Global Cash INDEX™

JANUARY 2018

THE AMERICAS EDITION

$3.02 TRILLION

Total **2016 value** of cash used for payments in the Americas

$3.4 TRILLION

Total **estimated amount** of cash used for payments in the Americas by 2021

1.8% CAGR of total cash use in the Americas between 2011 and 2016

2.4% Estimated compound annual rate increase of total cash use in the Americas between 2016 and 2021

Weighted average cash use as a percentage of GDP in the Americas **14.1% IN 2016**

Percentage point decline in cash share of GDP in the Americas **1.8% BETWEEN 2011 & 2016**

Estimated percentage point annual increase in GDP for the Americas **4.4% BETWEEN 2011 & 2016**

I. CASH USE INDEX

CASH USE INDEX:
THE AMERICAS EDITION

There are dozens of ways to pay these days. Digital dollars are on the rise, and mobile innovations mean even more payment method iterations to come. Around the world, however, cash is still king.

The Global Cash Index, powered by Cardtronics, focuses on cash as a payment option competing with cards, checks, direct debit and other methods consumers and businesses use to settle up. Unlike virtually all reported estimates of cash, our proprietary data analysis focuses on its use for making payments rather than hoarding.

We focused our attention on Europe in the last two editions of this report. We are concentrating on the United States, Brazil and Mexico in this edition, referring to them as the Americas. For context, the U.S. makes up 87 percent of the gross domestic product (GDP), followed by Brazil (8 percent) and Mexico (5 percent).

$3.02 trillion: Total 2016 value of cash used for payments in the Americas

1.8%: CAGR of total cash use in the Americas between 2011 and 2016

2.4%: Estimated compound annual rate increase of total cash use in the Americas between 2016 and 2021

14.1%: Weighted average cash use as a percentage of GDP in the Americas in 2016

1.8%: Percentage point decline in cash share of GDP in the Americas between 2011 and 2016

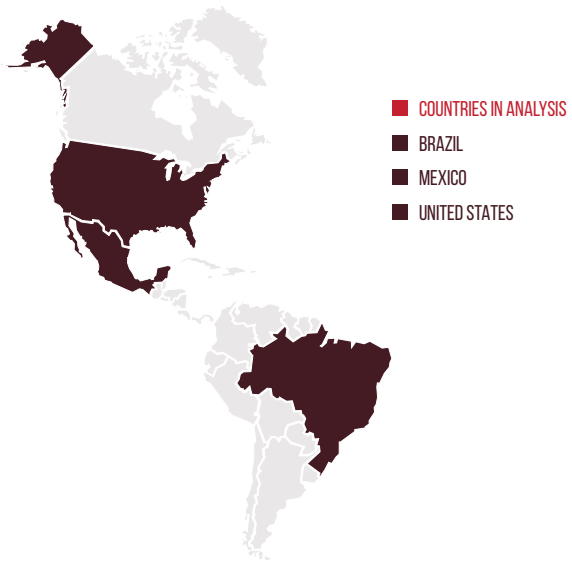
1.4%: Estimated percentage point decline in GDP cash share in the Americas between 2016 and 2021

4.4%: Estimated percentage point annual increase in GDP for the Americas between 2016 and 2021

$3.4 trillion: Total estimated amount of cash used for payments in the Americas in 2021

TABLE 1. SUMMARY STATISTICS BY COUNTRY IN THE AMERICAS

COUNTRY	POPULATION (MM)	GDP (BILLION DOLLARS)	CASH PROPENSITY 2016	ESTIMATED TOTAL CASH GROWTH 2016-2021
BRAZIL	208	1,799	21.4%	35.9%
MEXICO	128	1,047	26.1%	20.4%
UNITED STATES	323	18,624	12.7%	6.2%
TOTAL	658	21,471	—	—



II. CASH STILL LIVES ON

As the saying goes, old habits die hard — and cash is the oldest of payment habits. In fact, cash is ancient. It dates to 600 B.C. when minted coins first showed up in modern-day Turkey.[1] By comparison, checks are fairly youthful and only date to the ninth century.[2] Cash has since evolved to have several different physical forms, but its advantages and disadvantages have stayed the same.

On the plus side, cash is simple and requires no extra tools like internet or smartphones. On the downside, it's easy to lose bills and coins or run short on necessary funds, and it takes up space.

Cash is still being used by a solid portion of the population in the Americas, but is facing growing competition from alternate payment methods. In the United States, the bulk of the growth is in electronic payments. They grew by 5.8 percent per year between 2000 to 2015 — cash grew by 4.7 per year.[3] In the U.S., however, cash is still the most popular payment method when it comes to small, everyday purchases.[4] An estimated 24 percent of U.S. citizens are still making all their purchases with cash.[5]

Meanwhile, there's been a push in Brazil to use mobile payments, particularly due to safety conditions.[6] Approximately 80 percent of Brazilian households have a payment card and 30 percent of household purchases are paid for using one.

Cash is used most heavily in Mexico, and responsible for 90 percent of consumer transactions.[7] Nearly half of Mexican households do not have a bank account and rely purely on cash.[8]

The Global Cash Index, powered by Cardtronics, digs deeper into the details of how cash is being used, something we've been doing since 2013 when we realized governments don't really document the day-to-day life of cash. Each quarterly issue focuses on a region of the world, reports the historical changes in cash use and presents projections on its use in the future. This edition focuses on three countries in the Americas. Subsequent reports will analyze eight other countries that are mostly in Asia.

We examine two dimensions in this report: cash use and cash share. *Cash use* refers to the amount of cash used to make purchases or payments. *Cash share* refers to the percentage of a nation's GDP that is driven by cash. To derive our data, we calculate cash use by the amount withdrawn in a given year, including that from ATMs, banks and cash back opportunities at points of sale (POS).

For more information, please consult our Methodology section at the end of this report.

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[1] Beattie, Andrew. The history of money from barter to banknotes. Investopedia. Dec. 29, 2015. https://www.investopedia.com/articles/07/roots_of_money.asp. Accessed January 2018.

[2] Allison, Chelsea. Checking out: a brief history of checks. Fin. Jun 8, 2018. https://fin.plaid.com/articles/checking-out-a-brief-history-of-checks. Accessed January 2018.

[3] Author unknown. The Federal Reserve payments study. Board of Governors of the Federal ReserveSystem.2016.https://www.federalreserve.gov/paymentsystems/fr-payments-study.htm. Accessed January 2018.

[4] New, Catherine. Cash is still the most popular form of payment for most Americans, report says. Huffington Post. Jan, 24, 2012. https://www.huffingtonpost.com/2012/01/24/cash-most-popular-payment_n_1224636.html. Accessed January 2018.

[5] Ander, Steve and Swift, Art. Americans using cash less compared with five years ago. Gallup News. Jul. 12, 2016. http://news.gallup.com/poll/193649/americans-using-cash-less-compared-five-years-ago.aspx. Accessed January 2018.

[6] Author unknown. Brazil: where cash is not king and mobile payments thrive. Incite Group. May 31, 2016. http://www.incite-group.com/mobile-product/brazil-where-cash-not-king-and-mobile-payments-thrive. Accessed January 2018.

