUs) and QQ (861mn MAUs), through which Tenpay's services are offered. This significantly lowers the customer acquisition cost (CAC) for WeChat Pay and QQ Wallet, and underpins its strong performance in mobile and offline payments.

We believe Tenpay's key focus for growth is still offline payments. We expect promotion events such as August 8 "Cash-Free Day" (continued in 2017 as well) and initiatives such as Mini Program will help Tenpay further enhance its position in mobile and offline payment markets. According to Analysys, Tenpay's share in the third-party mobile payment market has increased from 11.4% in 1Q15 to 39.5% in 1Q17 (Exhibit 47).

Exhibit 47: Third-party mobile payment market share



Source: Analysys.

Paytm

Company snapshot

Year launched: 2010

Headquarters: Noida, India

Countries: 2

Employees: >11,000

Funding to date: $2.4bn

Last disclosed round: undisclosed

Last funding amount: $1.4bn

Paytm is India's largest mobile payments platform, and it also operates one of India's leading e-commerce platforms. According to the company, Paytm has reached over 220mn registered users since its establishment in 2010. For the fiscal year ended March 2017, Paytm processed 1.5bn transactions, with GMV of US$5bn. Alibaba and Ant Financial are strategic investors in Paytm's parent company One97 Communication, as well as its e-commerce spinoff Paytm Mall.

- **Key merchants:** Airtel, Tata Docomo, Vodafone, Aircel, BSNL, Idea Cellular, and 5mn+ merchants integrated with "Pay with Paytm" mode.
- **Pricing:** Paytm charges merchants a flat fee of 1.99% for accepting payments, which includes Whatsapp/SMS link payment, website online payment, and in-App payment. To transfer money from Paytm to a bank account, merchants can transfer free of charge, while individuals are charged 2% of transaction amount. Paytm introduced a 2% charge on credit card top-ups in March 2017 to curb improper usage (this was suspended shortly thereafter). Currently, individuals can top up their Paytm Wallet with credit card, debit card or online bank account free of charge (Exhibit 48).
- **Competitors:** In the mobile payment market, Paytm mainly competes with peers such as MobiKwik, Freecharge, and Citrus Pay. In the broader payment market, Paytm's competitors also include payment platforms backed by banks, such as HDFC's Payzapp, ICICI's Pockets, and Axis' Lime.

Exhibit 48: Paytm's cost structure

Party	Activities	Charges	Note
Merchants	Accept payments with Paytm	1.99%	Support Whatsapp/SMS, app and website
Merchants	Transfer money to bank account	0.00%	
Individual	Transfer money to bank account	2.00%	Up to Rs.20k per month and Rs.5k per transaction
Individual	Top up Paytm Wallet	0.00%	Suspended 2% credit card top up charges in Mar'17

Source: Company data.

A brief history and drivers of success

Paytm was launched by One97 in 2010 to facilitate bill payments and e-commerce via mobile devices. Since then, Paytm has expanded selectively into the online-to-offline (O2O) segment, initially by selling bus tickets and then movie tickets. In January 2017, Paytm Payments Bank Limited (PPBL), 49% owned by One97 Communications and 51% owned by private investors, was awarded a payments bank license. In March 2017, Paytm launched bill payment services in Canada, marking its first move outside of India.

Core product offerings

Paytm started with online mobile recharge and bill payment, and has expanded its operation to online travel agency (OTA), online-to-offline (O2O), and offline payment scenarios.

- **Mobile recharge**: Paytm allows users to recharge their mobile phone online. Paytm supports India's top cellular networks, including Airtel, Vodafone, Idea, Reliance Industries, Tata Docomo, and others.
- **Bill Payments**: Paytm users can pay their electricity bill, gas bill, water bill, education admission fee, insurance premium and loans online.
- **Travel booking**: Paytm also offers the complete range of travel bookings, including bus, train, flights and hotels. According to a company announcement in February 2017, its annualized GMV from the travel vertical has crossed US$500mn.

- **Entertainment ticketing**: Paytm launched a movie ticketing business in March 2016, and is connected to 3,500 screens in more than 550 cities. According to *The Economic Times*, Paytm's movie ticketing GMV is above Rs 400 crore (US$61mn) since its launch as of April 2017. Paytm also allows users to book tickets for events such as concerts, comedy shows, and amusement parks.
- **Mobile and offline payment**: Paytm users can pay offline merchants under Paytm's network by scanning a QR code, or send money to the merchants through a mobile number. Paytm's offline solutions cover grocery stores, chemists, restaurants, parking, and even street food and milk booths.

Differentiation and growth strategy

In our view, Paytm has benefited from the presence of its strategic investor, the Alibaba Group, which has brought capital, technology, and experience based on its own journey. Paytm is critical to Alibaba's two billion customer target by 2020. The Indian footprint has the ability to attract as many customers by 2020 as Alibaba currently has in China.

We believe the genesis of Paytm, a telecom recharge and value-added service (VAS) re-seller, is the reason the company understands the importance of being at the top of the traffic funnel, as well as the transformation to smartphone. The company's management has a deep understanding of the importance of cross-selling, customer targeting, and customer relationship. This is also the reason the management team had the necessary conviction to enter the payment business, despite being a late market entrant in India.

We believe Paytm will continue to provide solutions where there is a social need, just as Alibaba has done over the years by tapping into the e-commerce, payments, logistics, cloud, and entertainment.

PayU

Company snapshot

Year launched: N/A

Headquarters: N/A

Countries: 17

Employees: N/A

Funding to date: N/A

Last disclosed round: N/A

Last funding amount: N/A

Company overview

PayU provides payment and credit solutions to emerging markets in India, Eastern Europe, and LatAm. The company processed over 400mn transactions for over 300k merchants in 17 markets for the year ending March 2017. PayU actively invests and acquires other FinTech startups to grow its scale and product capabilities.

- **Key merchants:** Adidas, Groupon, Tui, Sony, Booking.com, goibibo.com.
- **Pricing:** PayU's payments gateway has two pricing models depending on the size of the online merchant, and pricing also varies by country. In India, PayU charges smaller businesses 0.75% per transaction for debit cards and 2.95% for most credit cards and wallets, compared to 0.75% and 2.25% for enterprise clients (respectively). In Mexico, PayU charges smaller merchants 3.50% + P$4 per transaction (or about 3.50% + US$0.22 at current exchange rates), with volume discounts for larger companies.
- **Competitors:** PayU competes against PayPal, Adyen, Stripe, and local gateways. In its credit business, PayU competes against traditional banks. PayU is not focused on the competitive digital wallet space, where companies like Paytm and Flipkart operate.

A brief history and drivers of success

PayU is owned by Naspers, a South African-based technology conglomerate. For the year ending March 2017, PayU generated $186mn in revenue (+33% yoy) and processed over $16bn in total payment volume (+36% yoy). About 40% of its processed volumes are from India, about 40% from Eastern Europe, and approximately 20% from Latin America.

Core product offerings

PayU has two core product offerings. PayU often makes investments in different FinTech companies to bolster these offerings:

(1) **Payment gateway:** PayU Hub provides local payment processing to online merchants. PayU believes that its gateway can increase customer approval rates by as much as 40%. PayU's gateway improves the customer experience by eliminating international transaction and FX fees and providing access to local banking and alternative payment methods. To extend its Indian merchant network, PayU acquired Citrus Pay for $130mn in August 2016—the largest cash M&A deal in Indian FinTech history—and now has over 50% market share of total e-commerce transactions in India.

(2) **Credit:** PayU provides consumers and small businesses access to several different local credit offerings which provide deferred payment for online transactions (LazyPay in India; PayU Te Fía in Colombia), consumer loans to the underbanked (Kreditech in Poland; Creditas in Brazil; and PaySense in India), and credit financing at the online point of sale (ZestMoney in India). These products have been developed internally, through partnerships, and through strategic investments.

Differentiation and growth strategy

We believe PayU has two key differentiators: (1) in-depth local market knowledge; and (2) access to capital for FinTech investments. PayU's on-the-ground teams understand the complexities of each region they serve. Its gateway can deploy more than 300 payment methods across its 17 markets, providing access to 2.3 billion new customers through a single API. PayU also has capital to invest in promising FinTech companies, which has been key to building out its consumer credit strategy. In the past year, PayU has made several strategic investments, including Kreditech, Creditas, PaySense, and ZestMoney. We expect PayU to continue investing in FinTech to expand its product offerings, gain scale, and enter new markets. PayU is also focused on incorporating AI/machine learning into payments models.

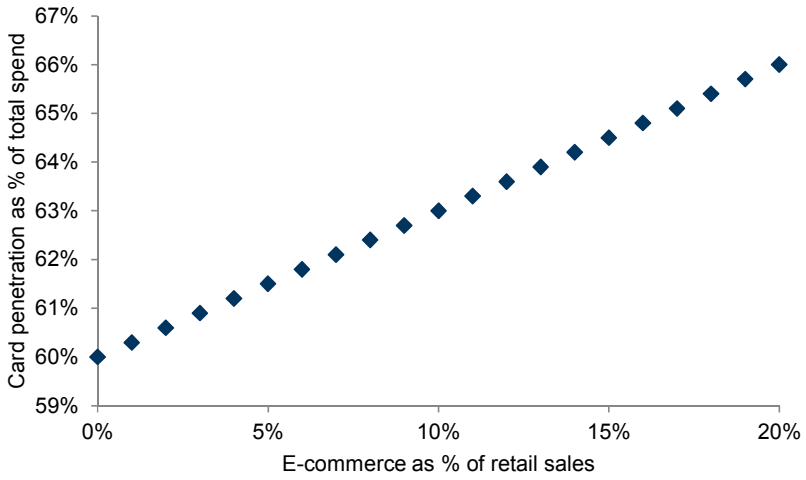
Q5: How are Visa and Mastercard positioned for the move online?

The advent of traditional e-commerce has accelerated the structural shift to electronic payments, and e-commerce is a tailwind to volume growth for the networks. But more important in the long run is the fact that we believe Visa and Mastercard have positioned themselves to capture a substantial share of the untapped $45 trillion volume opportunity we see in B2B payments, bill payments, and other emerging areas. We see the networks maneuvering to become key players, with partnerships to capture the next generation of opportunities in online payments over the next 10 years.

The transition to e-commerce is accelerating card penetration

As a greater share of consumer spending is done online than in-store, the penetration of electronic card payments has accelerated. We estimate card penetration is roughly 50% greater among traditional e-commerce (about 90%) compared to brick and mortar stores (about 60%) in the United States. We estimate that for every 100bp increase in e-commerce penetration as a percent of total retail sales, card penetration increases by 30bps, all else equal (Exhibit 49).

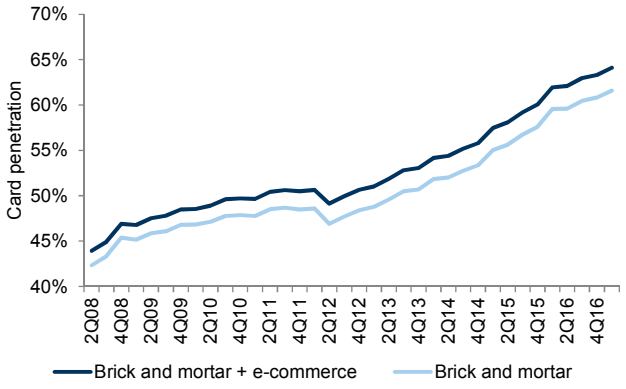
Exhibit 49: For every 100bp increase in e-commerce penetration, card penetration increases by 30bps
E-commerce as % of retail sales vs. card penetration as percentage of total spending



Source: Goldman Sachs Global Investment Research.

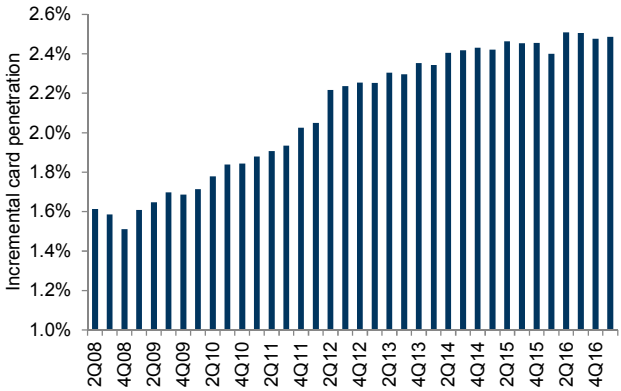
In our analysis, we divide US retail sales between brick-and-mortar and traditional e-commerce sales to better understand the impact the transition to e-commerce has had on card volumes over time. We focus exclusively on traditional e-commerce (rather than all online payments), as total retail sales has an 85% correlation with Visa and Mastercard card payment volumes. **We estimate that card penetration is about 250bps higher—or 4% greater—today because of e-commerce (Exhibits 50 and 51). However, because e-commerce has gained share at a fairly steady pace, we believe e-commerce has had a more modest impact on Visa and Mastercard's payment volume growth.**

Exhibit 50: Card penetration is slightly higher today because of e-commerce
Card penetration for total retail sales and brick and mortar only, 2Q08-1Q17



Source: Census Bureau, Goldman Sachs Global Investment Research.

Exhibit 51: As e-commerce gained share, its benefit to card penetration increased
Difference between total retail sales card penetration and brick and mortar card penetration, 2Q08-1Q17

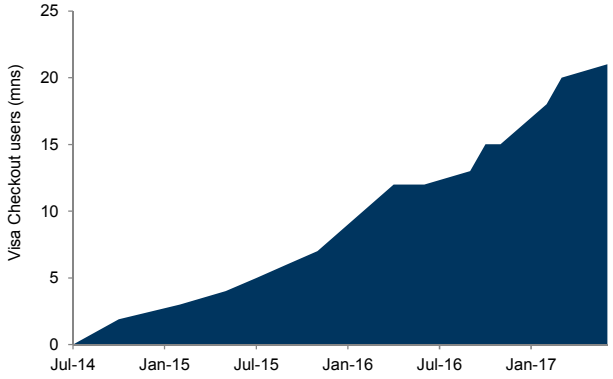


Source: Census Bureau, Goldman Sachs Global Investment Research.

