

the PYMNTS.com

Global Cash Index™

a **CARDTRONICS** collaboration

JANUARY 2017



Global Cash Index™

Snapshot

\$3.06T

Total amount of cash used for payments in the Americas in 2015.

\$3.5T

Total estimated amount of cash used for payments in Americas in 2020.

2.5%

Compound annual rate of increase of total cash use in Americas based on weighted average across countries between 2010 and 2015.

4.3%

Estimated percentage point annual increase in GDP for Americas between 2015 and 2020.

2.56%

Estimated compound annual rate of increase in total cash use in Americas based on weighted average across countries between 2015 and 2020.

1.2%

Estimated percentage point decline in cash share of GDP in Americas between 2015 and 2020.

14.6%

Weighted average cash use as a percent of GDP in Americas in 2015.

2.2%

Percentage point decline in cash share of GDP in Americas between 2010 and 2015.

Cash Use Index: The Americas Edition

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Today, cash is the most commonly used payment method in the world. While payment methods have multiplied and the rise of mobile has opened the door to all kinds of new ways to exchange money, cash still wins the popularity contest.

The PYMNTS.com Global Cash Index powered by Cardtronics index focuses on ***cash as a payment method*** that competes with cards, checks, direct debit and other methods of settling up between consumers and businesses. Unlike virtually all reported estimates of cash, our proprietary data analysis focuses on the use of cash for making payments rather than hoarding.

During our last two editions, we covered Europe. In this edition, we cross the ocean to the Americas and focus on the United States, Brazil and Mexico. For convenience, we will refer to them as the Americas. In terms of gross domestic product (GDP), the group is dominated by the U.S. (86 percent), followed by Brazil (8 percent) and Mexico (6 percent).

\$3.06 trillion: Total amount of cash used for payments in Americas in 2015

2.5%: Compound annual rate of increase of total cash use in Americas based on weighted average across countries between 2010 and 2015

2.56%: Estimated compound annual rate of increase in total cash use in Americas based on weighted average across countries between 2015 and 2020

14.6%: Weighted average cash use as a percent of GDP in Americas in 2015

2.2%: Percentage point decline in cash share of GDP in Americas between 2010 and 2015

1.2%: Estimated percentage point decline in cash share of GDP in Americas between 2015 and 2020

4.3%: Estimated percentage point annual increase in GDP for Americas between 2015 and 2020

\$3.5 trillion: Total estimated amount of cash used for payments in Americas in 2020

Cash Use Index: The Americas Edition

Table 1. Summary statistics by country by Americas

Country	Population (millions)	GDP (billion dollars)	Cash propensity 2015	Total cash growth 2015–2020
Brazil	206.1	1,756	22.2%	43.8%
Mexico	125.4	1,153	26.7%	12.6%
United States	318.9	17,968	13.1%	8.6%
Total	650.4	20,877	--	--

GDP, gross domestic product

Despite Its age, Cash Still Endures In The Americas

In a day and age where funds zip around the world at the press of a tablet, phone or computer button, cash seems ancient and clunky. In fact, cash is ancient: It dates back to 600 B.C.¹ Since that time, cash has gone through a couple of facelifts and some plastic surgery. Dolphin teeth (Solomon Islands), squirrel pelts (Russia) and tea bricks (China)² have all turned into paper and metal coins. However, the original disadvantages cash came with still exist. Cash is heavy. It can be stolen. It's easy to lose, and there's nothing more embarrassing than opening your wallet at a cash-only location and realizing you're short a few bucks.

And yet, despite its age and flaws, cash endures. While paper checks are going the way of the dodo (Americans are writing about 1.8 billion fewer checks each year),³ cash is still the most popular payment form when it comes to small, everyday purchases.⁴ But overall, considering the plethora of other payments options, from apps that transfer money between different banks for free (never worry about splitting bills at restaurants again) to the trusty credit card (never worry about being short again, which may come with its own hazards), cash is doing surprisingly well considering its age and limitations. A 2013 Federal Reserve survey found that U.S. consumers paid with cash for retail goods 8.5 times a month compared to 8.0 with debit cards and 5.9 with credit cards.⁵ A recent report from the Reserve Bank of Australia⁶ showed that cash use across the U.S. in 2015 was 32 percent. Americans use cash much less than Germans, Italians, Spaniards and Portuguese. And Americans use far less cash than developing nations – cash has the added advantage of being simple. You don't need a phone or internet connection to use it.