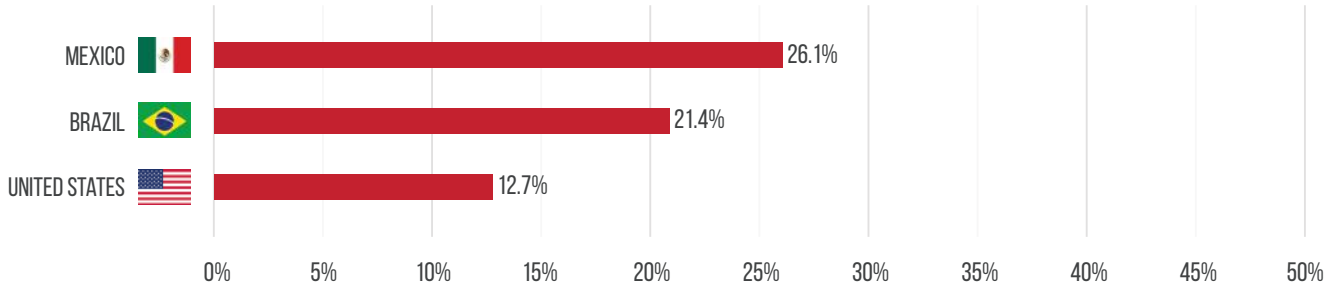
[7] Author unknown. New report: in Mexico eCommerce has a crush on cash. Apr. 14, 2017. https://www.pymnts.com/cash/2017/in-mexico-ecommerce-has-a-crush-on-cash-usage-payment-methods-javier-vallaure-allpago/. Accessed January 2018.

[8] Author unknown. Cash, please. Mexperience. Apr. 10, 2017. https://www.mexperience.com/cash-please/. Accessed January 2018.

III. CASH SHARE OF THE WALLET

As a reminder, total cash share corresponds to the cash-driven percentage of a nation's GDP. Figure 1 ranks this quarter's focus countries — Brazil, Mexico and the United States — from the largest cash share to the lowest.

FIGURE 1. CASH SHARE FOR COUNTRIES IN THE AMERICAS IN 2016



While Americans still use cash, it is losing some ground in the U.S., especially compared to Brazil and Mexico. This is mostly because cash faces stiff competition in the U.S. In fact, according to the U.S. Federal Reserve's "Survey of Consumer Payment Choice," credit and debit cards are replacing cash. It found that U.S. citizens spent a total of $2.6 trillion in cash and $5.5 trillion with cards in 2015.

Mobile payment methods are also posing a threat to cash. According to Business Insider's June 2016 "Mobile Payments Report," the number of mobile payment users is projected to reach 150 million by 2020, and the total of in-store mobile payments is expected to exceed $503 billion by 2020.[9]

With options like PayPal, Google Wallet, Apple Pay and more, paying for items electronically is perceived by some as more convenient than carrying cash. While users have become more comfortable paying for online transactions with electronic payments, it is also translating to using electronic payments in live retail environments.[10] According to a September 2017 survey, approximately 25 percent of iPhone owners have tried Apple Pay.[11]

Cash use is much higher when it comes to Brazil, but there are questions about how long cash will retain its throne. Government authorities have announced plans that reduce country's reliance on cash and will privatize the state-owned mint, following the example of Belgium, Denmark and the Netherlands. This has created concerns over security and national sovereignty.[12]

[9] Author unknown. 2016 U.S. consumer payment study. TSYS. 2016. https://www.tsys.com/Assets/TSYS/downloads/rs_2016-us-consumer-payment-study.pdf. Accessed January 2018.

[10] Ander, Steve and Swift, Art. Americans using cash less compared with five years ago. Gallup News. Jul. 12, 2016. http://news.gallup.com/poll/193649/americans-using-cash-less-compared-five-years-ago.aspx. Accessed January 2018.

[11] Author unknown, Apple Pay Stats 2017. PYMNTS. 2017. https://www.pymnts.com/apple-pay-adoption/. Accessed January 2018.

[12] Giedroyc, Richard. Brazil mint could be next. Numismaster. Nov. 28, 2017. http://www.numismaster.com/ta/numis/Article.jsp?ad=article&ArticleId=28767. Accessed January 2018.

III. CASH SHARE OF THE WALLET

Meanwhile, in Mexico, the country with the highest cash share, there are also signs that cash might be facing increasing competition. For example, Samsung launched Samsung Pay for handset users in Mexico in November 2017. As a result, Mexico happens to be the 20th largest market for Samsung Pay.[13]

Figure 2 contains our cash share projection for 2021. Table 2 compares the cash share for 2006, 2011, 2016 and 2021 for the Americas. We forecast that by 2021, Mexico and the U.S. will see slight declines. Average cash share in the Americas, weighted by GDP, was 14.1 in 2016, and we expected a decrease to 12.6 percent by 2021.

FIGURE 2. PROJECTION OF CASH SHARE IN THE AMERICAS IN 2021

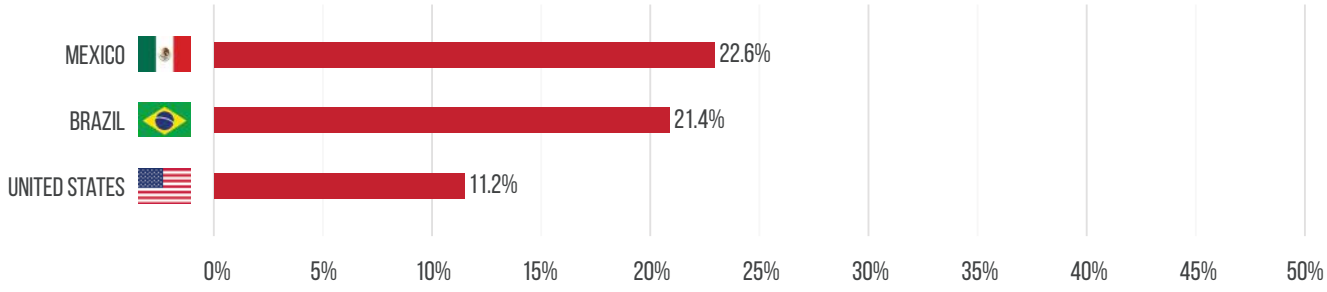


TABLE 2. CASH SHARE PER COUNTRY IN THE AMERICAS

WESTERN EUROPE	2001	2006	2011	2016	2021
BRAZIL	—	17.1%	19.9%	21.4%	21.4%
MEXICO	—	36.3%	31.4%	26.1%	22.6%
UNITED STATES	—	14.3%	14.6%	12.7%	11.2%
		15.6%	15.9%	14.1%	12.6%
UNIVARIATION 2011-2016				-1.8%	
VARIATION 2016-2021					-1.4%

[13] Farooqui, Adnan. Samsung Pay launched in Mexico. Übergizmo. Nov. 21, 2017. http://www.ubergizmo.com/2017/11/samsung-pay-launched-in-mexico/. Accessed January 2018.

IV. TOTAL CASH USE

Cash use refers to the amount of cash spent in a year. It's important to keep in mind that economic growth increases the total use of cash. For countries with a stable cash share, then, we expect total cash use to increase at the same pace as the growth of the economy.

The GDP growth of the Americas has been strong during the past five years, increasing by an average of 4.1 percent each year. It ranges from a low of 3.7 percent in the U.S. to a high of 7.4 percent in Brazil and has declined an average of 2.3 percent each year. Since the economy has grown an average of 4.1 percent each year, the overall use of cash is increasing by approximately 1.8 percent.