Visa and Mastercard's key e-commerce initiatives

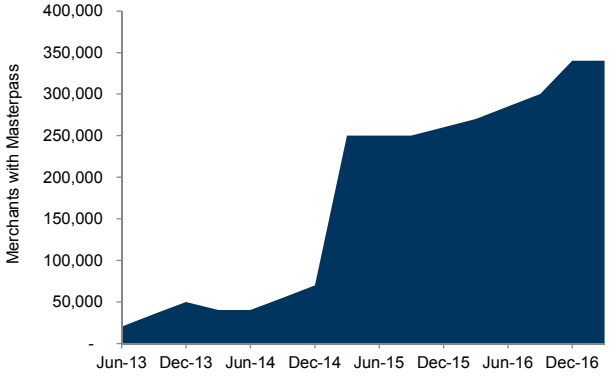
Digital wallets: Mastercard launched Masterpass in 2013 and Visa launched Visa Checkout in 2014 (after V.Me was launched in 2012 and later abandoned) to provide consumers with a streamlined and more secure payment experience, primarily online. Both products have focused on the versatility of the digital wallet to be used anywhere (online, in-app, or in-store) on any device (phone, tablet, or computer). In an attempt to emulate PayPal's success, Visa and Mastercard provide consumers with a payment login credential that obviates the need to re-enter card details with retailers, reducing the rate of cart abandonment and card fraud by 51% and 63%, respectively, according to Visa. Visa Checkout and Masterpass have been adding users and merchants quickly (Exhibits 52 and 53), although their enrollment figures are dwarfed by PayPal. Despite PayPal's large customer base of 210mn active customer accounts, PayPal added 19mn active customer accounts in 2016 – roughly the same number of total consumers enrolled in Visa Checkout since its 2014 launch.

Exhibit 52: Visa Checkout users have steadily grown
Visa Checkout users (mns), July 2014-present



Source: Company data, Goldman Sachs Global Investment Research.

Exhibit 53: Masterpass is accepted at 340k merchants
Masterpass merchant acceptance, June 2013-present

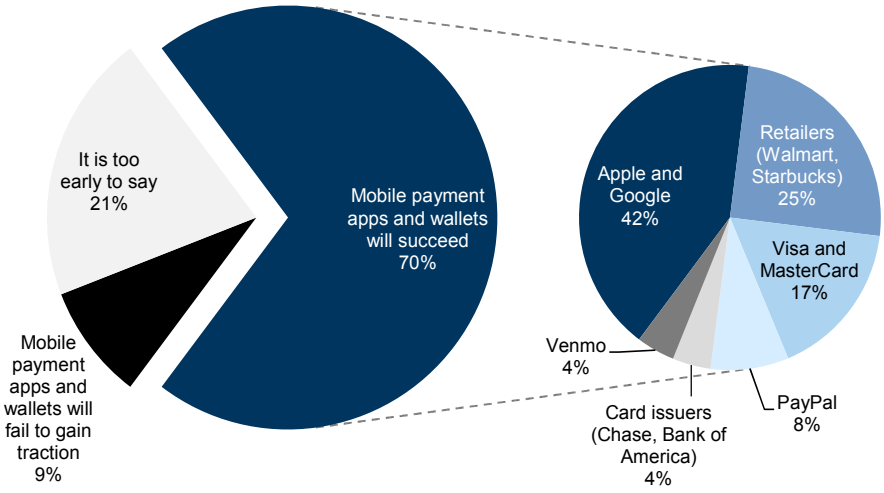


Source: Company data, Goldman Sachs Global Investment Research.

According to our survey of merchant acquirers, ISOs, and ISVs, mobile wallet sentiment improved significantly in early 2017 compared to prior year surveys, with 70% of respondents now expecting mobile wallets to succeed (up sharply from 35% in 2016,

Exhibit 54). However, Visa Checkout and Masterpass trail "big tech" names (Apple, Google) and retailers (Walmart, Starbucks) in industry expectations on their likelihood to succeed.

Exhibit 54: Respondents have an optimistic outlook on mobile payments; "Big tech," retailers, and networks are expected to be winners
Based on your industry knowledge, which option best expresses your view on the prospects for mobile payment apps and wallets?



Source: ETA, Goldman Sachs Global Investment Research.

Visa's acquisition of CyberSource: Visa acquired online payment gateway CyberSource in 2010 for $3.0bn to gain a foothold in online payment processing, and it is the second-largest acquisition in Visa's history as a public company (after Visa Europe). At the time of the acquisition, CyberSource held significant market share, processing about 25% of online transactions in the United States. However, beginning in 2013, CyberSource begin ceding share to newer entrants Braintree and Stripe. We believe CyberSource's struggle over the last few years is a cautionary tale: with the online payments landscape evolving quickly, any company with meaningful market share can be disrupted by more advanced and easier-to-use technology.

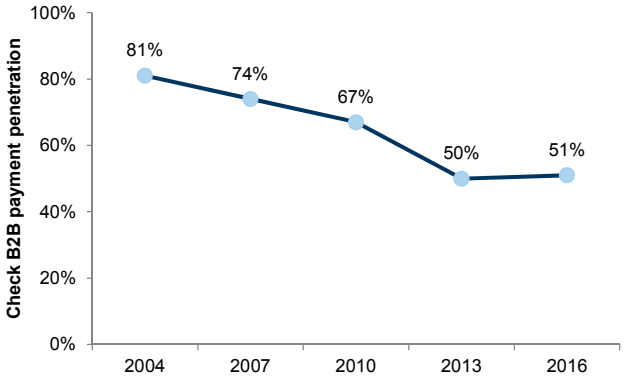
B2B: Untapped market potential to sustain growth in next decade

B2B payments represent a huge market opportunity at 3.5X the volume of consumer payments today. Historically, Visa and Mastercard have focused on penetrating consumer payments (but have pursued selective B2B payments such as travel and entertainment (T&E)). **However, even modest penetration in B2B payments can drive meaningful upside for Visa and Mastercard, and we believe the card networks are crystallizing their product offerings while securing partnerships that will position them to capture significant share over time.**

B2B payments are made today mainly with paper checks (about 50%) and Automated Clearing House (ACH) transfers (about 30%) (Exhibit 55). ACH transfers are aggregated into batches, allowing banks to process them more efficiently and inexpensively relative to paper checks. As a result, ACH has been taking share from paper checks (as it is cheaper and digital) and this payment channel is expected to exceed check payments by 2020, according to a survey by the CRF and NACHA (Exhibit 56). However, despite being electronic, ACH remains a slow and manual process due to wide technology gaps between the over 12,000 banks in the United States. Transfers typically take 1-3 days to process and

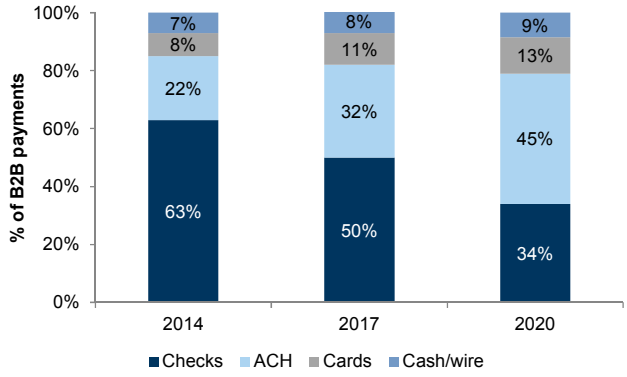
clear, although the Federal Reserve is focused on bringing Faster Payments' ACH options to the United States with same-day (and over the long run, real-time) clearing. Perhaps more important, ACH records provide extremely limited detail on the nature of the transfer (sender, recipient, amount) – and businesses have no ability to track the details (such as items being invoiced) underlying the transaction – thereby increasing the manual burden attached to reconciling accounts payable and receivable.

Exhibit 55: B2B transactions made via check have declined over the past decade…
% of organization's B2B payments made with checks



Source: Association of Financial Professionals.

Exhibit 56: …and this trend is expected to continue over the next few years
US B2B payment breakdown



Source: Credit Research Foundation, NACHA.

Enter Visa Direct and Mastercard Send: Simplifying B2B payments

Visa Direct and Mastercard Send are the networks' products for real-time debit push payments. The two products reverse the traditional payment flow to facilitate C2C, B2B, G2C, and B2C payments. Visa Direct and Mastercard Send's "push" capabilities—whereby people, governments, and banks can proactively send funds to a bank account tied to a debit card number —leverage the card networks' existing infrastructure, security protocols, and risk. These products are currently focused on disbursements, such as sharing economy sites like Uber using Visa Direct to pay its drivers, or Berkshire Hathaway Travel Protection using Mastercard Send to deliver travel insurance claims within seconds. These products are small but growing quickly; Visa Direct volume increased 65% yoy to $12bn in 1Q17.

We believe the success of Visa Direct and Mastercard Send will rest on expanding their partnerships with banks and software companies. For instance, Visa and Mastercard have partnered with Fiserv to gain access to its client base of banks and credit unions that service more than 4,600 banks and 21mn debit accounts. Visa Direct is also partnered with Stripe, Hyperwallet, and Ingo Money to facilitate disbursements. On the software side, Visa partnered with Amazon Business to provide US commercial accountholders full line-item details on Amazon Business customers' purchases, and Mastercard partnered with Oracle to integrate its general ledger software directly with payments flows.

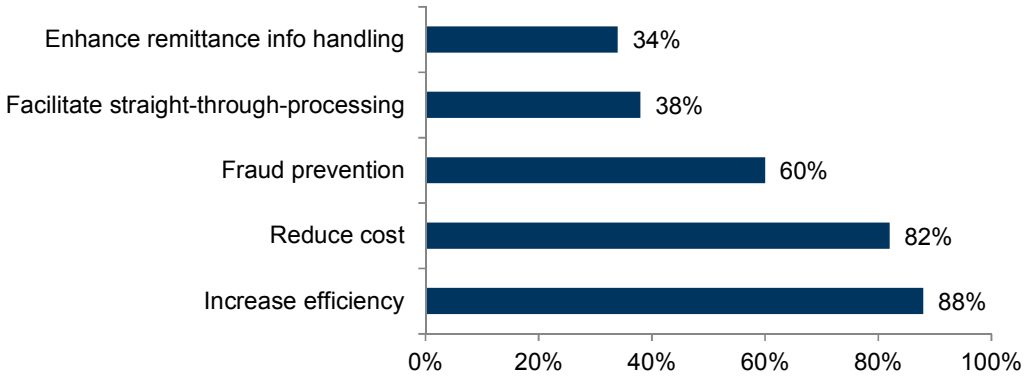
While the benefits of electronic payments (speed and cost) are obvious, we believe Visa Direct and Mastercard Send offer unique advantages over ACH that will help them penetrate the market:

- **Automatic reconciliation reduces overhead costs:** Push payments provide rich data records which allow businesses to record itemized details underlying transactions, making it easier to record and track payments. Information such as item details, invoice numbers, and descriptions can be easily transferred to and from accounting software. This eliminates the need for manual reconciliation overhead associated with tying individual payments to specific expenses and items – offering the potential for dramatic reductions in office overhead.

- **Working capital and cash flow management:** Visa Direct and Mastercard Send improve cash flow for both buyers and suppliers. Payment times can be scheduled precisely in advance (for example, according to net 30 or net 15 day rules), allowing buyers to manage their working capital more efficiently and giving sellers increased cash flow predictability.
- **Ease of use:** ACH is not particularly efficient for one-off transactions, as it requires each buyer-seller relationship to be set up separately with completed forms and agreements. One-time B2B push payments offered by the card networks require only a debit card number.
- **Security:** ACH requires buyers to have a supplier's bank account information, which can raise security concerns, especially for first-time customers.
- **Real-time payments:** Visa Direct and Mastercard Send both settle B2B transactions in real-time. Although ACH may transition to real-time settlement over the next few years, the card networks have a clear head start.

With nearly 80% of organizations in the process of transitioning their B2B payments from paper checks to electronic payments (Exhibit 57), according to the Association of Financial Professionals, we believe both the card networks and ACH stand to gain share.

Exhibit 57: Nearly 80% of organizations are in the process of transitioning their B2B payments from paper checks to electronic payments
Reasons for moving away from paper checks



Source: Association of Financial Professionals.

VocaLink: Mastercard's bet on the future of B2B payments

In order to accelerate its entry into fast ACH and the broader B2B payments market, Mastercard acquired VocaLink in 2Q17 for approximately $920mn. VocaLink operates a leading-edge instant payment clearing system (and ATM switching platforms) in the United Kingdom and several other countries. Its real-time Faster Payments Service in the United Kingdom serves as a useful model for the rollout of fast ACH in other countries globally. We believe the VocaLink acquisition bolsters Mastercard's presence in the United Kingdom (where it has had limited market share) and diversifies its payments offering beyond cards. We believe there is ample opportunity for both faster ACH and products like Visa Direct and Mastercard Send to gain share from legacy B2B payment methods such as cash and check.

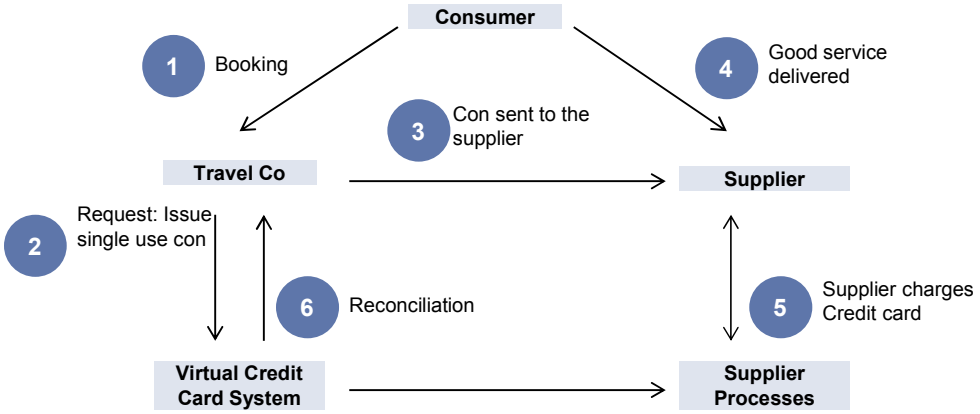
Virtual cards: Another potential avenue of growth

Virtual card payments are a way to automate the accounts payables process by using non-physical credit card numbers – or "virtual cards" for payments. Compared to Visa Direct and Mastercard Send, which facilitated "push" payments, virtual cards are stored value instruments. 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, construction, and online travel.