¹ Beattie, A. "The History of Money from Barter to Banknotes," Investopedia. Retrieved from http://www.investopedia.com/articles/07/roots_of_money.asp

² Shane. "10 Bizarre Forms of Ancient Currency," MBA in Finance Guide. Retrieved from <http://www.mba-in-finance.org/10-bizarre-forms-of-ancient-currency/>

³ Thomas, O. "The Death of the Paper Check," Business Insider, March 13, 2013. Retrieved from <http://www.businessinsider.com/the-death-of-the-paper-check-2013-3>

⁴ New, C. "Cash Is Still The Most Popular Form Of Payment For Most Americans, Report Says," Huffington Post, January 24, 2012. Retrieved from http://www.huffingtonpost.com/2012/01/24/cash-most-popular-payment_n_1224636.html

⁵ Schuh, S., and Joanna Stavins. The 2013 Survey of Consumer Payment Choice: Summary Results, Federal Reserve Bank of Boston, Table 6, p. T-10. Retrieved from <https://www.bostonfed.org/economic/rdr/2015/rdr1504.pdf>

⁶ Davies, C., Mary-Alice Doyle, Chay Fisher and Samuel Nightingale. (2016). "The Future of Cash," Reserve Bank of Australia. Retrieved from <http://www.rba.gov.au/publications/bulletin/2016/dec/5.html>

Cash Use Index: The Americas Edition

Sure, the real growth is in electronic payment systems: Total credit and debit card payments grew to 103.3 billion transactions with a value of \$5.72 trillion in 2015, up from 19.9 billion transactions worth \$1.07 trillion since 2012.⁷ But while cash use isn't growing and over time its popularity may decrease, it is still an important player in the world's economy, and its age doesn't mean it should be ignored.

Yet, despite cash's endurance, it is persistently ignored. There aren't a lot of sources of information on how cash is used. Governments document how many bills they have in circulation, but that doesn't provide insight into the day-to-day life of cash. This is a problem that inspired us to begin researching cash use in 2013. We take the process one step further and calculate cash use by the amount of cash that people withdraw over a year, including from ATMs, banks and cash back at points of sale. More about our methods and data-gathering process can be found in our methodology section at the end of this report.

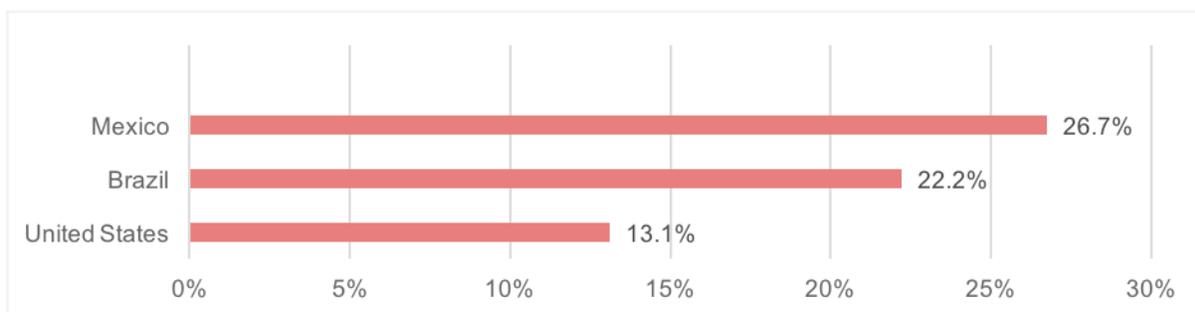
The PYMNTS.com Global Cash Index powered by Cardtronics updates and extends our analysis to 40 countries. Each quarterly issue focuses on a particular region of the world and reports the historical changes in the use of cash and presents projections on cash use in the future. This issue focuses on three countries in the Americas. Subsequent reports will analyze eight other countries that are mostly in Asia.

In this index, we distinguish between two dimensions of cash: cash use and cash share. Cash use refers to the total number of payments made with cash. Cash share refers to cash use as a percent of the GDP – in other words, it is the percent of payments made with cash.

Cash Share of the Wallet

As a reminder, total cash share of the wallet is our term for the percent of GDP that is cash-driven. Figure 1 rank orders the Americas' countries studied from the largest share of spending to the lowest. Brazil came in at 22.2 percent, 69 percent above the lowest user – in this case the United States (13.1 percent) – and 20 percent lower than the highest user, Mexico (26.7 percent).