Table 3 lists the countries alphabetically. It shows the historical and forecast total spending in cash for every five years from 2011 to 2021, along with the five-year annual growth rate.

TABLE 3. HISTORICAL AND FORECAST TOTAL USE OF CASH BY COUNTRY IN AMERICAS

COUNTRY	2001	2006		2011		2016		2021	
	CASH USE (BILLION DOLLARS)	CASH USE (BILLION DOLLARS)	CAGR 2001-2006	CASH USE (BILLION DOLLARS)	CAGR 2006-2011	CASH USE (BILLION DOLLARS)	CAGR 2011-2016	CASH USE (BILLION DOLLARS)	CAGR 2016-2021
BRAZIL	—	118.6	—	250.6	16.1%	385.3	9.0%	523.5	6.3%
MEXICO	—	205.2	—	245.2	3.6%	273.5	2.2%	340.8	4.5%
UNITED STATES	—	1986.5	—	2270.3	2.7%	2360.4	0.8%	2542.3	1.5%
TOTAL		2310.30		2766.11	3.7%	3019.25	1.8%	3406.66	2.4%

THE CASE FOR ELIMINATING HIGH DENOMINATION NOTES

In recent years, developed countries' governments have been pushing to eliminate high denomination bank notes. The European Central Bank, for one, announced it would stop issuing €500 notes by the end of 2018,[14] a move made in response to the note's common usage in criminal circles. The €500 will remain legal tender, though, and will continue to be used as a means of payment and store of value.

In his *Washington Post* article entitled "It's time to kill the $100 bill," Lawrence H. Summers, former U.S. Treasury Secretary and a professor at Harvard, explained that high denomination bills foster crime.[15] However, it's also commonly accepted that reducing high denomination notes is the first step in reducing overall cash use.

In this section, we'll be diving into several arguments for eliminating high denomination bills, and examining the moves the U.S., Brazil and Mexico are making on that front.

High denomination bills tend to foster crime. According to Peter Sands, former chief executive of Standard Chartered bank, such bills "are the preferred payment mechanism of those pursuing illicit activities because they can be passed on anonymously, without leaving a transaction record."[16] Given its anonymity, cash also plays a key role in underground economy activities such as funding criminal activities and terrorism, corruption, money laundry, avoiding capital controls and tax evasion, among others. All of this has led to a new nickname for the €500: "the Bin Laden."[17]

This note, along with the famous $100 bill, was the most-used bill in criminal transactions. According to an article in *The New York Times*,[18] it takes about half of a standard-sized suitcase to carry $1 million dollars in $100 bills, which

weighs about 22 pounds, compared to the three-and-a-half suitcases one would need to carry the same amount in $20 bills, which weighs in at 110 pounds. Placing a ban on the emission of such high-value notes could be enough to disrupt criminal business models. Any organization dependent on the movement of large quantities of illicit cash would have to find another, more costly way of sending money, a step that would increase the likelihood of detection. Enabling a process to reduce and stop production of high denomination banknotes could hinder criminal activities and raise both the cost and risk of detection for those engaged in them.

[14] Author unknown. ECB ends production and issuance of €500 banknote. European Central Bank. May 4, 2016. https://www.ecb.europa.eu/press/pr/date/2016/html/pr160504.en.html. Accessed January 2018.

[15] Summers, Lawrence H. It's time to kill the $100 bill. The Washington Post. Feb. 16, 2016. https://www.washingtonpost.com/news/wonk/wp/2016/02/16/its-time-to-kill-the-100-bill/?utm_term=.8ed4a136a281. Accessed January 2018.

[16] Sheffield, Hazel, Scrap high-denomination banknotes to stop crime, ex-bank boss urges. Independent. Feb. 8, 2016. http://www.independent.co.uk/news/business/news/scrap-high-denomination-banknotes-to-stop-crime-ex-bank-boss-urges-a6860816.html. Accessed January 2018.

[17] Wolf-Mann, Ethan. Why $100 bills and €500 notes may soon be killed off. Money Magazine. Feb. 17, 2016. http://time.com/money/4226174/kill-100-dollar-bill-500-euro-phase-out/. Accessed January 2018.

[18] Ewing, Jack. Europe to remove 500-euro bill, the 'Bin Laden' bank note criminals love. The New York Times. May 4, 2016. https://www.nytimes.com/2016/05/05/business/international/ecb-to-remove-500-bill-the-bin-laden-bank-note-criminals.html. Accessed January 2018.

V. DEEP STATISTICAL DIVE

Meanwhile, the impact on the rest of the population would be minimal. Cash is mainly used for low-value transactions. There are several other options for higher transactions — at least in developed countries — including checks, debit cards, credit cards, prepaid cards, mobile phone solutions and, possibly, digital cryptocurrencies like bitcoin or Ethereum.

If countries were to omit high denomination bank notes, central banks could increase the lower bound on interest rates. Typically, if the interest rate of financial assets dips below zero, it still must exceed the cost of storing, insuring and safekeeping currency. Getting rid of large denominations increases the costs of storing money, which now needs to be safekept in a larger number of notes of lower value. This allows the interest rate to drop.

A central bank's ability to set interest rates at negative levels is valuable, as they can cut rates below zero to stimulate demand during business cycle downturns. Also, the rising cost of storing cash might force banks to lend more, thereby creating opportunity for a further decrease in interest rates.

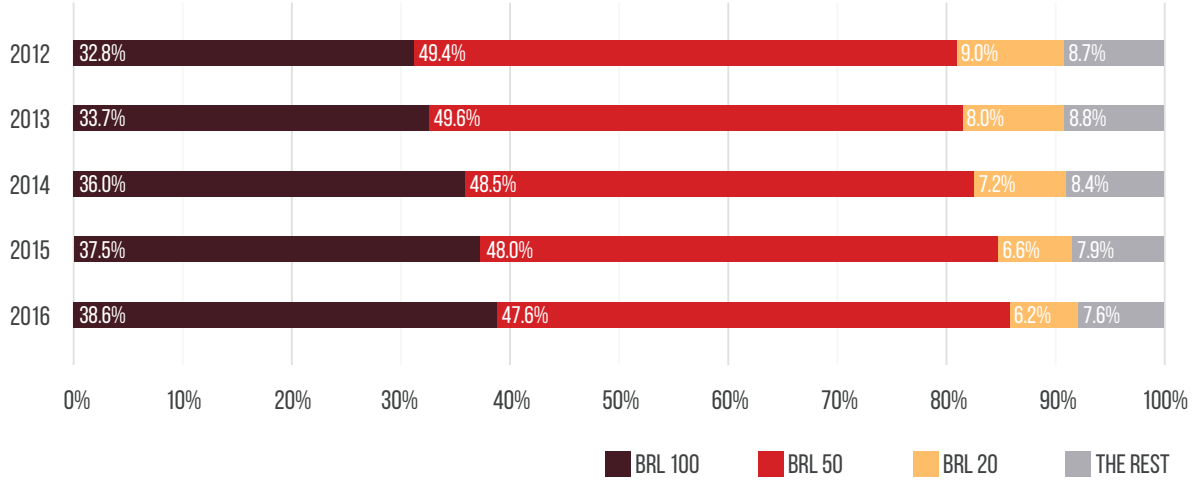
Let's consider the Americas. Are the highest denomination notes losing their importance, and are these societies moving toward a less-cash society — if not a cashless one? To answer this question for Brazil, Mexico and the U.S., we examined data from 2012 to 2016 provided by the Bank of International Settlements.