Virtual card use has become popular among online travel agents like Expedia in order to reconcile online reservations with onsite payments at a hotel or car rental agency (Exhibit 58). Mastercard has found the most success in this space by partnering with FleetCor and WEX to provide virtual card capabilities.

Exhibit 58: The travel sector has seen strong adoption of virtual cards
Virtual credit cards for travel suppliers



Source: Company data.

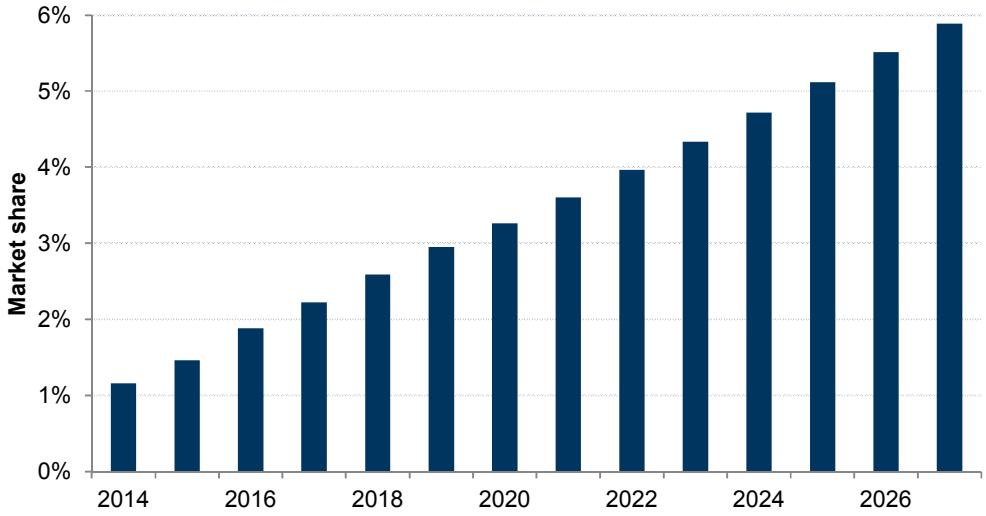
American Express' B2B partnership with MineralTree: American Express has partnered with MineralTree, an accounts payable automation company, to provide an integrated solution for B2B payments that reduces the need for paper checks and enhances B2B payment security through the use of a virtual card. AXP's partnership embeds B2B payment capabilities from MineralTree directly into AXP's commercial T&E platform and allows B2B payments using virtual card payments. AXP has also embedded the value propositions of its traditional credit card offerings by connecting B2B payments over the MineralTree platform with its Membership Rewards program, providing additional incentives for adoption.

What risks can online payments pose to the card networks?

We highlight two potential risks to card networks that could arise from the transition to online payments.

Pricing power could be hurt if a single merchant becomes too dominant. As the e-commerce landscape consolidates, it is likely that large merchants will negotiate lower merchant discount rates. The largest online merchant today is Amazon, and we estimate it represents 1.9% of global card payments (excluding China) in 2016 and will be 5.5% in 2026 (assuming 100% of Amazon volumes are transacted through cards) (Exhibit 59). This does not include the company's Amazon Payments offering, which could drive incremental bargaining power. While this could impact Visa and Mastercard's spreads, we believe more pain is likely to be absorbed by bank issuers (since they receive the majority of the merchant discount rate) and merchant acquirers.

Exhibit 59: Amazon's market share of card volumes set to grow to 5.5% by 2026
Amazon's market share (including third party sales) of global card payment volumes (ex-China)



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

Second, if Chinese payment systems gain traction in the United States and Europe, that could erode Visa and Mastercard's market share. Chinese consumers that use Alipay or Tenpay do not have to pay with a credit card. These services provide interest-bearing escrow deposit accounts that allow consumers to circumvent the card networks entirely. If Alipay or Tenpay were to make significant inroads in the United States and Europe, this could be a competitive threat to Visa and Mastercard. However, these Chinese payment providers would have to address three main obstacles: (1) receiving bank-related regulatory approvals to offer deposit accounts in each country of operation; (2) providing additional incentives to win consumer wallet share, as card issuers (particularly in the United States) offer more compelling rewards programs than those in China; and (3) achieving high levels of merchant acceptance needed to make these forms of payment as convenient as cards are today.

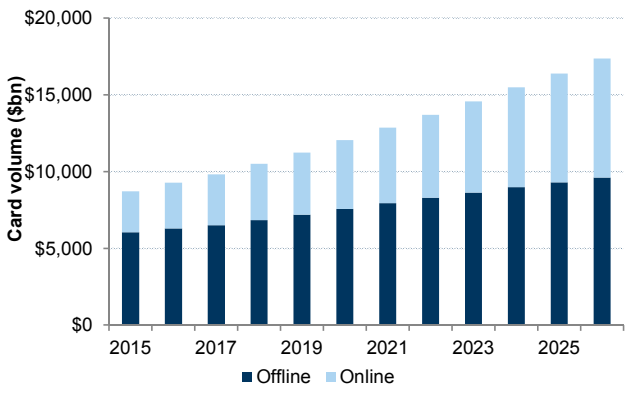
Q6: Can payment processors still grow as the market shifts online?

We believe traditional merchant acquirers will lose online payments share to players like PayPal, Adyen, Stripe, and Wirecard who have more advanced technology solutions and who serve more online-only merchants. While this phenomenon is not new and has been impacting the growth of acquirers for years, we see an increasingly narrow path to success for this group. We believe merchant acquirers will continue consolidating in order to mitigate pricing pressure and sustain their stock multiples going forward.

What is the online opportunity for traditional merchant acquirers?

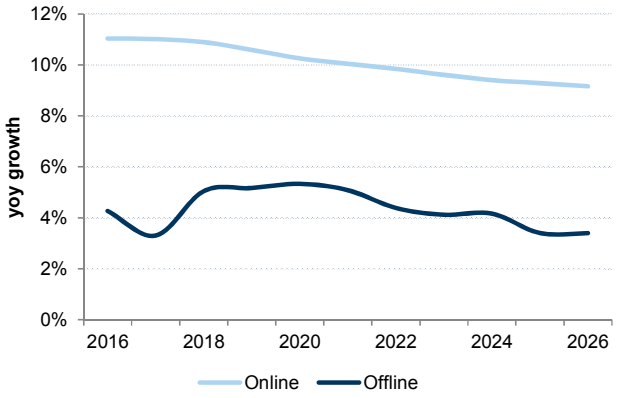
We estimate online card volumes (credit plus debit) are growing twice as fast as offline card volumes in the United States and EMEA (10.0% vs. 4.3% CAGR over the next ten years). We believe online card spend captures more than traditional e-commerce and includes categories like online travel, online bill pay, online B2B spend, and the sharing economy. We believe online card payments represented 32% of total card volume in 2016 and will grow to 45% by 2026 (Exhibits 60 and 61).

Exhibit 60: Online card volumes are gaining share…
US and EMEA card volume, online and offline ($bn)



Source: World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

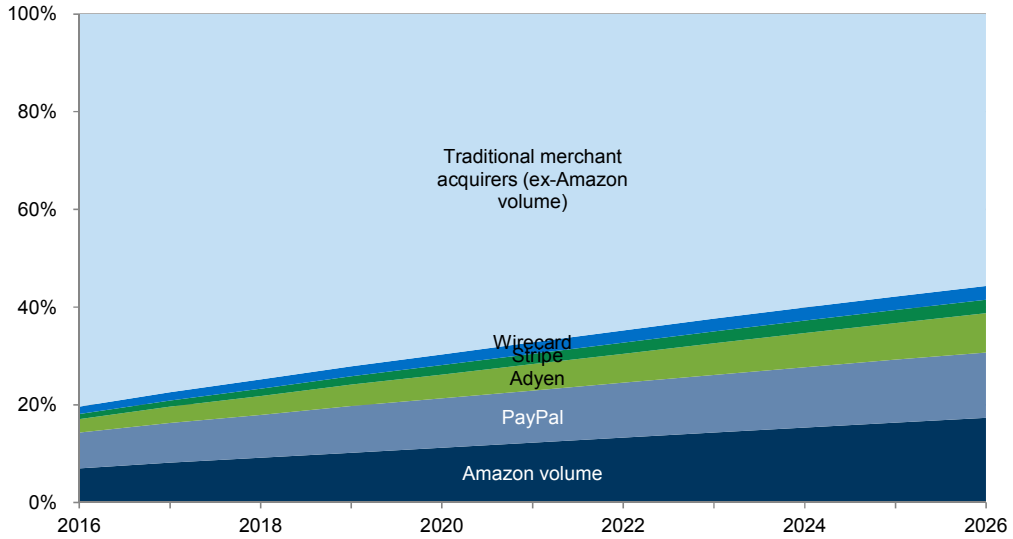
Exhibit 61: …as they grow roughly 2X faster than offline card volumes
US and EMEA online and offline volume growth



Source: World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

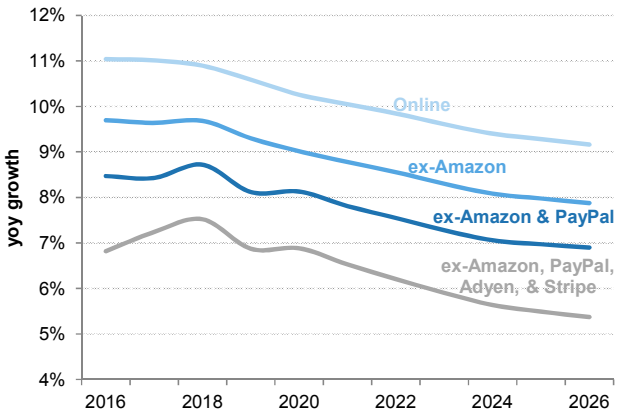
Traditional merchant acquirers have been consistently losing online market share to newer players like PayPal, Adyen, and Stripe that were quick to recognize the online payments opportunity (Exhibit 62). We estimate that traditional merchant acquirers' online market share could decline by 13% over the next ten years including Amazon (from 89% in 2016 to 76% in 2026). Excluding Amazon, PayPal, Adyen, Stripe, and Wirecard, the online card volume available to traditional merchant acquirers is growing at a 6.4% CAGR over the next ten years, meaningfully slower than the 10.0% CAGR for the overall online market (Exhibit 63). **Online card volume available to traditional merchant acquirers is set to grow 200bps faster than offline volume over the next decade** (Exhibit 64).

Exhibit 62: Traditional merchant acquirers are losing online market share to players like PayPal, Adyen, and Stripe
US and EMEA card volume online market share, 2016-2026E



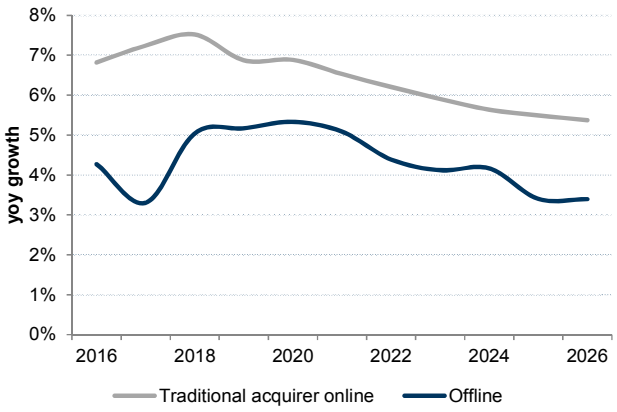
Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

Exhibit 63: Online volume available to traditional merchant acquirers is only growing at a 6% CAGR…
US and EMEA online card volume growth, 2016-2026E



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

Exhibit 64: …which is 200bps faster than offline volume growth
US and EMEA traditional acquirer online and offline card volume growth, 2016-2026E



Source: Company data, World Bank, Euromonitor, eMarketer, Adyen, Aite Group, NACHA, Visa, Nilson Report, Goldman Sachs Global Investment Research.

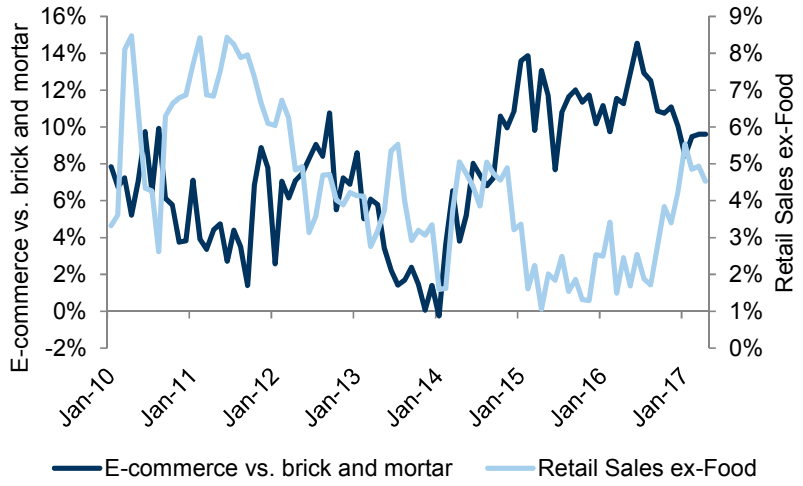
Increasing risks to growth suggests more consolidation is likely…

Risk 1: Retail sales growth is unlikely to remain constant

If retail sales growth slows, companies with more e-commerce exposure will likely be more resilient. While a decelerating macro environment would weigh on any merchant acquirer, we believe that companies with less e-commerce exposure will be more vulnerable. Brick-and-mortar sales growth is driven more by macro variables than is e-commerce sales growth, which is also driven by structural tailwinds. We have seen this relationship play

out in recent changes in retail sales growth – all of which occurred in an expansionary economic environment. The spread between e-commerce and brick and mortar retail sales growth widens when retail sales growth decelerates (such as in 2012) and narrows when retail sales growth accelerates (such as in 2016) (Exhibit 65).