Figure 1. Cash share for countries in the Americas in 2015



⁷ Federal Reserve System. The Federal Reserve Payments Study 2016. Retrieved from <https://www.federalreserve.gov/newsevents/press/other/2016-payments-study-20161222.pdf>

Cash Use Index: The Americas Edition

These statistics are much lower rates than those in Eastern Europe, where last quarter the highest user, Lithuania, was at 86.5 percent. There are several reasons behind the lower cash use in the Americas. Right now, more than 60 percent of U.S. transactions are electronic, and this is expected to grow to 76 percent by 2026.⁸

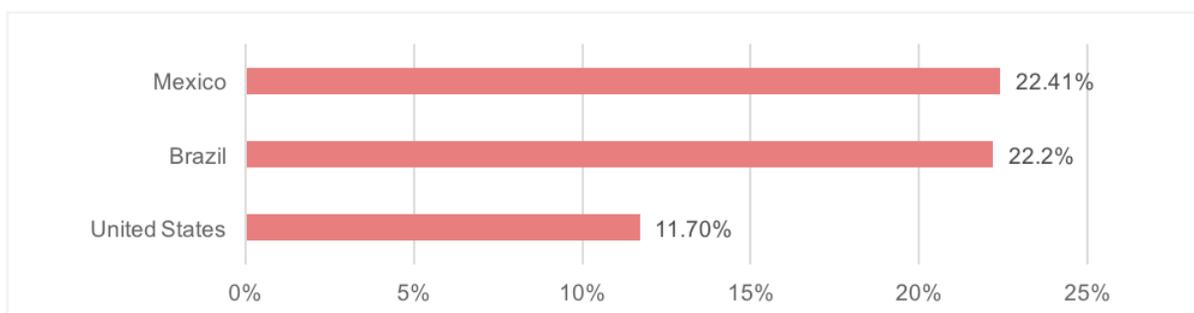
The proliferation of new payment methods in the U.S. is also contributing to the decline in cash. For instance, as of 2016, 38 million contactless payments occurred in the U.S. This number is expected to increase to 221 million by 2026, possibly accompanied by the growth of digital wallets and cryptocurrencies like bitcoin. In fact, recent research from Paul Hastings and the Center for Economics and Business predicts that in the long run, U.S. citizens will stop using cash.

However, Brazil and Mexico are a different story. For Brazilians, cash doesn't seem to be going anywhere — at least for now. In the case of Brazil,⁹ according to Focus Economics, the federal government agreed to give cash-strapped states more assistance in cash.

And in Mexico, which has the highest cash share, the government seems bent on reducing cash usage. In June 2016,¹⁰ the government committed to reduce cash, increase the use of digital payments, and reduce the gap between formal and informal employment, which is commonly powered by cash and supports shadow economy.

In Figure 2, we show our projection on the cash share for these three countries by 2020. Table 2 shows the cash share for 2005, 2010, 2015 and 2020 for the three countries. We forecast that by 2020, Mexico and the U.S. will see slight declines, while Brazil's cash share will remain stable. We forecast that the median cash share for these countries will decrease from 22.2 percent in 2015 to 15.7 percent in 2020. The average, weighted by the GDP, is forecast to decrease from 14.6 percent in 2015 to 13.3 percent in 2020.

Figure 2. Projection of Cash Share in Americas in 2020



⁸ "US Cash Usage To Dip Below 25% by 2026," The Merkle, December 16, 2016. Retrieved from <http://themerke.com/us-cash-usage-to-dip-below-25-by-2026/>

⁹ "Brazil Economic Outlook," Focus Economics, December 5, 2016. Retrieved from <http://www.focus-economics.com/countries/brazil>

¹⁰ Corbalan, A. "Mexico's route to financial inclusion begins with commitment to reduce the use of cash," Better Than Cash Alliance, June 23, . Retrieved from <https://www.betterthancash.org/news/media-releases/mexicos-route-to-financial-inclusion-begins-with-commitment-to-reduce-the-use-of-cash>

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Table 2. Cash share per country in the Americas

Country	2005	2010	2015	2020
Brazil	--	19.9%	22.2%	22.2%
Mexico	--	31.5%	26.7%	22.4%
United States	12.4%	14.8%	13.1%	11.7%
Weighted average cash share	--	16.8%	13.2%	13.4%
Variation 2010–2015	--	--	-3.6%	--
Variation 2015–2020	--	--	--	0.2%

Note: To make the weighted average cash shares comparable among different periods, we estimated them for the same set of countries.

Total Cash Use

Economic growth increases the total use of cash, so for countries with a stable cash share, we expect their total use of cash to increase significantly if there is economic growth.