In Brazil, the share of the highest denomination bill in that country (BRL 100) increased steadily from 32.8 percent in 2012 to 38.6 percent in 2016. In the same timeframe, the most common note (BRL 50) saw a reduction in share from 49.4 percent to 47.6 percent. The rest of the denominations — including BRL 20, BRL 10, BRL 5, BRL 2, BRL 1 and coinage — have all decreased.

In Mexico, its most popular bill is its second-highest denomination, the MXN 500. The bill has increased its share from 59.6 percent in 2012 to 69.8 percent in 2016. Meanwhile, the highest denomination, the MXN 1,000, has decreased from 8.5 percent to 5.8 percent.

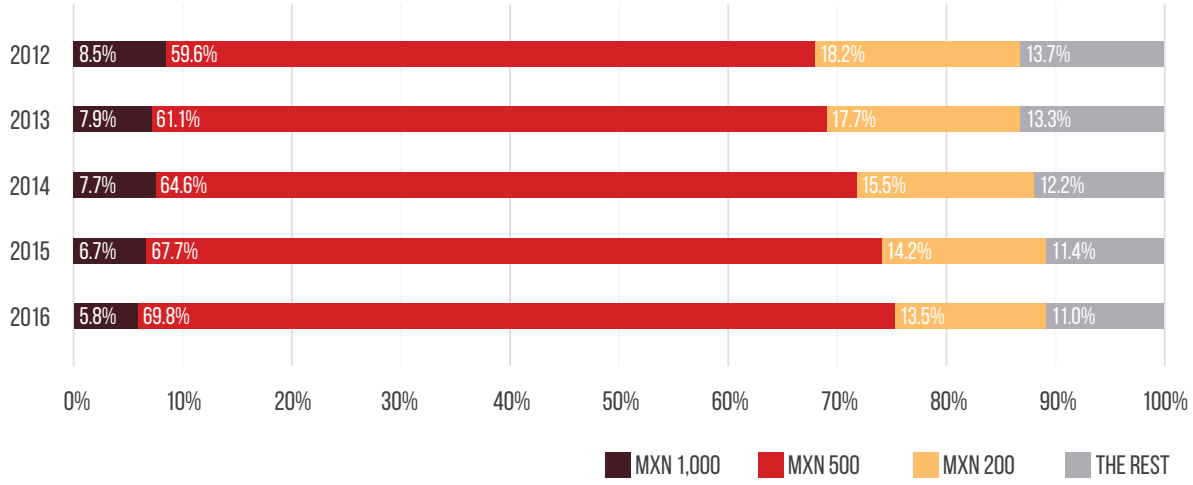
The second highest denomination bill was the most-issued note in each currency. While Mexico saw a reduction in the emission of MXN 1,000, however, Brazil is issuing increasing numbers of BRL 100. In fact, the emission rate of the MXN 500 dropped by 1.1 percent in 2016, while the issuing of the BRL 100 increased by 5.9 percent — above the 3 percent emission rate for all notes and coins.

FIGURE 3. COMPOSITION OF THE EMISSION OF BRAZILIAN BANKNOTES BY YEAR



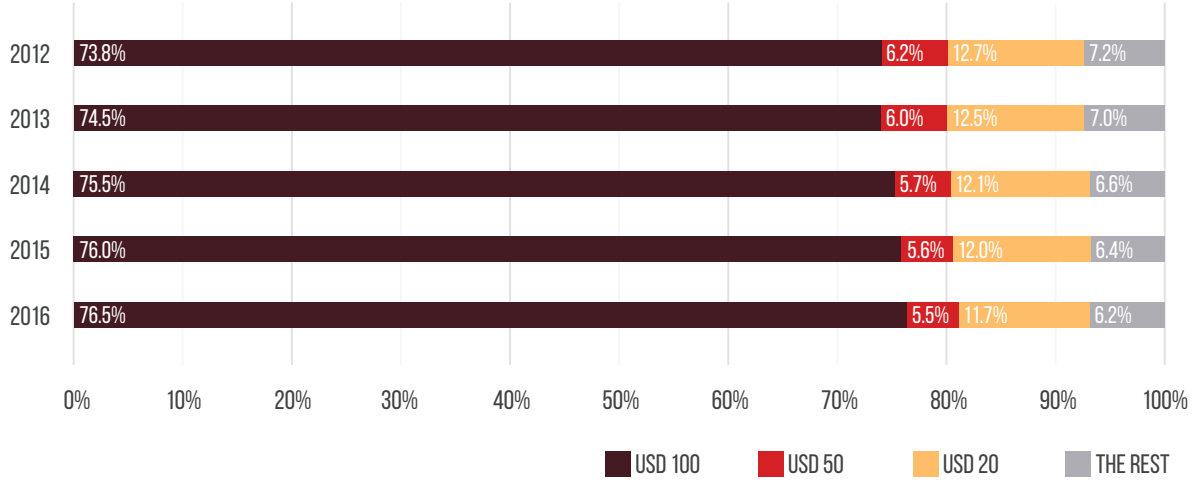
V. DEEP STATISTICAL DIVE

FIGURE 4. COMPOSITION OF THE EMISSION OF MEXICAN BANKNOTES BY YEAR



In the U.S., the share of the highest denomination bill has increased, from 73.8 percent in 2012 to 76.5 percent in 2016, while the rest of the denominations have declined. Total emission of cash increased by 5.9 percent during 2016, below the 6.7 percent registered by $100 bill issuance.

FIGURE 5. COMPOSITION OF THE EMISSION OF US BANKNOTES BY YEAR



Of the three countries, Mexico is the only one that has seen the reduction of high denomination notes also impact cash use. Given the advantages of reducing such notes, why are the U.S. and Brazil instead increasing their high denomination emissions? According to economist Willem H. Buiter, going completely cashless or even reducing the issuance of such notes would mean the loss of seigniorage revenue, something that is likely to be unpopular with the central bank.[19] Furthermore, some households and small businesses are neither familiar nor comfortable with existing alternatives to paper currency.

ATM AND BANK BRANCH AVAILABILITY INDEX

To discuss cash's accessibility in 40 countries around the world, we created two indexes measuring the availability of ATMs and bank branches (for more details, please turn to our Methodology section). The top score is 100 points and the minimum is zero. Each Index creates an aggregate value for different variables, including population, GDP per capita, ATM and bank branches per every 100,000 people and participation of ATM withdrawals, over-the-counter (OTC) withdrawals and cash overall as a percentage of the GDP.

As can be seen in Figure 6, the Americas (32) earned a score like that of Western Europe (33) for the ATM Availability Index, one that was well above the Worldwide Average (28). Inside the Americas, there is a significant difference between the U.S. and the other two developing countries of Mexico and Brazil. Both Mexico and Brazil have large rural populations and a prevalence of informal economic activities, resulting in a very low Index score when compared to the U.S. Similar factors explain the scores for the Bank Branches Availability Index, in which Mexico (7) and Brazil (16) lag far behind the U.S. (47).