Exhibit 65: Retail sales growth has an inverse relationship with the dispersion between e-commerce and brick and mortar growth
left-axis: spread between US e-commerce and brick and mortar retail sales growth; right-axis: US retail sales ex-food growth

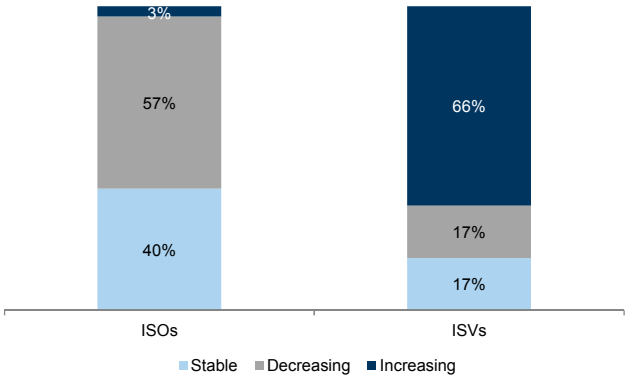


Source: BLS, Haver, Goldman Sachs Global Investment Research.

Risk 2: Online share losses could accelerate.
Acquirers like PayPal, Adyen, Stripe, and Wirecard could continue to crowd out traditional merchant acquirers. The analysis above does not take into account a potentially intensifying competitive environment and accelerating market share gains for the names noted above. We believe Chase Paymentech (which processes large Internet retailers like Amazon) and Global Payments (which derives about 10% of its total company net revenue from online) are particularly well-positioned online among traditional merchant acquirers. Conversely, we note that merchant acquirers within our coverage universe (particularly Global Payments) can take share from other traditional merchant acquirers among SMB brick-and-mortar retailers to offset any online share losses.

Risk 3: Residuals could increase in the fast-growing integrated payments segment.
We will watch changes in independent software vendors (ISVs) residuals carefully, as upward pressure on ISV residuals (the portion of merchant acquiring spreads paid as a commission to ISVs) could pressure net yields for traditional merchant acquirers. At the moment, we expect residuals to tick up gradually, broadly consistent with the results of our GS-ETA survey of merchant acquirers, ISOs, and ISVs (Exhibit 66). We believe ISVs seem more focused on growth through volume than through price and the fragmentation of the ISV market limits pricing power. Generally, we continue to view the shift to integrated payments as a necessity to maintain share: integrated payments provide a stickier customer base (more than 50% reduction in churn) and allow merchant acquirers to compete on service elements other than price.

Exhibit 66: ISV residuals are expected to increase, while ISO commissions are expected to remain stable or decline
Which of the following do you view as the most likely trend for ISO and ISV commissions/ residuals over the next 3 years?

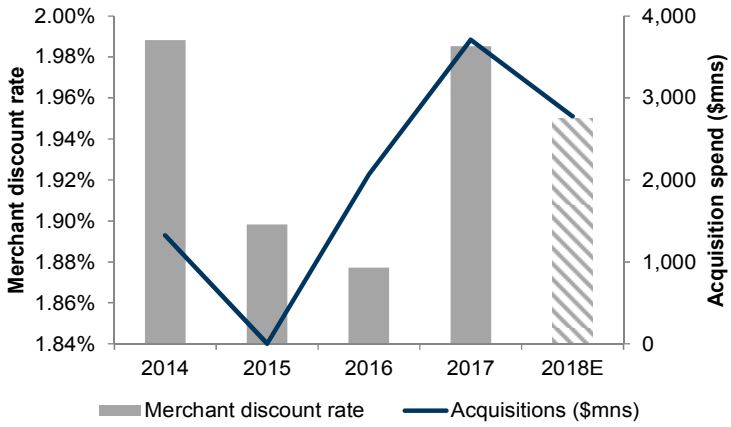


Source: ETA, Goldman Sachs Global Investment Research.

Risk 4: Pricing pressure could intensify if consolidation activity dries up

Our GS-ETA Merchant Acquirer survey shows that higher levels of industry consolidation are well correlated with a more benign pricing environment. In Exhibit 67, we show that recent acquisitions (such as TransFirst by TSYS and Heartland by Global Payments) likely improved the pricing environment in our Spring 2017 survey after years of consistent pricing declines. We expect merchant acquirers to continue to use their balance sheets for further consolidation to keep the pricing environment in check. However, if acquisitions were to slow down, we believe pricing pressure could intensify.

Exhibit 67: We believe an accelerated pace of acquisitions serves as a tailwind for pricing
left-axis: merchant discount rate for merchant with over $1mn in annual card volume; right-axis: total acquisition spend lagged by ~1.5 years



Source: Company data, ETA, Goldman Sachs Global Investment Research.

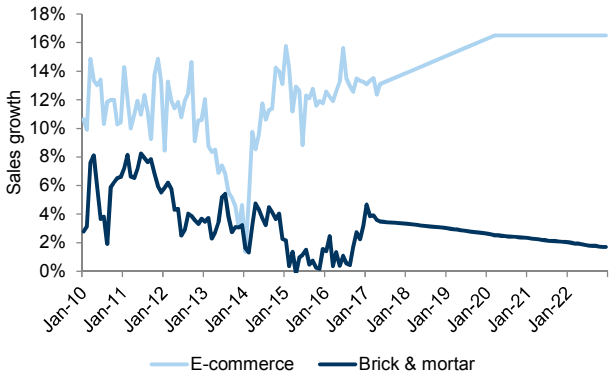
...although the online shift is not the biggest risk facing the industry

We look to understand how growing online spend could impact merchant acquirer volume growth, holding macro forces constant. **We find that, if e-commerce growth remains constant or even accelerates slightly, there is likely only a modest negative impact on a merchant acquirer's volume growth trajectory.**

For the sake of simplicity, we limit our analysis to US retail sales, which have an 85% correlation with Visa and Mastercard US card volume growth. Therefore, e-commerce and brick and mortar sales growth serve as our proxies for online and offline spending, respectively. E-commerce sales comprised 10.1% of retail sales in 2016. Given the higher rate of card usage for e-commerce purchases, we estimate e-commerce comprised roughly 20% of US retail sales card volumes in 2016.

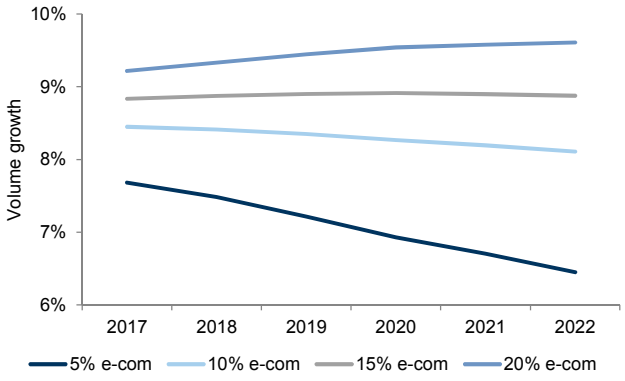
Accelerating e-commerce growth: In this scenario, we hold total US retail sales growth constant, but e-commerce sales growth accelerates by 10bps mom and levels at 16.5%. This implies that brick and mortar growth would decelerate to offset the e-commerce acceleration (Exhibit 68). We believe most traditional merchant acquirers would experience modestly decelerating volume growth if e-commerce growth accelerated. While we believe typical traditional acquirers derive 10-15% of volumes from e-commerce (below total industry penetration of about 20%), this is partly offset by nearly 2X greater card penetration for e-commerce sales vs. brick and mortar sales in the United States (we estimate 90% vs. 50% based on company and industry data). Companies with less exposure to e-commerce would be worse off, though – we find that an acquirer with little e-commerce exposure will experience a meaningful deceleration in card volume growth over five years (Exhibit 69).

Exhibit 68: Our scenario assumes e-commerce growth accelerates to 16.5%, at the expense of brick & mortar
E-commerce and brick and mortar sales growth, 2010-2022E



Source: BLS, Haver, Goldman Sachs Global Investment Research.

Exhibit 69: Accelerated mix shift to e-commerce is offset by accelerated mix shift to card spending
E-commerce sales growth accelerates: Volume growth for theoretical, traditional merchant acquirers with different e-commerce volume mix exposures

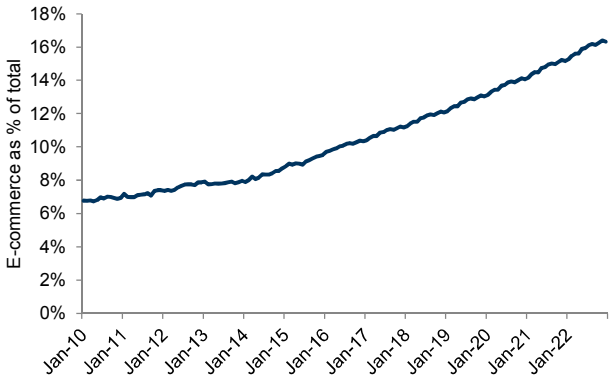


Source: BLS, Haver, Goldman Sachs Global Investment Research.

E-commerce sales held constant: We assume US retail sales growth and the spread between e-commerce and brick and mortar retail sales growth remain constant. As a result, e-commerce continues to gain share of total retail sales, as e-commerce sales growth continues to outpace brick-and-mortar sales growth at the same rate (Exhibits 70 and 71).

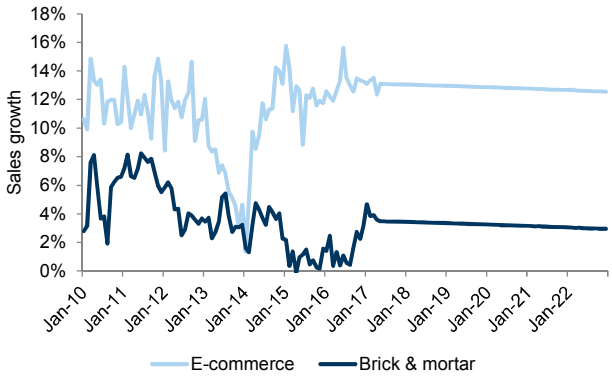
We then use the regression between retail sales and card volumes to calculate e-commerce and brick-and-mortar card volume growth. Not surprisingly, merchant acquirers with lower e-commerce sales exposure will grow more slowly. **However, when retail sales and e-commerce sales are constant, there is a mild deceleration in card volume growth over time for each business model (Exhibit 72).**

Exhibit 70: E-commerce continues to gain share…
E-commerce as % of total retail sales, 2010-2022E



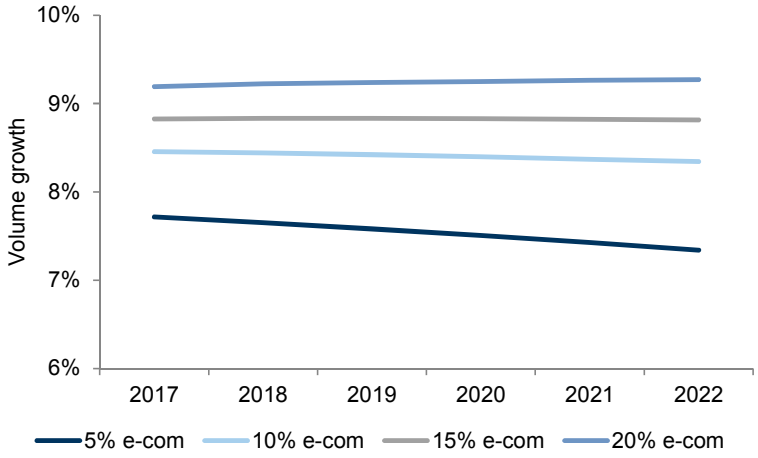
Source: BLS, Haver, Goldman Sachs Global Investment Research.

Exhibit 71: …as we hold the spread between e-commerce and brick and mortar sales growth constant
E-commerce and brick and mortar sales growth, 2010-2022E



Source: BLS, Haver, Goldman Sachs Global Investment Research.

Exhibit 72: The less e-commerce exposure an acquirer has, the bigger the headwind if e-commerce growth accelerates
E-commerce sales growth stable: Volume growth for theoretical, traditional merchant acquirers with different e-commerce volume mix exposures



Source: BLS, Haver, Goldman Sachs Global Investment Research.

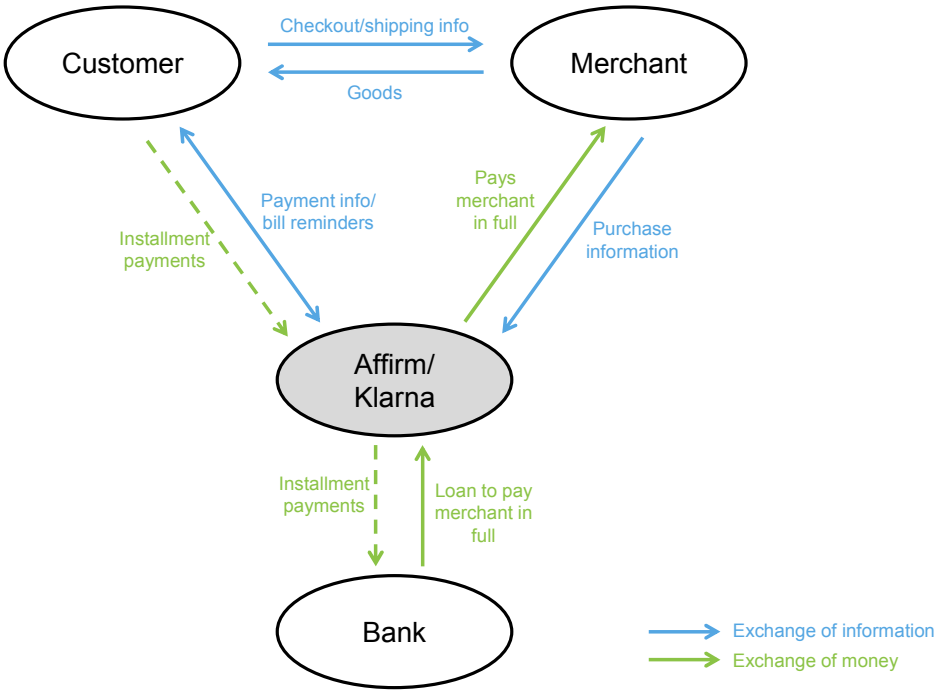
Q7: How is e-commerce changing the consumer credit landscape?

Looking back at the evolution of the payment ecosystem both online and offline, payments companies have aimed to tackle two main issues to drive increased consumer spending: (1) make the payment experience more convenient; and (2) expand consumer spending capacity. Every party—from card networks to digital wallets to payment gateways to merchant acquirers—can credit their success to addressing some aspect of these two issues. The rise of online point of sale (POS) credit facilities over the last decade is no different.