The GDP growth of the Americas has been strong during the past five years. Since 2010, the GDP of the three countries has grown by an average of 4.4 percent each year. This ranges from a low of 3.8 percent in the U.S. to a high of 8.7 percent in Brazil. Cash share has declined an average of 4.7 percent each year. However, since the economy has grown an average of 4.4 percent each year, the overall use of cash is increasing slightly (by approximately 0.3 percent).

Table 3 lists the countries alphabetically. It shows the historical and forecasted total spending in cash for every five years from 2010 to 2020 along with the five-year annual growth rate.

Table 3. Historical and Forecast Total Use of Cash by Country in Americas

Country	2010	2015		2020	
	Cash use	Cash use	CAGR 2010–2015	Cash use	CAGR 2015–2020
Brazil	232.8	393.5	11.1%	565.8	7.5%
Mexico	263.1	305.2	3.0%	343.7	2.4%
United States	2214.7	2368	1.3%	2571	1.7%
Total	2710.6	3066.7	--	3480.5	2.6%

CAGR, compound annual growth rate

Cash Use Index: The Americas Edition

For 2010 to 2015, cash use across the Americas grew by an average of 2.3 percent.¹¹ While we predict cash use will increase between 2015 and 2020, we also predict that the growth rate of cash use will slow.

Deep Dive: The Americas vs. Europe

Every quarter we take a close look at one topic. This quarter, we analyze the main differences in the use of cash between the Americas, Western Europe and Eastern Europe. We've analyzed Eastern and Western European¹² countries in previous editions of this report. However, this quarter we're focusing on gaining a global perspective. Table 4 provides summary statistics for the three regions.

Table 4. Comparison Between Main Features in the Use of Cash for Americas

Description	Western Europe (15 Countries)	Eastern Europe (14 Countries)	Americas (3 Countries)
GDP (2015, trillion dollars)	\$14.7	\$3.2	\$2.09
GDP per capita, 2015	\$37,182	\$9,449	\$32,098
Population (millions)	395	341	650
Median cash share of GDP	12.8%	40.3%	22.2%
Country with lowest cash share	Switzerland, 4.5%	Estonia, 19.2%	U.S., 15.2%
Country with highest cash share	Spain, 29%	Lithuania, 86.5%	Mexico, 26.7%
Total cash use (trillion dollars)	\$2.3	\$1.3	\$3.1
Cash use per capita (dollars)	\$5,680	\$3,739	\$4,646
ATM withdrawals per capita (dollars)	\$3,603	\$2,352	\$1,883
ATM share	9.7%	24.9%	5.9%
OTC withdrawals per capita (thousand dollars)	\$ 2,077	\$1,387	\$2,762
OTC share	5.6%	14.7%	8.6%
Bank branches per 100,000 population	44.3	27.6	25.4
ATM terminals per 100,000 population	108.2	73.4	62.8*

Table continues on next page



¹¹ Weighted by GDP

¹² We studied in-depth 15 countries in Western Europe, which were Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Cash Use Index: The Americas Edition

Description (continued)	Western Europe (15 Countries) (continued)	Eastern Europe (14 Countries) (continued)	Americas (3 Countries) (continued)
Point-of-sale terminals per 100,000 population	2,242	1,435	1,735*
Card payments per capita	\$6,532	\$1,451	\$9,366
ATM withdrawals per ATM terminal (million dollars)	\$3.3	\$3.2	\$5.9*
OTC withdrawals per bank branch (million dollars)	\$4.7	\$5	\$10.9

Note: *Excludes the United States since there was no data on OTC (Over-the-Counter withdrawals) and ATM withdrawals

Several interesting facts can be gleaned from Table 4. First, Western Europe and the Americas have comparable GDPs per capita. However, Eastern Europe's profile is vastly different from Western Europe's and the Americas' profiles. Western Europe's GDP per capita is 293 percent bigger than Eastern Europe's, and the Americas' is 240 percent.

In a previous report, we found a negative correlation between wealth and cash share: Richer countries tend to depend less on cash. This holds true for the three regions. (We'll delve into this in more detail in the next section.) Accordingly, the median cash share in Eastern Europe is 40.3 percent, while in the Americas and Western Europe it is 22.2 percent and 12.8, respectively.

However, it's important to note that although cash share is lower in Western Europe and the Americas than it is in Eastern Europe, total use of cash for both regions is higher than it is in Eastern Europe. This is mainly due to the amount of wealth in Western Europe and the Americas. The total use of cash is \$3.06 trillion for the Americas, while it is \$2.3 trillion for Western Europe and \$1.3 trillion for Eastern Europe.