FIGURE 6. ATM AVERAGE INDEX

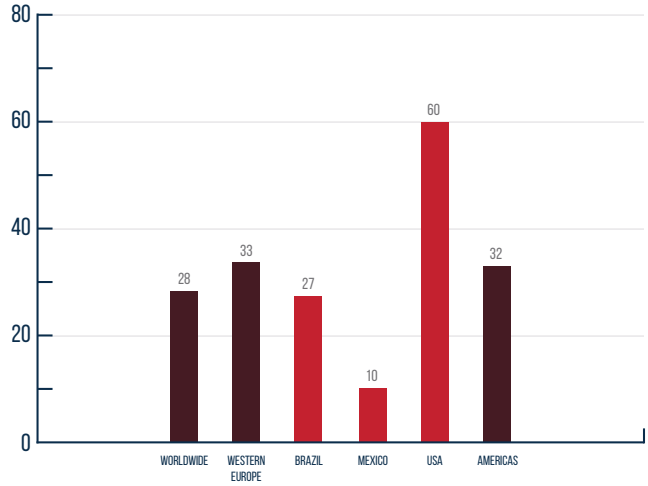
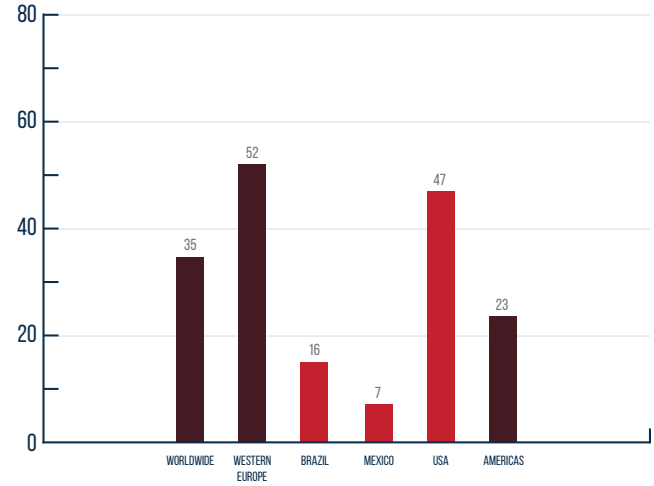


FIGURE 7. BANK BRANCHES AVERAGE INDEX



[19] Chalabi, Mona. Brazil has more ATMs than any other country. Where are all the world's cash machines?. The Guardian. Dec. 17, 2013. https://www.theguardian.com/news/datablog/2013/dec/17/where-are-the-worlds-cash-machines-atms. Accessed January 2018.

V. DEEP STATISTICAL DIVE

TABLE 4. COMPARISON OF ATM AND BANK BRANCHES AVAILABILITY INDEXES IN THE AMERICAS

COUNTRY	WORLDWIDE AVERAGE INDEX	WESTERN EUROPE	BRAZIL	MEXICO	USA	AMERICAS
ATM Avg. Index	**28**	**33**	27	10	60	**32**
Bank Branches Avg. Index	**35**	**52**	16	7	47	**23**
Population	**108**	**25**	208	128	323	**219**
GDP Per Cap (Avg.)	**28**	**43**	9	8	58	**25**
ATM Share	**15.0%**	**11.6%**	20.9%	16.5%	3.8%	**5.9%**
OTC Share	**10.0%**	**6.4%**	0.5%	9.6%	8.9%	**8.2%**
Cash Share	**24.6%**	**17.9%**	21.4%	26.1%	12.7%	**14.1%**
POS Per 100,000	**1957**	**2416**	2447	702	4302	**2484**
ATM Per 100,000	**78**	**90**	77	38	151	**89**
Bank Branches Per 100,000	**28**	**38**	16	10	35	**20**

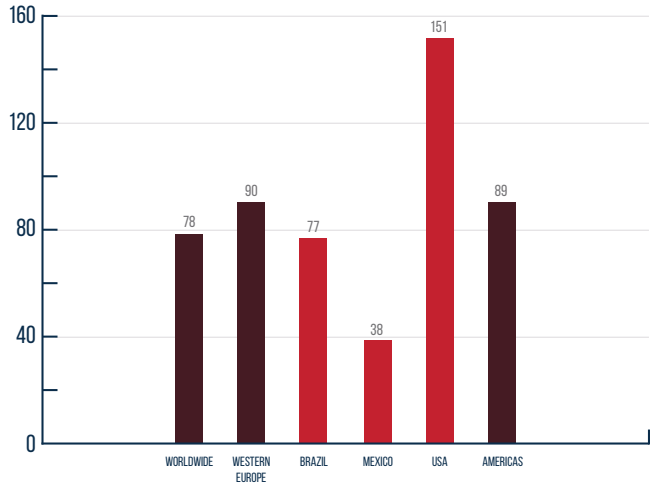
The GDP per capita of the Americas is lower than that of Europe. Europe contains countries registering very high GDP per capita, though, including Germany, Switzerland and Luxembourg. It is also important to remember that analysis of the countries in the Americas is very heterogeneous. The U.S. is the most developed country in the world, while Mexico and Brazil are developing, which impacts the blended score for the Americas

What is remarkable is that overall cash share of the Americas (14.1 percent) is lower than that of Western Europe (17.9 percent), even though OTC share (8.2 percent) is higher than that of Europe (6.4 percent). Here, the sheer weight of the U.S. economy must be taken into consideration, since it represents approximately 87 percent of the total GDP of the Americas. Brazil's cash share (21.4 percent) and Mexico's (26.1 percent) are similar to the worldwide average (25 percent), but the U.S.'s very low cash share (12.7 percent) lowers the weighted average considerably.

Meanwhile, the ATM share of these developing countries is also like the worldwide average (15 percent): 20.9 percent for Brazil and 16.5 percent for Mexico. Given the high usage of credit and debit cards in the U.S., however, the ATM share was only 3.8 percent.

Brazil does a particularly excellent job in terms of ATM availability: 77 per 100,000 people. While that's half that of the U.S. (151 per 100,000), it is much higher than Mexico's 38 per 100,000. In fact, according to the World Bank, Brazil is home to more ATMs than any other country.[20]

FIGURE 8. NUMBER OF ATMS PER 100,000 PEOPLE



[20] Chalabi, Mona. Brazil has more ATMs than any other country. Where are all the world's cash machines?. The Guardian. Dec. 17, 2013. https://www.theguardian.com/news/datablog/2013/dec/17/where-are-the-worlds-cash-machines-atms. Accessed January 2018.

FEATURE STORY

HOW CROSS RIVER BANK KEEPS CASH FLOWING

In the financial services world, most buzzworthy payment innovations are frequently aimed at rendering older, physical financial concepts moot. This includes checks, brick-and-mortar bank branches, ATM cards and, yes, cash.

But not all financial innovations are focused on making such concepts obsolete. Some companies, like Cross River Bank of Teaneck, New Jersey, have launched services to ease consumers' access to physical cash notes by tapping into the convenience of the existing financial infrastructure.

That infrastructure is helping keep cash a fixture of U.S. commerce today. The U.S. Federal Reserve's "Survey of Consumer Payment Choice" found Americans spent $2.6 trillion in cash in 2015, a higher rate than that of Western European nations.

Given its high usage in the U.S., some financial institutions (FIs) see a need to innovate how their consumers access cash. PYMNTS recently spoke with Ben Isaacson, senior vice president of Cross River Bank, who discussed how the FI's newest offering addresses the needs of underbanked consumers and millennials, and why he believes it could spell trouble for the U.S. Postal Service (USPS).

The ATM real estate advantage

Cross River teamed up with Mastercard in 2017 to launch Mastercard Cash Pick-Up, a disbursement service that delivers cash on behalf of businesses to vetted recipients through a network of ATMs.