An online POS credit facility provides the ability for consumers to sign up for flexible financing for an online purchase at checkout. This stands in contrast to a standard online lender like Lending Club or SoFi, which are trying to drive standalone loan issuance and refinancing. Instead, online POS credit facilities are an alternative to using the credit facility on a credit card. We view them as the digital version of in-store credit card offerings of companies like Synchrony. We highlight two companies, Affirm and Klarna, which provide installment loans to consumers originating at the point of sale. Affirm and Klarna pay the merchant the full price of a customer's purchase (with funds supplied by a partner bank), and then Affirm and Klarna collect installment payments from consumers (Exhibit 73).

While the mechanics behind Affirm and Klarna look similar, the two companies evolved in different ways. We believe Affirm's platform is focused on providing a cash management solution to specific demographics such as millennials, which Affirm believes are averse to conventional bank-sponsored credit card products. On the other hand, Klarna was initially focused on reducing cart abandonment with its Klarna Checkout product, which allows customers to order and receive online goods before making payments. Its installment loan solution is an ancillary offering to Klarna Checkout merchants. Nonetheless, both Klarna and Affirm seek to tackle the two core issues at the center of all successful payments' companies: convenience and spending capacity.

Exhibit 73: Business model for online POS credit facilities, Affirm and Klarna
Exchange of information and payments when customer pays using installment loan



Source: Goldman Sachs Global Investment Research.

Affirm

Company snapshot

Year launched: 2012

Headquarters: San Francisco

Countries: 1

Employees: 101-250

Funding to date: $420mn

Last disclosed round: Series D

Last funding amount: $100mn

Company overview

Affirm is transforming personal lending online. Affirm differentiates itself from personal lending peers in that it provides financing alternatives to consumers directly at the point of sale as an alternative to traditional bank- or retailer-sponsored credit cards.

- **Key merchants:** Casper, Wayfair, Expedia, Peloton, Tradesy, Reverb, Joybird Furniture, and Motorola.
- **Pricing:** Affirm loans vary between 10% and 30% APR simple interest paid over 3, 6, or 12 month periods. Merchants have the option of customizing the interest rates for certain products, product categories, cart sizes, or promotions. To drive incremental volume, merchants can offer 0% APR financing on a promotional or permanent basis. There are no hidden fees or deferred interest on loans.
- **Competitors:** Affirm is competing against traditional credit card lenders and services like PayPal Credit. The company's emphasis on pricing transparency and ease of use is what makes it a compelling offering for consumers. The company claims that its unique risk-scoring model looks beyond FICO scores, often reaching those overlooked by the traditional credit scoring system.

A brief history and drivers of success

Affirm was founded in 2012 by PayPal cofounder Max Levchin. It has raised $420mn in three rounds of equity funding. In April 2017, Affirm announced its one millionth consumer installment loan. Affirm's loan volume more than tripled in 2016, growing to hundreds of millions of dollars, and the number of retailers offering Affirm's services has grown from just 100 at the end of 2015 to over 900 in April 2017.

Affirm has a couple of key differentiators: (1) a unique product offering, targeted toward millennials with a potential aversion to credit card products; and (2) clear transparency that drives high levels of customer satisfaction (and a Net Promoter Score of +72).

Core product offerings

Affirm offers installment loans to consumers directly at the online point of sale. Loans are approved in real-time, the merchant processes the order, Affirm settles the full amount with the merchant, and the customer pays Affirm over time with a debit card, bank transfer, or check. There is a simple and transparent pricing structure, and consumers can customize the loan duration.

Differentiation and growth strategy

Affirm believes it can maintain a sustained long-term advantage over traditional lending products given its lower cost of customer acquisition combined with its risk-scoring model. Affirm has grown its retail partner base quickly for two reasons. First, there is a clear value proposition for retailers. When retailers use Affirm, they see average order value increase by 75%, merchant conversion increase by 20%, and revenue per visitor increase by 10%. Affirm also eliminates chargebacks for merchants, as it takes on repayment and buyer fraud risk. Second, Affirm has partnered with several e-commerce platforms such as Salesforce Commerce Cloud, Magento, Shopify, and NetSuite to expand its merchant reach. It is also planning to expand its installment loan offering to offline spending.

Klarna

Company snapshot

Year launched: 2005

Headquarters: Sweden

Countries: 18

Employees: 1500

Funding to date: $521mn

Last disclosed round: private equity

Last funding amount: $225mn

Company overview

Klarna is simplifying online checkout by expanding the traditional gateway to include consumer credit. With Klarna, the shopper no longer has to provide payment information at checkout and can receive the product before paying for it. Klarna also offers installment loans to customers during checkout. The company has serviced 45mn customers with 65k online merchants in 18 countries.

- **Key merchants:** Spotify, Disney, Samsung, Wish, ASOS, and Overstock.com.
- **Pricing:** Klarna charges a flat rate to the merchant for each transaction, although no pricing is disclosed on its website. Klarna's loans through Klarna Payments are extended for 6-36 month payment terms with 19.99% APR for standard purchases.
- **Competitors:** Klarna Checkout is competing against other gateways provided by merchant acquirers, Stripe, or Braintree. Klarna Payments competes with traditional credit card lenders and services like PayPal Credit. Klarna believes that its algorithms can identify creditworthy customers better than conventional financial firms by relying on details like the email and delivery address supplied, size and type of purchase, device used, and time of day.

A brief history and drivers of success

Klarna is a Swedish company, founded in 2005. It has raised $521mn in equity funding, and was valued at $2.5bn in 2017. In 2017, Visa and Klarna announced that Visa would invest in Klarna (terms not disclosed) and pursue a strategic partnership. Klarna has dominant scale in Sweden, where about 40% of all e-commerce sales are processed through it, and it has expanded into other markets. Klarna acquired Sofort in 2013 and BillPay in 2017 to expand its presence in Germany, and launched in the United States in 2015. The company has disclosed that it increased transaction volumes 50% in 2016, and Pitchbook estimates revenue above $450mn in 2016. By providing value to both retailers (by eliminating credit card and fraud risk) and to consumers (by delivering products ahead of payment), Klarna has grown rapidly and has differentiated from other gateway offerings.

Core product offerings

Klarna offers two products: **(1) Klarna Checkout:** Shoppers provide an email and delivery address to the merchant at checkout, but no payment information. Klarna pays the merchant upfront, and the shopper pays Klarna after receiving the product; and **(2) Klarna Payments:** Klarna offers installment loans to customers directly at the point of sale. The merchant processes the order, Klarna pays the merchant upfront, and the customer pays Klarna over time. In Sweden, about 10% of Klarna's transactions use financing.

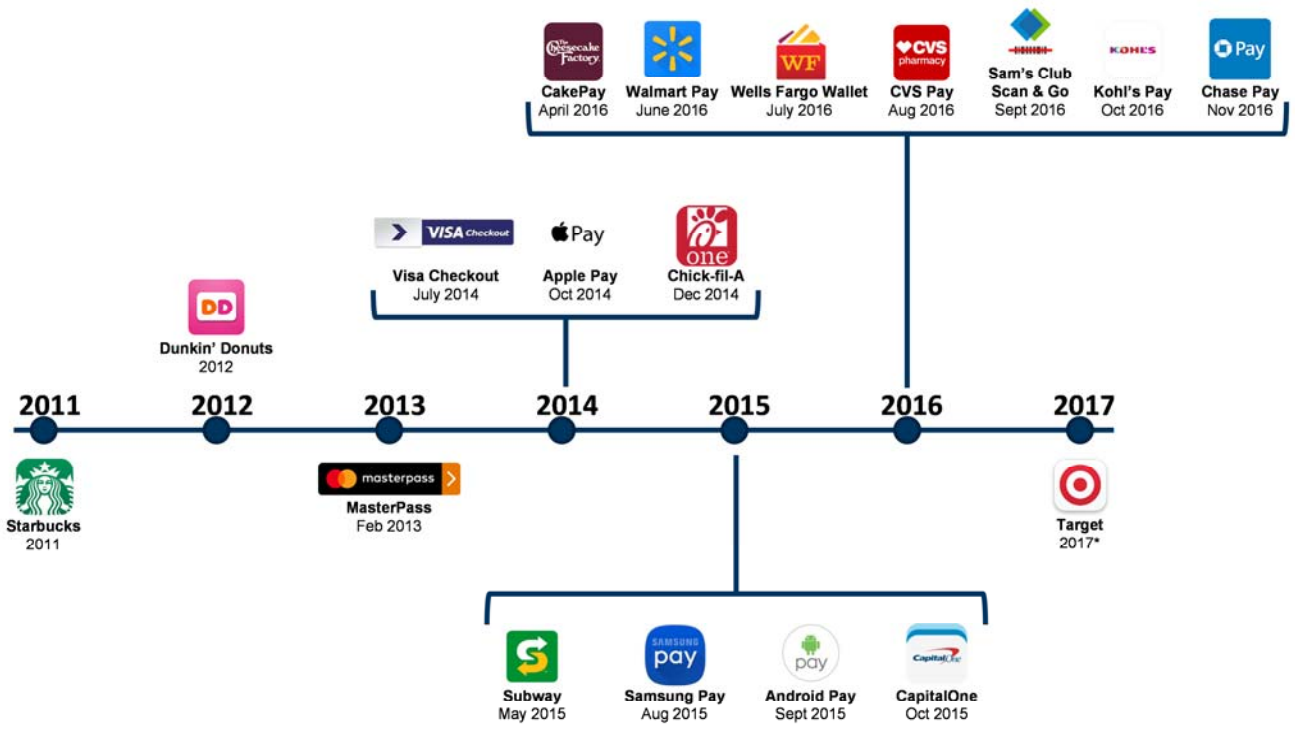
Differentiation and growth strategy

The fact that consumers pay after delivery is a key aspect of Klarna's differentiation, and this can facilitate its growth for two reasons. First, as more online shopping is done on the phone, consumers are demanding easier and more secure checkout. With Klarna, consumers do not need to provide sensitive payment information when purchasing items in crowded public places, and do not need to remember another username and password. Second, shoppers do not have to pay until the goods are delivered, obviating delivery and quality assurance concerns – which is especially important when shopping across national borders. Klarna appears focused on international growth, making two acquisitions to gain scale in Germany and launching in the US market two years ago. Klarna also streamlines the payment process for merchants by providing a single integrated solution with a single technical integration, one agreement, and one customer support. Its platform partners include BigCommerce, Shopify, WooCommerce, and Magento.

Q8: What role will mobile wallets like Apple Pay play in the emerging online payments landscape?

Mobile wallet adoption has been underwhelming to date by nearly every objective standard, including initial penetration of smartphone users and repeat usage rate. "The Pays"—Apple Pay, Samsung Pay, and Android Pay—do not disintermediate the existing payment system, but instead reinforce it by relying on enhanced security technology provided by Visa and Mastercard that significantly reduces fraud and the leakage of personal financial data. However, we believe mobile wallets have not gained meaningful traction because (1) they are not universally accepted online or in-store; (2) consumers do not perceive them to be significantly easier to use than cards; and (3) they have lacked rewards programs which would stimulate regular usage. While we think mobile wallets stand a good chance of gaining traction in the long run, we expect medium-term adoption to be slow for these reasons.

Exhibit 74: The types of digital wallets quickly multiplied from 2014-2016
Timeline of digital wallet launches



*Target release expected in 2017
**Third party brands used in this presentation are the property of their respective owners, and are used here for informational purposes only. The use of such brands should not be viewed as an endorsement, affiliation or sponsorship by or for Goldman Sachs or any of its products/services.

Source: Goldman Sachs Global Investment Research.

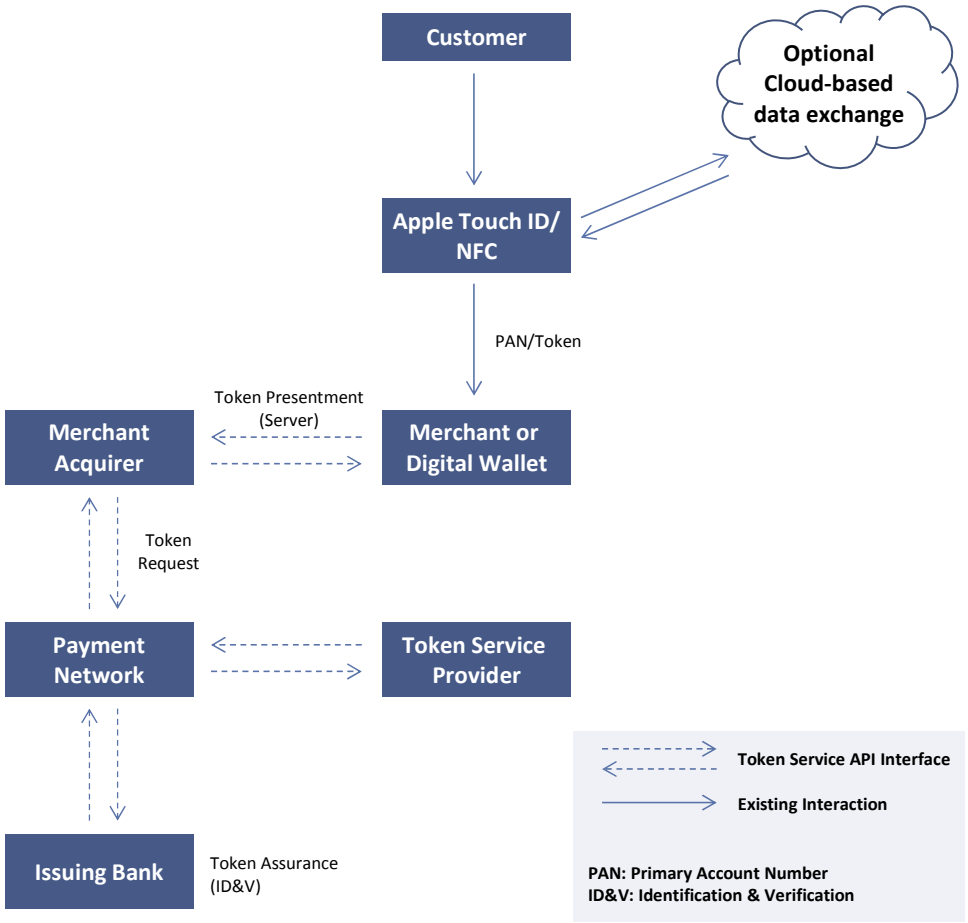
Timeline of digital wallet launches

We outline a timeline of digital wallet launches in Exhibit 74. The first digital wallets were provided by Starbucks and Dunkin Donuts in 2011 and 2012 as part of their loyalty rewards program. Visa and Mastercard launched their mobile wallet offerings in 2012 and 2013, and Visa re-launched its offering in 2014. Apple was the first among mobile phone manufacturers to introduce its digital wallet, launching Apple Pay nearly a year before

Samsung Pay and Android Pay. Banks and most retailers followed suit in 2015 and 2016. As a result of the rapid pace of these launches, it is not surprising to us that there is significant confusion among consumers about how and where to use digital wallets, as reflected by our survey of merchant acquirers, ISOs, and ISVs in early 2016 (see our April 19, 2016, report, *ETA – Goldman Sachs Merchant Acquirer and ISO Survey: Spring 2016*).