According to Isaacson, the service is intended to offer businesses a new option to make cash payments by allowing recipients to pick them up at a nearby ATM. It can be used by businesses to send customer rebates and, in the case of consumers, be used by family and friends to send emergency funds to one another. Other uses include social benefits disbursement, such as Social Security payments.

Businesses or individuals that need to send money or make payments can use Cash Pick-Up to initiate a request. Once the transaction is initiated, the sender's bank is notified to send money to the recipient.

The service delivers a code to the recipient's smartphone via text message. Once the code is entered at an enabled ATM, he or she can access the cash without using a debit card.[22] It is intended to offer consumers a convenient way to access funds by tapping into a network of thousands of ATMs, Isaacson said.

"What ATMs have is a big and broad real estate footprint," he added. "So, anywhere you are in the country, you're [likely] just a few blocks from an ATM."

In addition to winning over consumers with the promise of easy cash access, Isaacson noted the joint service is also appealing to newer financial players. These emerging players often lack the broad physical infrastructure needed to reach consumers wherever they might go.

"We're seeing a lot of interest from emerging FinTechs and payment companies who really like the physical footprint of the ATM network," he said. "Because they don't have extensive brick-and-mortar infrastructure, the ability to send money to a place where consumers can physically go and pick it up is very attractive to them."

> "We look at it from distribution perspective. Even if you don't have a bank account, you can still go to an ATM and get money out."

End of the mail drop?

For businesses and individuals initiating payments, Cross River's Cash Pick-Up service can offer an additional cost-saving benefit. By alerting recipients to pick up their cash at a local ATM, these parties can avoid costs associated with issuing checks and the consumer frustration that stems from being forced to wait by their mailboxes.

Isaacson noted that many businesses end up making wage and rebate payments in this manner, and the reason often involves accessing consumers' checking accounts and routing numbers. In some cases, such numbers are difficult to remember, and in others, consumers might not know how to find the information on a digital platform. Some might be uncomfortable sharing the information, while others might not have a checking account at all.

It's far more difficult for these consumers to get set up for electronic payments without their account information, though. As a result, some businesses and employers are often forced to use the U.S. Mail to make payments via paper check.

Isaacson pointed out that smartphone numbers are more easily accessible and sharable than checking account numbers, adding that it makes the Cash Pick-Up service — and the cash element — even more appealing to tech-savvy millennial users.

"Millennials love getting text messages saying your money's there and [they] just need to go to the nearest ATM," he said.

Another benefit is that it helps businesses and senders rely less on USPS to deliver payments. While a service that encourages the use of cash might seem counterintuitive, Cross River Bank believes consumers will use it if it can take postal deliveries out of the payment equation and more quickly distribute payments.

"While the end result is more cash in the system, what it's really doing is replacing a manual paper-based distribution

[22] Author unknown. US ATMs finally see growth. PYMNTS. Aug. 9, 2017. https://www.pymnts.com/cash/2017/atmia-says-us-atms-finally-see-growth/. Accessed January 2018.

system — the U.S. Mail — with a mobile, electronic payment," Isaacson said.

Will the service help to #KillTheMail and #KillTheCheck at the same time? Time will tell.

Assisting the un- and underbanked

Companies can use Cash Pick-Up to more easily distribute funds to customers, Isaacson said, and family and friends can also use it to send money to each other — thus saving them a trip to Western Union, or a MoneyGram that only operates during specific hours.

The service can also help unbanked consumers transact without hassles.[23] According to the Federal Deposit Insurance Corporation (FDIC)'s "Consumers and Mobile Financial Services 2016 Report," approximately 9 percent of Americans do not have access to banking services like checking, savings or money market accounts. Meanwhile, 22 percent were "underbanked," meaning they had a bank account, but also relied on alternative financial services like money orders, cash checking and payday loans.

For these underbanked consumers, Cash Pick-Up means access to funds without needing a bank account — just a smartphone. The same FDIC report found 70 percent of underbanked consumers had access to a smartphone, 40 percent for unbanked respondents.

"Being able to pay using a cell phone number will allow [businesses] to reach a population that doesn't have bank accounts," Isaacson explained.

A service that enables recipients to access cash at the nearest ATM helps put the unbanked and underbanked populations on stronger financial footing.

"We look at it from [a] distribution perspective," he said. "Even if you don't have a bank account, you can still go to an ATM and get money out."

Allowing the underbanked access to fast financial services also points to the role cash continues to play in the economy — even as it faces increased competition from newer financial tools.

"Cash still works everywhere," Isaacson noted. "People use less of it, but they still need some of it."

While there are available alternatives to cash, a widespread network of ATMs and a population that relies on quick access to money indicates cash usage will continue to persist in the U.S. for years to come.

[23] Author unknown. US ATMs finally see growth. PYMNTS. Aug. 9, 2017. https://www.pymnts.com/cash/2017/atmia-says-us-atms-finally-see-growth/. Accessed January 2018.

APPENDIX

METHODOLOGY AND DATA

The Global Cash Index, powered by Cardtronics analyzes the level of overall cash usage and projected trends over the next five years for 40 countries around the world that provide sufficient data to make estimates on cash usage. These countries are divided into four regions, and we will publish reports that review cash share and total cash usage, covering one region each quarter. The four regions are as follows:

WESTERN EUROPE	EASTERN EUROPE	THE AMERICAS	ASIA AND OTHER
AUSTRIA	BULGARIA	UNITED STATES	AUSTRALIA
BELGIUM	CROATIA	MEXICO	CHINA
FINLAND	CZECH REPUBLIC	BRAZIL	INDIA
FRANCE	ESTONIA		JAPAN
GERMANY	GREECE		SOUTH KOREA
IRELAND	HUNGARY		SINGAPORE
ITALY	LATVIA		SAUDI ARABIA
LUXEMBOURG	LITHUANIA		SOUTH AFRICA
MALTA	POLAND		
NETHERLANDS	ROMANIA		
PORTUGAL	RUSSIA		
SPAIN	SLOVAKIA		
SWEDEN	SLOVENIA		
SWITZERLAND	TURKEY		
UNITED KINGDOM			

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Total cash usage is the combination of two overall factors:

- The first factor is cash share, or the amount of total purchases that are made with cash. We measure cash share as the total amount of cash used by a country divided by the country's annual GDP. The total cash used by citizens of the country is assumed to be equal to the total amount of cash withdrawn at ATM machines plus the total amount of cash withdrawn OTC at bank branches in the country.
- The second factor is how the overall economy is growing. The total cash usage is estimated as the total cash share multiplied by the country's GDP. As a country's economy develops and grows, more overall spending occurs, which means more cash spending is occurring.

What we have found is that the total cash share is decreasing in most countries; however, because population and GDP are growing, the total cash usage is still growing (albeit at rates lower than the GDP).

In order to calculate the results in this report, we did the following for each country:

- Gather historic and projected data.
- Estimate OTC cash withdrawals for countries that do not report this data.
- Calculate historic cash share.
- Estimate cash share for 2015 forward.
- Estimate total cash usage for 2015 forward.

Gathering Historical and Projected Data

For each country, we collected historical data from 2000 through 2014 on the total population, the GDP, cash withdrawals from ATM and OTC, total card spending data, and data on payment infrastructures including the number of POS machines, the number of ATM machines, and the number of bank branches.[23] We also gathered data to project cash usage including projected GDP and projected population by age group.[24]

We gathered data from 2000 through 2016 and used as much data as is available. We have data on population and GDP for all years and data on cash withdrawals and payments infrastructure for many, but not all years.

For each country, we collected projections for the GDP and for population by age group. This data comes from the International Monetary Fund (IMF) and World Bank, respectively, and is from the same source as the historical data. Population projections are available every five years, and we used a linear interpolation for the years that are not reported. GDP projections are by year, and if we needed time periods beyond the last projected data point, we assumed that final GDP growth rate will be consistent over time.

Estimate OTC Cash Withdrawals for Countries Which Do Not Report This Data

As described above, cash share is defined as the total cash withdrawals from ATM machines plus total OTC cash withdrawals. We have selected the 40 countries in our analysis based on the availability of sufficient cash withdrawal data. The 40 included countries produced at least some data on the level of ATM withdrawals each year. If ATM withdrawals are not available, the country is excluded from our analysis.

While all 40 countries provided ATM data, only 12 provided data on OTC cash withdrawals. This means that for the other 28 countries, we had to estimate the level of OTC withdrawals. We did this by looking at each of our 28 target countries (the ones for which we need to estimate OTC withdrawals) and selecting a comparable country from the 12 countries that did provide data (we refer to these as our potential comparable countries).

The estimation procedure is done in the following four steps:

- **ONE:** Calculate the OTC-to-ATM ratio for each of the 12 potential countries that do provide OTC data. These are all potentially comparable countries. This is a simple calculation of dividing the level of OTC withdrawals by the level of ATM withdrawals for each year where data is available.

[23] Data on Population is from the World Bank [http://data.worldbank.org/indicator/SP.POP.TOTL], Data on GDP is from the IMF [http://www.imf.org/external/ns/cs.aspx?id=28], and data on cash with drawals, card spending and the payments infrastructure is from the Bank of International Settlements [http://www.bis.org/cpmi/publ/d142.pdf] or from the European Central Bank [https://www.ecb.europa.eu/pub/pdf/other/art2_mb201104en_pp79-90en.pdf]

[24] Data on projected population is from the World Bank, and projected GDP is from the IMF. If these are the same, combine these footnotes into a single footnote.

- **TWO:** Estimate the logarithm trend of the OTC to ATM ratio from 2000 through 2014 for each of the potentially comparable countries.[25]

$$\overline{\left(\frac{OTC}{ATM}\right)_{Year}} = \propto + \beta \times LN(Year) + \varepsilon$$

We do this to remove any data jumps or movements that are due to factors specific to the country. This trend gives us a complete trend of the OTC to ATM ratio for each year from 2000 through 2014.

- **THREE:** Select the potential comparable country. For each country that does not have OTC data (target country), we select the most comparable country from the list of countries that do provide OTC data. This country is selected by comparing the trends and levels in five different variables:
  - ATM withdrawals as a percentage of GDP
  - Card spending as a percentage of GDP
  - Bank branches per 1,000 people
  - ATM terminals per 1,000 people
  - POS terminals per 1,000 people

For each potential comparable country, we calculate a difference in levels and a difference in changes over an eight-year period from 2006 to 2014. These are calculated as follows:

$$Difference\ in\ levels = \sqrt{\sum_{i=2006}^{2014} (Variable_{Comparable/i} - Variable_{Target/i})^2}$$

$$Difference\ in\ changes = \sqrt{\sum_{i=2006}^{2014} \left(\frac{Variable_{Comparable/i}}{Variable_{Comparable/i-1}} - \frac{Variable_{Target/i}}{Variable_{Target/i-1}}\right)^2}$$

In the formula above, i is the year and "Variable" refers to each of the five variables listed above. We perform this calculation for each of the 28 target countries against each of the 12 potential comparable countries. This provides a difference in levels and a difference in changes for each of the five variables for each combination of a target country and comparable comparison country. We then assign a weight of two-thirds to the difference in levels and one-third difference in changes, and for each target and comparable country, we calculate a weighted average difference:

$$Weighted\ Average\ Difference_{ij} = 0.667 * Avg\ difference\ in\ levels + 0.333 * Avg\ difference\ in\ changes$$

where i is the target country and j is the comparable country.

For each target country, we then have a weighted average difference for each of the 12 potential comparable countries. The comparable country for each target is selected as the potential comparable country with the smallest difference for each target

[25] For three countries, the reduction in OTC-to-ATM ratio was so strong that we used a polinomial trend. These three countries were Latvia, Romania and Slovakia.

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country. The following table shows the comparable country selected for each of the 28 target countries.

NUMBER	TARGET	COMPARABLE
1	AUSTRALIA	UNITED KINGDOM
2	AUSTRIA	ITALY
3	BELGIUM	NETHERLANDS
4	BRAZIL	MALTA
5	BULGARIA	HUNGARY
6	CHINA	SLOVAKIA
7	CROATIA	MALTA
8	ESTONIA	NETHERLANDS
9	FINLAND	NETHERLANDS
10	FRANCE	ITALY
11	GREECE	HUNGARY
12	INDIA	SLOVAKIA
13	IRELAND	LATVIA
14	JAPAN	GERMANY
15	KOREA	UNITED KINGDOM
16	LUXEMBOURG	ITALY
17	MEXICO	CZECH REPUBLIC
18	POLAND	HUNGARY
19	PORTUGAL	UNITED KINGDOM
20	RUSSIA	ROMANIA
21	SAUDI ARABIA	SLOVAKIA
22	SINGAPORE	NETHERLANDS
23	SLOVENIA	HUNGARY
24	SOUTH AFRICA	SLOVAKIA
25	SWEDEN	NETHERLANDS
26	SWITZERLAND	NETHERLANDS
27	TURKEY	MALTA
28	UNITED STATES	UNITED KINGDOM

- **FOUR:** Calculate the estimated level of OTC withdrawals for the target country. We have 28 target countries for which we are estimating the level of OTC withdrawals. For nine of these countries, we do have data on the OTC-to-ATM ratio for a single year but have no other data that can allow us to understand how it's trending. For these countries, we adjust the value of $\overline{\left(\frac{OTC}{ATM}\right)_{Year}}$ such that it matches the known OTC-to-ATM ratio. This has the result of shifting the OTC-to-ATM ratio for every year up or down such that our estimated trend line passes through the known point. For the other 19 countries, we assume that this adjustment is equal to zero or that the OTC-to-ATM ratio for the selected comparable country is the same as the OTC-to-ATM ratio for the target country.

  For each target country, we then take this adjusted value of $\overline{\left(\frac{OTC}{ATM}\right)_{Year}}$ for the selected comparable country and use it to calculate the level of OTC withdrawals for each from 2000 through 2014.

$$OTC\ Withdrawals_{Year} = \overline{\left(\frac{OTC}{ATM}\right)_{Year}} \times ATM\ Withdrawals_{Year}$$

  The following table identifies the 12 countries for which OTC data is reported, the nine countries for which we have to estimate the trend based on a comparable country but for which we do have a single known data point to set the level of OTC withdrawals, and the 19 countries for which the trend and OTC-to-ATM ratio are derived from the comparable country.