How Apple Pay, Samsung Pay, and Android Pay work

Exhibit 75: Overview of token provisioning for Apple Pay transactions



Source: Goldman Sachs Global Investment Research.

Digital wallets provided by smartphone providers broadly work in the same way. They do not attempt to disrupt the existing payment system, but rather work with payment and technology incumbents (including networks and banks) to bring ease-of-use and increased security features to consumers, issuers, and merchants. Apple, Samsung, and Google launched mobile wallets in order to bolster customer retention for their mobile phone, not to break into the payments industry.

The Pays combine EMV, NFC, and Touch ID to ensure the credit card information used is protected, and is being properly authorized by the card user (Exhibit 75). Apple Pay, Samsung Pay, and Android Pay use tokenization provided by Visa, Mastercard, AmEx, and banks to ensure that consumer identity and credit card information is never stored on merchant systems and hence not subject to data breaches. In addition to NFC wireless

functionality, Samsung Pay uses another wireless magnetic technology that allows the phone to transmit the user's credit card information via magnetic field to most standard magnetic stripe point-of-sale terminals.

Banks that make up the majority of US credit card purchase volume (over 90%) have partnered with Apple Pay, Samsung Pay, and Android Pay. We estimate the issuer banks pay tech companies (we believe only Apple, but not Samsung or Google) a small fee (5-15bps for US credit transactions), although this loss in economics is likely to be offset by lower fraud rates and higher volumes. Apple claims that Apple Pay doubles the conversion rate for online shoppers and speeds up checkout by 60%.

Innovation since launch: Moving beyond replacing plastic cards

We believe Apple Pay has paved the way in mobile wallet innovation among mobile phone providers, as it has focused on expanding the functionality of its mobile wallet beyond simply replacement of a physical card at the point of sale. We highlight three developments:

(1) **Loyalty.** Over the last few years, Apple Pay has been focused on augmenting merchant loyalty programs with its digital wallet. It has introduced new offerings with large merchants (Kohl's, the Gap, Walgreens, Dunkin Donuts, etc.) to support private label and co-branded credit cards, rewards programs, and gift cards. For example, the Walgreens loyalty card is automatically added to a customer's iPhone if they swipe their rewards card and then tap with Apple Pay. The POS and the phone communicate so the phone digitizes the rewards information. Apple Pay has also worked with Kohl's and the Gap to automatically present their private label and co-branded cards (rather than the default card) at checkout.

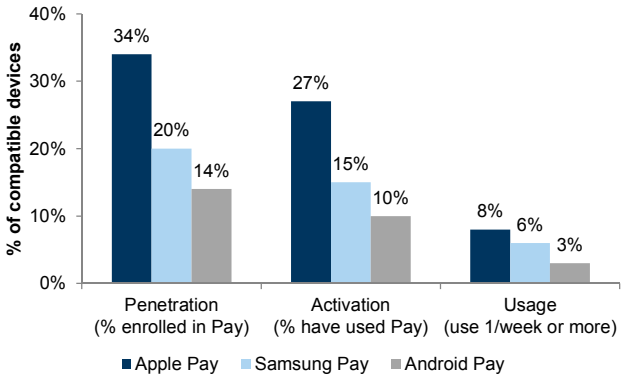
(2) **Web-based payments.** Initially, paying through Apple Pay was available only in-store and in-app, but not on the web through a standard browser. In 2016, Apple extended Apple Pay to browser-based shopping on its Safari browser on devices which are enabled with Touch ID fingerprint technology. Apple also partnered with Braintree to accept Apple Pay on the web outside of Safari browsers.

(3) **C2C payments.** In June 2017, Apple announced that consumers can send money digitally to each other via text. These C2C payments will launch in fall 2017 on its new operating system (iOS 11).

We expect modest mobile wallet penetration in the medium term

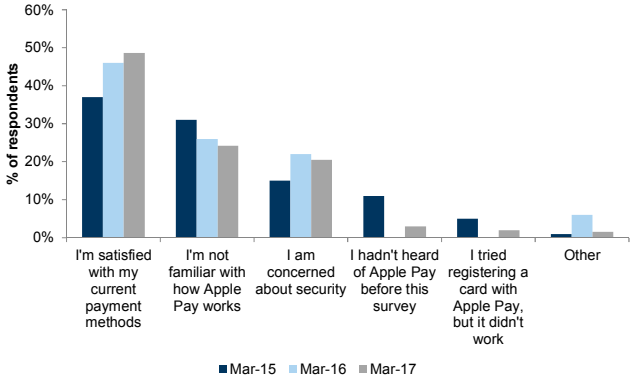
Despite much publicity upon launch, Apple Pay, Samsung Pay, and Android Pay have struggled to gain traction. Apple Pay has the highest penetration (in part because it launched nearly a year earlier), with 27% of compatible iPhone users having ever used Apple Pay, compared to 15% and 10% for Samsung Pay and Android Pay, respectively. Frequent usage is even less common: 8%, 6%, and 3% of people use Apple Pay, Samsung Pay, and Android Pay at least once per week, respectively (Exhibit 76). That being said, Apple Pay is seeing rapid growth (albeit off a small base), with transaction volume up 450% over the last 12 months as Apple expands its merchant and user bases. Apple Pay is the dominant name among the digital wallets with 90% of all mobile phone contactless US transactions done on Apple Pay, according to Apple.

Exhibit 76: Mobile wallet traction remains low…
Penetration, activation, and usage statistics for Apple Pay, Samsung Pay, and Android Pay (January 2017)



Source: First Annapolis.

Exhibit 77: …largely because people are satisfied with their current payment methods
Reason why consumers have not tried Apple Pay, 2015-2017



Source: PYMNTS/InfoScout.

We identify several reasons why usage has fallen below expectations:

(1) **Low merchant penetration.** If digital wallets are not as ubiquitously accepted as plastic credit cards, consumers will likely be confused about where they can use them. One-third of the biggest 100 merchants in the United States do not accept Apple Pay (including merchants like Wal-Mart and Kroger) – and we estimate that nearly 80% of smaller merchants do not accept Apple Pay. However, we expect this to be remedied over time as the US merchant base becomes fully penetrated with EMV/NFC payment terminals.

(2) **Lack of perceived utility.** We believe most consumers fail to see a clear advantage in terms of ease of use relative to traditional cards (particularly magnetic swipes which take 2-3 seconds). However, we would point out that with the advent of EMV in the United States, card verification times have extended significantly (to 4-6 seconds in many cases), which could bolster consumer adoption over time. We note that in mature EMV countries like Australia, NFC usage now exceeds 80% of all transactions.

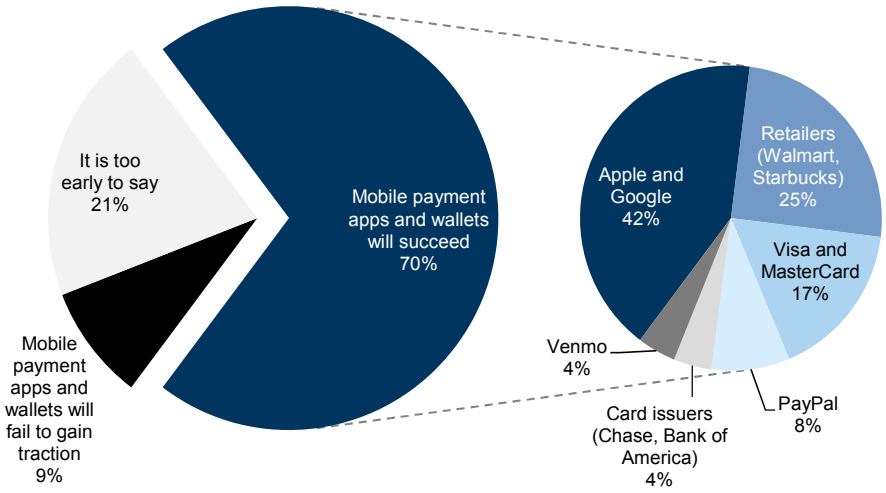
(3) **Lack of consumer incentives.** According to a survey of over 8500 consumers, among the consumers who have not tried Apple Pay, about half were already satisfied with their current payment methods (Exhibit 77). Apple Pay, Samsung Pay, and Android Pay do not provide any additional incentives to use their mobile wallet. However, we have seen consumers choose their mode of payment based on incentives, which has been the case with credit cards rewards programs driving incremental credit card spend and loyalty programs linked to digital wallets at Starbucks and Dunkin Donuts driving mobile app usage.

(4) **Confusion about security benefits.** Even though Apple Pay is clearly more secure than plastic cards by virtue of biometric authentication, nearly 40% of smartphone owners believe mobile payments are less secure than credit cards and only 33% consider them more secure, according to technology firm 451 Research.

Mobile wallet sentiment has improved, but it's not yet reflected in hard data

According to our survey of merchant acquirers, ISOs, and ISVs, mobile wallet sentiment improved significantly in early 2017 compared to prior year surveys. 70% of respondents now expect mobile wallets to succeed (up sharply from 35% last year, Exhibit 78). Within the group of respondents that expects mobile payments apps/wallets to succeed, 42% expect Apple and Google to succeed (given their integration with smartphone operating systems) (see our May 20, 2017, report, *Goldman Sachs – ETA Merchant Acquirer, ISO & ISV Survey: Spring 2017*).

Exhibit 78: Respondents have an optimistic outlook on mobile payments; "Big tech," retailers, and networks are expected to be winners
Based on your industry knowledge, which option best expresses your view on the prospects for mobile payment apps and wallets?



Source: ETA, Goldman Sachs Global Investment Research.

Q9: Why does C2C matter, and will it ever make money?

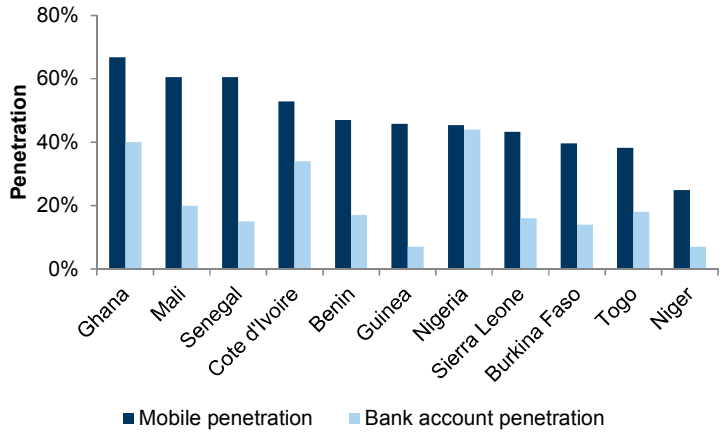
We believe gaining a scale presence in peer-to-peer (C2C) payments will be of greatest value in emerging markets given a large under-banked population and lack of tech-enabled banking, as it can be used to establish a user base upon which a larger payment presence can be built. We have seen this story play out with mobile money transfers in the past 10 years, and believe China and India are well down this path. We are less optimistic about monetization of C2C payments in the United States, although we think Venmo is a prime example of the importance of building a loyal base of users in a particular demographic – millennials. 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), rather than a payment made in exchange for goods and services.

Emerging markets: C2C offers a gateway to other payment services

Mobile money transfers: Expanding beyond C2C payments

Historically, wireless carriers have had a negligible role in payments, but the emergence of mobile in emerging markets as the primary growth channel for payments has created interesting opportunities for telcos. The first mobile money transfer service launched in 2001, and the trend gained momentum in 2007, with the launch of M-Pesa (owned by Vodafone) in Kenya. For the last decade, non-financial institutions with distribution strength have grown a strong presence in un-banked and under-banked populations. We expect this trend to continue going forward, as many emerging markets have higher mobile phone penetration than bank account penetration (Exhibit 79).

Exhibit 79: Significant gap between mobile and banking penetration creates attractive opportunities
Mobile phone penetration (%), bank account penetration (%) for countries in West Africa

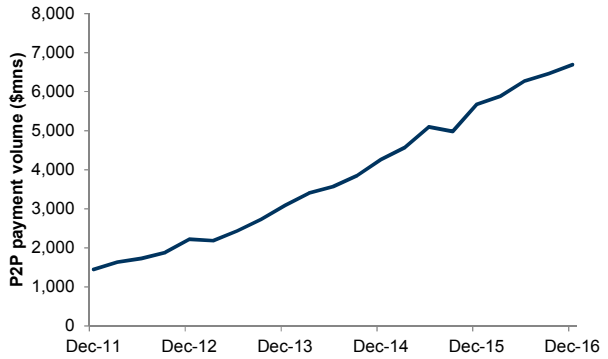


Source: World Bank's Global Findex Database, GSMA Mobile Money Tracker.

Mobile money accounts have already achieved impressive scale, and have surpassed bank accounts in sub-Saharan Africa in 2015, according to the GSMA Mobile Money Tracker. As of the end of 2016, more than half a billion mobile money accounts were registered globally. More than 40% of the adult population in Kenya, Tanzania, Zimbabwe, Ghana, Uganda, Gabon, Paraguay and Namibia are using mobile money on an active basis (90-day window).