ASIA AND OTHER

NO	COUNTRY	SOURCE OF OTC DATA		
		OTC DATA AVAILABLE	KNOWN DATA POINT	VALUE IS DERIVED
1	AUSTRALIA		✔	
2	CHINA			✔
3	INDIA			✔
4	JAPAN			✔
5	SOUTH KOREA			✔
6	SINGAPORE			✔
7	SAUDI ARABIA			✔
8	SOUTH AFRICA			✔

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WESTERN EUROPE

NO	COUNTRY	SOURCE OF OTC DATA		
		OTC DATA AVAILABLE	KNOWN DATA POINT	VALUE IS DERIVED
1	AUSTRIA			✓
2	BELGIUM			✓
3	FINLAND		✓	
4	FRANCE		✓	
5	GERMANY	✓		
6	IRELAND		✓	
7	ITALY	✓		
8	LUXEMBOURG			✓
9	MALTA	✓		
10	NETHERLANDS	✓		
11	PORTUGAL		✓	
12	SPAIN	✓		
13	SWEDEN		✓	
14	SWITZERLAND			✓
15	UNITED KINGDOM	✓		

EASTERN EUROPE

NO	COUNTRY	SOURCE OF OTC DATA		
		OTC DATA AVAILABLE	KNOWN DATA POINT	VALUE IS DERIVED
1	BULGARIA			✓
2	CROATIA		✓	
3	CZECH REPUBLIC	✓		
4	ESTONIA			✓
5	GREECE			✓
6	HUNGARY	✓		
7	LATVIA	✓		
8	LITHUANIA	✓		
9	POLAND			✓
10	ROMANIA	✓		
11	RUSSIA			✓
12	SLOVAKIA	✓		
13	SLOVENIA		✓	
14	TURKEY			✓

AMERICAS

NO	COUNTRY	SOURCE OF OTC DATA		
		OTC DATA AVAILABLE	KNOWN DATA POINT	VALUE IS DERIVED
1	UNITED STATES		✓	
2	MEXICO			✓
3	BRAZIL			✓

Calculate historical cash share.

The cash share is defined as the total cash spending divided by the GDP. In this sense, cash usage is relative to the overall size of the economy. Total cash spending is defined as ATM withdrawals plus OTC withdrawals. Total cash share is calculated as follows:

$$Cash\ Share_{Year} = \frac{ATM\ Withdrawals_{Year} + OTC\ Withdrawals_{Year}}{GDP_{Year}}$$

Estimate cash share for 2015 forward.

The cash share is estimated as a logarithm trend of the historical data. We then estimate the log trend and adjust the line such that it lines up with the historic data for 2014. This creates a naïve historic cash share trend starting at the historic cash share for 2014, rolling forward for five or 10 years.

We then adjust this naïve cash share based on the demographic trends in the country and the likelihood that younger demographics will be more prone to shift away from cash to new payment methods such as mobile wallets or other new technologies that are becoming available. This adjustment analyzes the proportion of the population that is younger and accounts for the relative amount of spending (because younger people generally earn and spend less than older people). This analysis suggests that the actual cash share is likely to be lower than the naïve cash share estimated above once we take these factors into account.

This analysis results in a projected cash share that is less than the cash share projected using the naïve analysis described above.

Estimate total cash usage for 2015 forward.

The total cash usage is calculated by multiplying the adjusted cash share by the projected GDP for each year, 2015 through 2020.

ATM AND BANK BRANCH
AVAILABILITY INDEXES

We have created two Indexes based on the availability of ATMs and bank branches. To do this, we used economy data and population data from 40 countries, which are listed below:

- AUSTRALIA
- AUSTRIA
- BELGIUM
- BRAZIL
- BULGARIA
- CHINA
- CROATIA
- CZECH REPUBLIC
- ESTONIA
- FINLAND
- FRANCE
- GERMANY
- GREECE
- HUNGARY
- INDIA
- IRELAND
- ITALY
- JAPAN
- LATVIA
- LITHUANIA
- LUXEMBOURG
- MALTA
- MEXICO
- NETHERLANDS
- POLAND
- PORTUGAL
- ROMANIA
- RUSSIA
- SAUDI ARABIA
- SINGAPORE
- SLOVAKIA
- SLOVENIA
- SOUTH AFRICA
- SOUTH KOREA
- SPAIN
- SWEDEN
- SWITZERLAND
- TURKEY
- UNITED KINGDOM
- UNITED STATES

The Indexes measure the availability of ATM and bank branches per 100,000 inhabitants in each of the 40 countries. The maximum value Indexes can achieve is 100 points and the minimum is 0. Each country has its own score.

The following table shows how we calculated both Indexes for each country. We first obtained the number of ATM and bank branches per 100,000 people, then took the lowest and the highest number for each Index and set them at 0 and 100, respectively. The rest of the numbers were calculated according to the following formula:

$$Index_i = \frac{x_i - x_{Min}}{x_{Max} - x_{Min}}$$

In the formula, x is the number of ATM and bank branches per 100,000 people and i represents each country with neither a minimum nor a maximum score. In the table below, the pink highlights the minimum and the green denotes the maximum.

COUNTRY	SOURCE OF OTC DATA			
	OTC DATA AVAILABLE	KNOWN DATA POINT	VALUE IS DERIVED	VALUE IS DERIVED
AUSTRALIA	132.3	22.89	51.9	27.3
AUSTRIA	156.1	47.49	62.6	67.8
BELGIUM	139.7	31.33	55.2	41.2
BRAZIL	81.4	—	29.1	—
BULGARIA	79.2	51.61	28.1	74.6
CHINA	63.1	—	20.9	—
CROATIA	—	27.84	—	35.4
CZECH REPUBLIC	43.6	19.68	12.2	22.0
ESTONIA	61.0	8.15	20.0	3.0
FINLAND	37.3	19.21	9.3	21.2
FRANCE	96.1	58.45	35.7	85.9
GERMANY	104.5	41.43	39.5	57.8
GREECE	62.8	23.42	20.8	28.2
HUNGARY	48.9	29.38	14.5	38.0
INDIA	16.4	11.15	0.0	7.9
IRELAND	56.9	22.20	18.1	26.1
ITALY	81.6	50.13	29.2	72.2
JAPAN	107.7	—	40.9	—
LATVIA	53.3	13.90	16.5	12.5
LITHUANIA	41.9	19.21	11.4	21.2
LUXEMBOURG	92.0	39.61	33.9	54.8
MALTA	49.9	25.53	15.0	31.6
MEXICO	37.9	10.61	9.6	7.0
NETHERLANDS	41.4	10.42	11.2	6.7
POLAND	56.3	37.64	17.9	51.6
PORTUGAL	149.5	53.81	59.6	78.2
ROMANIA	57.9	24.91	18.6	30.6
RUSSIA	89.5	26.24	32.7	32.8
SAUDI ARABIA	54.9	6.34	17.2	0.0
SINGAPORE	50.8	8.51	15.4	3.6
SLOVAKIA	50.4	23.80	15.2	28.8
SLOVENIA	81.9	28.55	29.3	36.6
SOUTH AFRICA	52.7	7.37	16.2	1.7
SOUTH KOREA	239.7	14.84	100.0	14.0
SPAIN	107.5	67.01	40.8	100.0
SWEDEN	31.9	—	6.9	—
SWITZERLAND	84.6	29.76	30.5	38.6
TURKEY	62.1	15.79	20.5	15.6
UNITED KINGDOM	108.2	—	41.1	—
UNITED STATES	—	34.83	—	47.0

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