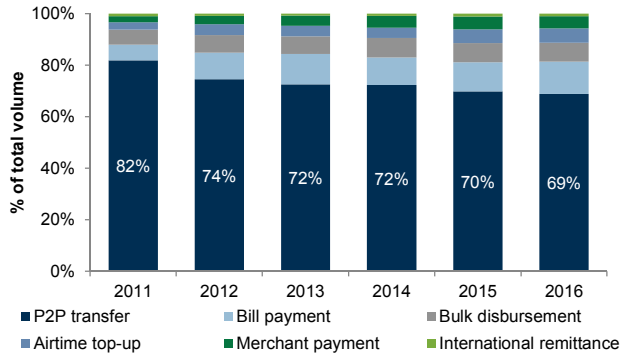
The largest component of mobile money transfers is C2C transfers. C2C transfers have steadily grown over the past decade, exceeding $7bn in December 2016 (Exhibit 80). **The ability to facilitate C2C transfers has been integral to growing mobile money's scale and expanding into higher-yielding categories like bill payment, disbursement, and merchant payments.** C2C transfers comprised 69% of total mobile money payment volume in 2016, compared to 82% in 2011 (Exhibit 81).

Exhibit 80: C2C mobile money payment volume has been growing at a healthy clip
Monthly C2C payments through mobile money, $mns



Source: GSMA Mobile Money Tracker.

Exhibit 81: C2C has been a useful foothold for mobile money to diversify into other payment verticals
Breakdown of mobile money payment volume

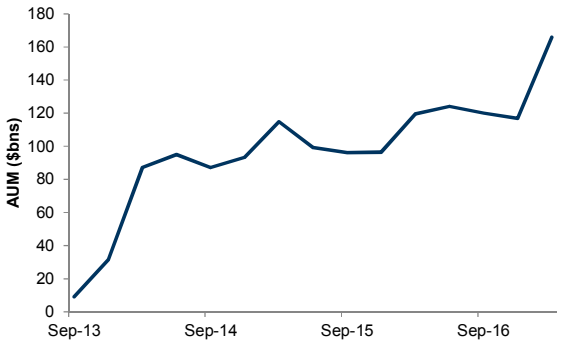


Source: GSMA Mobile Money Tracker.

China: Alipay's interest-bearing accounts provide compelling alternative to banks

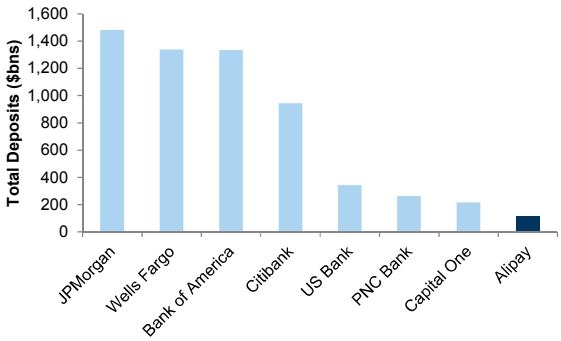
Through its Ant Financial arm, Alibaba provides a diverse set of financial services including wealth management, financing, insurance, and credit, on top of core payments capabilities. We believe Alipay's wealth management arm—Yu'e Bao, or "leftover treasure"—has already started to transform the financial services industry by providing convenient, interest-bearing depository accounts to both banked and unbanked individuals. Yu'e Bao's returns have historically been up to twice as high as interest-bearing accounts through banks (~6% vs. ~3%), although rates have receded in recent years. Alipay's wealth management business boasts 330mn users in the past 12 months (117% yoy growth) and assets under management (AUM) of $170bn as of March 2017 (Exhibit 82). Yu'e Bao has posted impressive growth and has now surpassed JPMorgan as the largest money market fund ($150bn) in the world, although it still lags international financial banks in total deposits (Exhibit 83).

Exhibit 82: Yu'e Bao's AUM has grown quickly since launch
Yu'e Bao assets under management (AUM), $bn



Source: Bloomberg.

Exhibit 83: Alipay still lags global banks in total deposits
Total deposits as of 4Q16, $bn



Source: Company data, Goldman Sachs Global Investment Research.

India: Payments banks offer new, quasi-banking options

Three "payments banks" have launched in India this year, representing a new type of bank in the country. A payments bank cannot issue loans or credit cards, but it can provide access to interest-bearing accounts. Aside from the India Post Payments Bank, a state-owned entity, two non-bank entities have launched as payments banks: Airtel Payments Bank (with a telecom parent company) and Paytm Payments Bank (the largest mobile wallet provider in India) (Exhibit 84). These companies provide interest rates between 4% and 7.25% on deposits. Eight other entities received payments bank licenses, including Vodafone M-Pesa (the telecom company that provides the popular mobile money offering in Kenya) and Tech Mahindra (the Indian consulting and outsourcing company).

Exhibit 84: "Payments banks" have now entered the field in India
Three payments banks have launched to date

	India Post Payments Bank	Airtel Payments Bank	Paytm Payments Bank
Launch date	Jan-17	Jan-17	May-17
Core business	State-owned entity	Telecom	Mobile wallets
Interest rate	5.50%	7.25%	4.00%
Online fund transfer	Rs2.5-5 for NEFT, IMPS at bank branch	0.5% of the amount	Free

Source: Company data, livemint.com.

US: Strong growth prospects, but monetization more challenging

Few areas of payment technology are changing as rapidly as peer-to-peer (C2C) transactions in the United States, with C2C payment volumes nearly doubling in each of the past three years. Non-bank players have entered the space given substantial growth opportunities, but the market has proven difficult to monetize thus far.

Relative to other payment types, we believe mobile C2C payments have the potential to evolve much more rapidly due to several factors: (1) convenience and ease of use compared to cash and checks; (2) lack of slower-moving counterparties such as businesses, which typically adopt new technologies with a significant lag; and (3) lack of "stickiness" for incumbent service providers given lack of offers and rewards.

We believe US companies are building out their C2C payments presence in order to benefit from the "network effects" that come with it. Every participant, from Venmo to banks, wants to increase customer stickiness and mindshare—whether it is to gain access to a younger demographic and potentially expand to other payment options (Venmo), or to offer a more comprehensive app to increase customer stickiness (banks/Zelle), or to incentivize people to continue buying iPhones (Apple Pay).

Venmo remains the market leader, while banks play "catch up" with Zelle

A number of mobile C2C payment services have developed over the past decade, and user adoption has grown dramatically over that period. We estimate that $34bn of volume was transferred using various C2C payment services in the United States in 2016, compared to $19bn in 2015. We highlight key service providers—including Venmo (owned by PayPal), Popmoney (owned by Fiserv), Square Cash, and Zelle (owned by Early Warning and operated by a consortium of banks)—in Exhibit 85.

Exhibit 85: Comparison of various C2C payment providers by features and cost

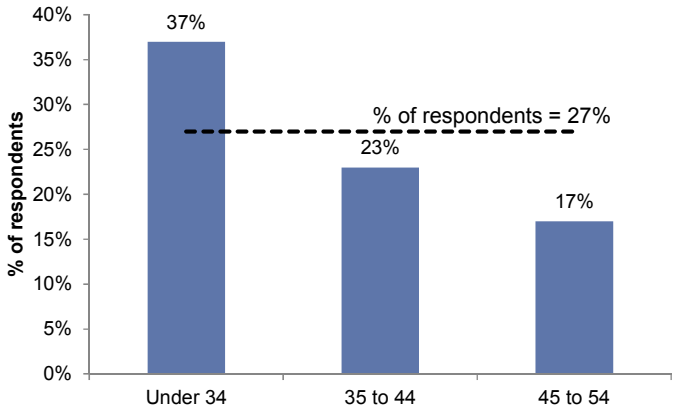
	Google Wallet	Facebook Messenger	PayPal	Square Cash	Venmo	Popmoney	Zelle
Platforms	iOS, Android	iOS, Android	iOS, Android, Windows Phone	iOS, Android	iOS, Android	iOS, Android, Windows Phone	iOS, Android
Instant Transfers	N/A	N/A	$0.25*	1% fee	$0.25*	N/A	Free
Bank Account Transfer	Free	Free	Free	N/A	Free	$0.95	
Credit Card Payments	Free	N/A	2.9% fee+$0.30	3% fee	2.9% fee	$0.95	N/A
Debit Card Payments	Free	Free	2.9% fee+$0.30	Free	Free	$0.95	Coming in 2017
Cash out time	2-3 business days	Up to 5 business days	3-5 business days	1 business day	1 business day	1-3 business days	Real time within the Zelle network Up to 3 business days if bank is outside the network
Transfer amount limit	$10,000 per transaction $50,000 per 5 day period	$10,000 per transaction	$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	$1,000 per day $2,500 per week $10,000 per month
Differentiators	Can attach a payment to any Gmail message	Installed Facebook Messenger user base of 1.2bn	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	Accessible through a participating bank's mobile app

*Currently in trial period.

Source: Company data, Goldman Sachs Global Investment Research.

In most cases, these services provide users with the ability to send money to another user using a mobile app, email, or SMS message. Nearly all of them 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, the heaviest adoption of these C2C payment services has been among younger demographic groups such as millennials – while adoption among older users has remained relatively low (Exhibit 86).

Exhibit 86: C2C payment penetration is significantly higher among millennials
Q: Which of the following types of payments have you made using your mobile phone within the last 12 months? Send and/or receive money to other people (data collected in June 2016)

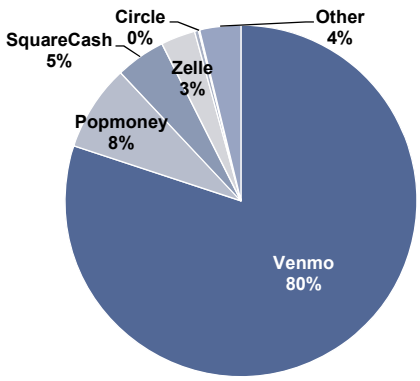


Source: First Annapolis.

Venmo: Venmo was acquired by PayPal in December 2013 and is the clear market leader among independent online C2C payments (which excludes offerings from companies like Facebook and Bank of America). We estimate Venmo garners 80% and 51% transaction and

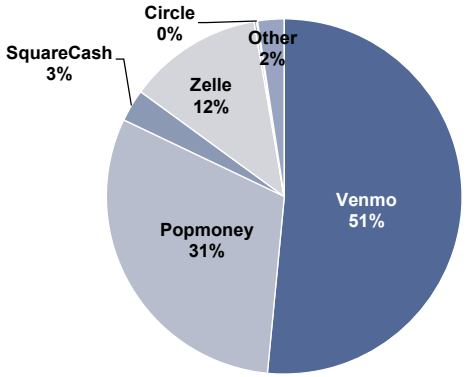
volume share in this segment (Exhibits 87 and 88). We expect Venmo's market dominance to continue over the next few years and forecast its volumes to double in 2017 given its strong network effect and ample runway to grow principal per transaction.

Exhibit 87: We estimate Venmo garners 80% transaction share…
US C2C mobile payment transaction share, 2016



Source: Goldman Sachs Global Investment Research.

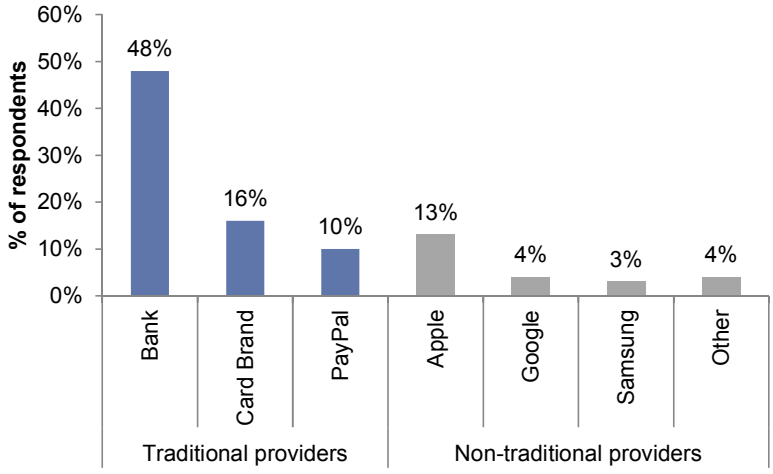
Exhibit 88: …and 51% wallet share given lower average principal per transaction
US mobile C2C payment volume share, 2016



Source: Goldman Sachs Global Investment Research.

Zelle: Zelle, the C2C network backed by some of the nation's leading financial institutions and re-branded from ClearXchange, officially launched in June 2017. Over 30 banks are expected to go live on the network in the first year. We see two clear benefits from Zelle: (1) real-time availability of funds; and (2) perceived security of banks. In fact, First Annapolis has shown that consumers would prefer a comprehensive mobile payments offering provided by their bank rather than non-traditional providers (Exhibit 89), but we do not think banks are adequately meeting this market demand today. We believe that in order for Zelle to succeed, banks need to deliver a consistent user experience and marketing message, and consumers need to be fully aware of the service and its specific benefits.

Exhibit 89: Consumers would prefer a mobile wallet through their bank
Q: If you were to choose one provider of a mobile wallet app, which would be your preferred provider? (data collected in January 2017)



Source: First Annapolis.

How can Venmo be monetized?

Given its dominant share in the United States, we focus our attention on Venmo and its path to monetization. Despite impressive user and volume fundamentals, we believe Venmo's prospects for monetization as a C2C service are limited given zero fees assessed by competitors – although we note that Venmo's instant deposit feature should generate incremental revenue. We believe PayPal needs to eventually drive Venmo user traffic to its merchant payment platform. While the path to monetization could be slow, Venmo represents a demographic – millennials – which we believe online merchants want to access.

We see several ways of connecting Venmo users into the PayPal ecosystem, including:

- **Extend "Pay with Venmo" functionality to online B2C transactions.** By offering a "Pay with Venmo" button on merchant sites which already accept PayPal, PayPal can drive incremental volume at merchants for customers with Venmo but no PayPal account. PayPal can thus maintain the integrity of its free C2C offering, preserving its core Venmo user base, and drive more and different types of users to the Venmo platform. Venmo has already started down this path with a limited number of merchant partners, including Munchery, ParkingPanda, and Poshmark.
- **PayPal can earn investment income from Venmo users' balances.** Anecdotally, we believe many Venmo users store a cash balance directly on Venmo's mobile app. We think Venmo could make use of this cash by investing it in short-term or long-term instruments, capturing yield from the float between users' transactions.
- **Monetize Venmo's user traffic via personalized ads.** The possibility of ads on Venmo's newsfeed based on personal transaction history could potentially be a revenue opportunity. We note that the most common use cases for C2C payments can be broadly categorized as "Dining," "Gifts," and "Entertainment." Importantly, users often post captions that describe the nature of their payment interactions (i.e., "Sushi" or "Billy Joel tickets"), which indirectly offer insights into consumer habits.
- **Pair international remittances with free domestic C2C payments.** PayPal could merge its Venmo and Xoom offerings to accelerate Xoom transaction volumes. We note that this path seems less likely, as we do not think there is significant overlap between Venmo and Xoom's user bases.

Appendix I: Index of global emerging payments companies

Exhibit 90: Index of global emerging payments companies
List of payment vendors

Company Name	Domicile	Year Founded	Business Model	Latest Financing	Series Round	Capital Raised (mn)	Total Capital Raised (mn)
Payment service providers/gateways							
Adyen	Netherlands	2006	Outsources payment services to international merchants	Sep-15	Venture	N/A	$266.0
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
BlueSnap	U.S.	2002	Mobile checkout and payment conversions for eCommerce	Nov-14	Private Equity	$50.0	$183.0
Cardspring (part of parent, uncovered)	U.S.	2012	Platform enabling app developments for payments	May-13	Series A	$9.8	$19.8
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
Klarna	Sweden	2005	E-commerce payment solutions for merchants and shoppers	Jun-17	Secondary Market	N/A	$296.4
MineralTree	U.S.	2010	Payment software that automates invoice-to-payment processes	Feb-15	Series B	$11.1	$22.7
Payline Data	U.S.	2009	Flexible payment solutions for businesses	Feb-17	Non Equity Assistance	$3.0	$7.0
PayNearMe	U.S.	2009	E-commerce platform for consumers without credit or debit cards	Apr-15	Series F	$14.7	$71.2
Paytm	India	2010	E-commerce platform that offers mobile wallet solutions	N/A	N/A	N/A	N/A
PayU	Netherlands	2011	Online payment services for individual and institutional customers	N/A	N/A	N/A	N/A
Skrill	U.K.	2001	Online payments and digital wallet provider	N/A	N/A	N/A	N/A
Stripe	U.S.	2010	Provider of online payments infrastructure	Nov-16	Series D	$150.0	$440.0
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	May-15	Series D	$40.0	$74.2
Direct bank debit transfer system							
Dwolla	U.S.	2008	Electronic payments platform using ACH	Jan-17	Venture	$6.9	$39.3
Euronet (public, uncovered)	U.S.	1994	Offers EFT processing and money transfer services using ACH	N/A	N/A	N/A	N/A
NVoicePay	U.S.	2009	Electronic accounts payable solution using ACH	Oct-16	Series F	$10.0	$20.3
Paymode-X	U.S.	2000	Electronic accounts payable 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
Revolut	U.K.	2015	P2P and B2B money transfer in partnership with Mastercard	Jul-16	Crowdfunding	$1.3	$14.3
Xoom (public, uncovered)	U.S.	2001	Digital money transfer services using ACH	N/A	N/A	N/A	N/A
International money transfer							
Azimo	U.K.	2012	Online international money transfer company	May-16	Series B	$15.0	$46.6
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	Mar-16	Venture	$9.0	$24.4
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	May-15	Series B	$10.9	$21.1
Midpoint (public, uncovered)	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-00	Series D	$26.0	$116.4
WeSwap	U.K.	2010	Peer-to-peer money transfer product using network rails	Oct-16	Crowdfunding	$3.0	$21.5
WorldRemit	U.K.	2010	Online and mobile money transfer platform	Feb-16	Debt Financing	$45.0	$192.7
Loyalty & rewards							
Cardlytics	U.S.	2008	Advertising technology connecting buyers/ sellers via online banking channels	May-17	Undisclosed	$11.9	$177.9
SavingStar	U.S.	2010	Shoppers earn savings with offers linked to retail loyalty cards	May-15	Debt Financing	$5.0	$32.4
Shopkick	U.S.	2009	Mobile app with reward offerings for patrons of participating vendors	N/A	N/A	N/A	$26.7
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	May-17	Debt Financing	$13.0	$111.8
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
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
ClearXchange	U.S.	2011	Peer-to-peer payments application through the networks	N/A	N/A	N/A	N/A
POS/analytics solution							
Affirm	U.S.	2012	Installment loans to consumers at the point of sale	Oct-16	Debt Financing	$100.0	$520.0
AvidXchange	U.S.	2000	Web-based accounts payable and invoice management solutions	Jun-17	Private Equity	$300.0	$545.3
Bill.com	U.S.	2006	Accounts payable application for CPAs and small and mid-sized businesses	Apr-15	Series F	$30.0	$159.1
Izettle	Sweden	2010	Mobile payment POS solution compatible with EMV	Jan-17	Debt Financing	$51.3	$225.9
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	Aug-15	Series C	$13.5	$128.5
ShopKeep	U.S.	2008	POS solution provider designed for SMB	Jul-15	Series D	$35.0	$72.2
SumUp	U.K.	2011	POS solution for mobile devices	Jun-15	Series D	$11.4	$44.4
Payleven	Germany	2012	Mobile POS device that attaches to smartphone	Feb-16	Series D	$10.0	$50.5
Womply	U.S.	2011	Offline to-online card processing service and analytics solution	Nov-16	Private Equity	$30.0	$50.0

Source: TechCrunch, company data.

Appendix II: Model assumptions and price targets

We take a top-down approach to building our model, starting with personal consumption expenditure/final household expenditure as a starting point for consumer spend, and B2B spend for commercial expenditure. With a goal to capture the global opportunity for online and offline payments, we incorporate data from the following regions: North America, Latin America, EMEA, and Asia Pacific. We looked to estimate the breakdown of payments by method (card, check, ACH, and cash) across regions in order to develop a global card spend estimate in the online and offline channels.

Our model uses historical and forecasted data from many sources, including The World Bank, Nilson, eMarketer, NACHA, and Euromonitor, as well as company-specific data and internal Goldman Sachs estimates.

Volume assumptions by region

North America

(1) Personal Consumption Expenditure: We use an adjusted PCE figure sourced from Nilson as a baseline for our forecasts. This is essentially goods and services-related PCE, excluding non-purchase transactions like food furnished to employees, life insurance, employee lodging, etc. As this figure is specific to the United States, we apply a gross-up factor to incorporate the impact of adding Canada. We incorporate our macro team's PCE growth estimate for our forecasts.

(2) B2C online spend: We take a bottom-up approach to building our B2C online spend estimate. This figure includes three main categories: retail sales (e-commerce), travel spend, and other online spend. Our **retail sales** figures are sourced from the Census Bureau for historicals and eMarketer for our forecast, while our **travel** figures are sourced from Euromonitor. For the build up to **other B2C online** spend, we estimate the following categories (with sources in parentheses): primary ticket sales (Live Nation, PwC), secondary ticket sales (Live Nation, Tech Navio), curated music delivery services (Goldman Sachs Internet team), curated movies/TV delivery services (Netflix, Goldman Sachs Media team), online gambling (state gaming regulatory boards), food delivery (Euromonitor, GrubHub), online dating (Match Group, Spark), bill payment (Aite Group), and sharing economy (Uber, Lyft, company data, and news releases).

(3) B2C offline spend: Our B2C offline spend estimates are calculated as the difference between our total adjusted PCE estimate and B2C online spend estimate.

(4) Total B2B spend: We use data from Visa's Commercial Consumption Expenditure (CCE) presentations for our historical and forecasted estimates.

(5) B2B online spend: We use estimates from Visa's CCE presentations and NACHA Automated Clearing House (ACH) transfer data.

(6) B2B offline spend: Our B2B offline spend estimates are calculated as the difference between our total B2B spend estimate and B2B online spend estimate.

Rest of world

(1) Personal Consumption Expenditure: We adjust World Bank PCE data for LatAm, EMEA, and APAC using a similar methodology as North America. The relative adjustment amount varies across regions, as some may have more non-payment transactions than others. Our PCE forecasts across regions are sourced from our Goldman Sachs macro team.

(2) B2C online spend: We take a bottom-up approach to building our B2C online spend estimate, though it is a little more simplified relative to North America given the lack of available information. This figure includes three main categories: retail sales (e-commerce), travel spend, and other online spend. Our **retail sales** figures are sourced from eMarketer for our forecast and historicals, while our **travel** figures are sourced from Euromonitor. For the build up to **other B2C online** spend, we estimate the percentage of total B2C online spend this figure represents compared to our North America estimate, and back into the number accordingly.

(3) B2C offline spend: Our B2C offline spend estimates are calculated as the difference between our total adjusted PCE estimate and B2C online spend estimate.

(4) Total B2B spend: We use data from Visa's Commercial Consumption Expenditure (CCE) presentations for our historical and forecasted estimates.

(5) B2B online spend: We use North America as a baseline to forecast B2B online spend in other regions.

(7) B2B offline spend: Our B2B offline spend estimates are calculated as the difference between our total B2B spend estimate and B2B online spend estimate.

Countries included in each region

(1) North America: United States and Canada.

(2) Latin America/Caribbean: Antigua and Barbuda, Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Uruguay, and Venezuela.

(3) Europe, Middle East, and Africa: Europe & Central Asia, Middle East & North Africa, and Sub-Saharan Africa, as defined by the World Bank.

(4) Asia Pacific (ex-China): Japan, South Korea, Australia, New Zealand, and India.

Payment mix assumptions

Broadly, we expect card penetration to increase over time, ACH to increase modestly, and cash and check payments to decrease meaningfully. We use the pace of historical trends as a basis for our forecasts.

(1) **B2C mix:** We use Euromonitor data and our internal Goldman Sachs estimates to determine a B2C payments mix. We use data from Adyen and other online payment providers' market reports to determine the B2C online mix. We are able to calculate the implied B2C offline mix based on the total B2C mix and B2C online mix.

(2) **B2B mix:** We use Visa's Commercial Payments Study, Phoenix-Hecht's Treasury Management Monitor (for the United States), and internal estimates to determine a B2B payments mix. We use NACHA data and internal estimates to determine a B2B online mix. We are able to calculate the implied B2B offline mix based on the total B2B mix and B2B online mix.

PayPal

We use estimates from our Internet team, combined with data from company filings and our internal forecasts to build a **Total Payment Volume (TPV)** forecast for our model. We adjust this TPV figure to exclude non-payment volume including Venmo and PayPal Credit – which helps us achieve a figure more comparable to the volume traditional merchant acquirers process. We incorporate management's commentary with our internal estimates to determine PayPal's **penetration among markets** (retail, travel, bill payment, etc.). We assume PayPal has limited exposure to China.

Amazon

We source company filings (for historical data) and our Internet team's estimates for our volume forecast. We assume Amazon has minimal exposure to China and 100% of payments are made with cards (credit and debit).

Exhibit 91: Price target, methodology, and risks

Company Name	Ticker	Rating	Price 08/02/17	Price Targets	PT Methodology	Risks
Alibaba Group	BABA	Buy*	151.91	$186	SOTP analysis	Slower GMV growth, lower monetization, more intense competition
Alphabet Inc.	GOOGL	Buy*	947.64	$1100	Equal-weighted blend of DCF, 14X 2018E EV/EBITDA, and 24X 2018E P/E	Weaker-than-expected cost discipline, competition, dilutive M&A
Amazon.com Inc.	AMZN	Buy*	995.89	$1275	SOTP analysis	Competition, margin pressure from investment, valuation
First Data	FDC	Neutral	18.31	$18	11X 2018E EBITDA	Market share, financial leverage, pricing, merchant attrition.
FleetCor Technologies, Inc.	FLT	Buy	154.18	$200	21X 2018E EPS	M&A execution, interest rates, fuel prices, FX
Global Payments, Inc.	GPN	Buy	95.41	$105	22X 2018E EPS	Consumer spending, cost cutting, pricing/margins, and M&A accretion
Mastercard, Inc.	MA	Buy	130.61	$146	28X 2018E EPS	Slower consumer spending, share loss, and regulatory issues
PayPal Holdings	PYPL	Buy*	59.12	$72	85%/15% blend of 20X 2018E EV/EBITDA fundamental valuation and 24X 2018E EV/EBITDA M&A valuation	Competition, transaction/operating margin pressure, security threats
Square Inc	SQ	Buy	26.46	$29	9.5X 2018E EV/Sales	Slower client growth, faster investment, credit quality, weaker SMB trends
Tencent Holdings	0700.HK	Buy	39.48	HK$300	SOTP analysis	Slower gaming growth, competition in online advertising
Total System Services, Inc.	TSS	Buy	63.69	$71	19X 2018E EPS	Slower revenue growth, fewer client wins, weaker margin expansion
Visa, Inc.	V	Buy*	101.28	$112	26X CY18E EPS	Slower consumer spending, litigation and regulatory issues, and FX volatility
The Western Union Company	WU	Sell	19.49	$17	10X 2018E EPS	Stronger remittance volumes, improved pricing trends, more efficient compliance spending
WEX, Inc.	WEX	Neutral	106.85	$114	18.5X 2018E EPS	Credit losses, fuel prices, margin execution on acquisitions, increased competition
Wirecard AG	WDIG.DE	Buy*	77.17	€ 78	70%/30% blend of 26X 2018E PF EPS fundamental valuation and 6.5X 2018E EV/Sales M&A valuation	Volumes/pricing, regulations, M&A integration, competitive landscape
Worldline	WLN.PA	Buy	40.49	€ 39	Based on 13.5X 2018E PF EV/EBITDA (ex-minorities)	Competition, M&A, maintaining a specialized focus, regulatory changes, contract renewals, and pricing pressure

*Shares of AMZN, BABA, GOOGL, PYPL, V and WDIG.DE are on their respective regional Conviction Lists.

Source: Goldman Sachs Global Investment Research.

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Disclosure Appendix

Reg AC

We, James Schneider, Ph.D., Lara Fourman, CFA, Heath P. Terry, CFA, Piyush Mubayi, Mohammed Moawalla, Ryan M. Nash, CFA, Julia McCrimlisk, Mancy Sun, Richard Ramsden, Matthew J. Fassler, Daniel Powell, Stanley Tian, Adam Hotchkiss and Will Nance, 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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