Breaking this down into more detail, ATM withdrawals per capita are \$1,883 for the Americas, \$3,603 for Western Europe and \$2,352 for Eastern Europe. Or, that's \$2.5 million a year in the Americas, \$3.3 million in Western Europe and \$3.2 million in Eastern Europe.¹³ Over-the-counter (OTC) withdrawals are \$2,077 per capita for Western Europe, \$2,762 for the Americas and \$1,387 for Eastern Europe. In other words, that's \$10.9 million a year in the Americas, \$4.7 million in Western Europe and \$5 million in Eastern Europe.

ATM and OTC withdrawals make up a smaller percentage of transactions in the Americas compared to Eastern and Western Europe. For example, ATM withdrawals account for 5.9 percent of the GDP in the Americas, while in Western and Eastern Europe, they are 9.7 percent and 24.9 percent, respectively. As for OTC withdrawals, they make up 8.6 percent of the GDP in the Americas, compared to 5.6 percent in Western Europe and 14.7 percent in Eastern Europe.

¹³ Data for Americas excludes the United States and is only for Mexico and Brazil. Data for the United States is not available.

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One reason why ATMs make up such a low percentage of transactions in the Americas is because there are fewer ATMs per capita in the Americas than in Eastern and Western Europe. There are 108.2 ATMs per 100,000 people in Western Europe and 73.4 in Eastern Europe, while in the Americas there are only 62.8 ATMs per 100,000 people. However, when it comes to point-of-sale (POS) terminals, there are 2,241.7 per 100,000 people in Western Europe compared to 1,734.8 in the Americas and 1,434.7 in Eastern Europe.

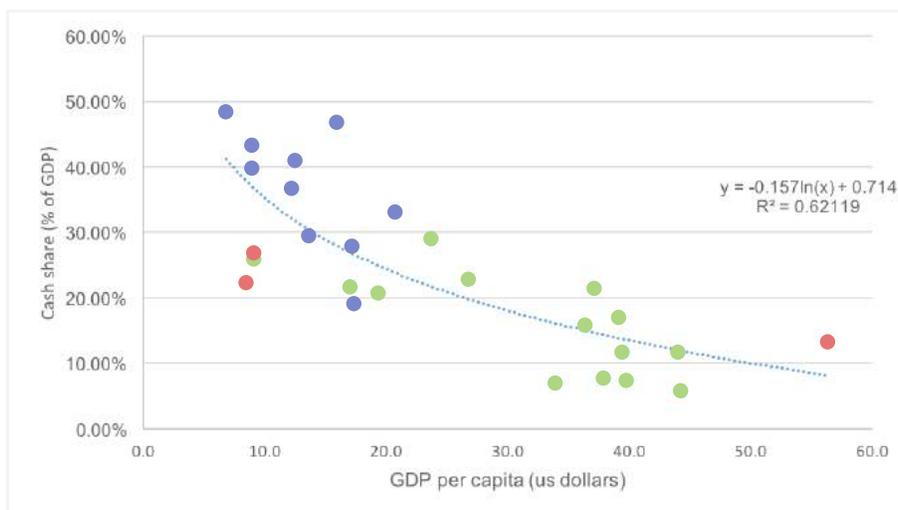
And although we're focusing on cash, it's worth noting that the difference between card usage in Americas and both regions of Europe is overwhelming. In the Americas, the use of cards is 43 percent higher than in Western Europe countries (\$9,367 per capita versus \$6,531) and 546 percent higher than in Eastern Europe. In other words, for every dollar spent with a card in the Americas, only \$0.49 in cash is spent. By comparison, in Western Europe, it's \$0.87 per dollar on a card and \$2.60 per dollar on a card in Eastern Europe.

In the next section, we present a statistical analysis on the relationship between wealth and cash usage and the differences between the Americas, Western Europe and Eastern Europe.

Wealth and Cash Usage

We compared GDP per capita with the cash share for all regions and found that wealth was indeed related to a lower cash share. Figure 3 shows the relationship of GDP per capita and cash share for the three regions.

Figure 3. Relationship between GDP per capita and cash share in 2015: Americas, Western and Eastern Europe: logarithmic trend



GDP, gross domestic product

Note: Red dots belong to the Americas group (i.e., Brazil, Mexico and the U.S.), while in purple we have the Eastern countries (i.e., Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Poland, Romania, Russia, Slovakia and Slovenia). Finally, the green markers belong to the Western countries (i.e., Austria, Belgium, Finland, France, Germany, Ireland, Italy, Malta, the Netherlands, Portugal, Spain, Sweden, Turkey and the United Kingdom).

¹⁴ Data for Americas excludes the United States and is only for Mexico and Brazil. Data for the United States is not available.

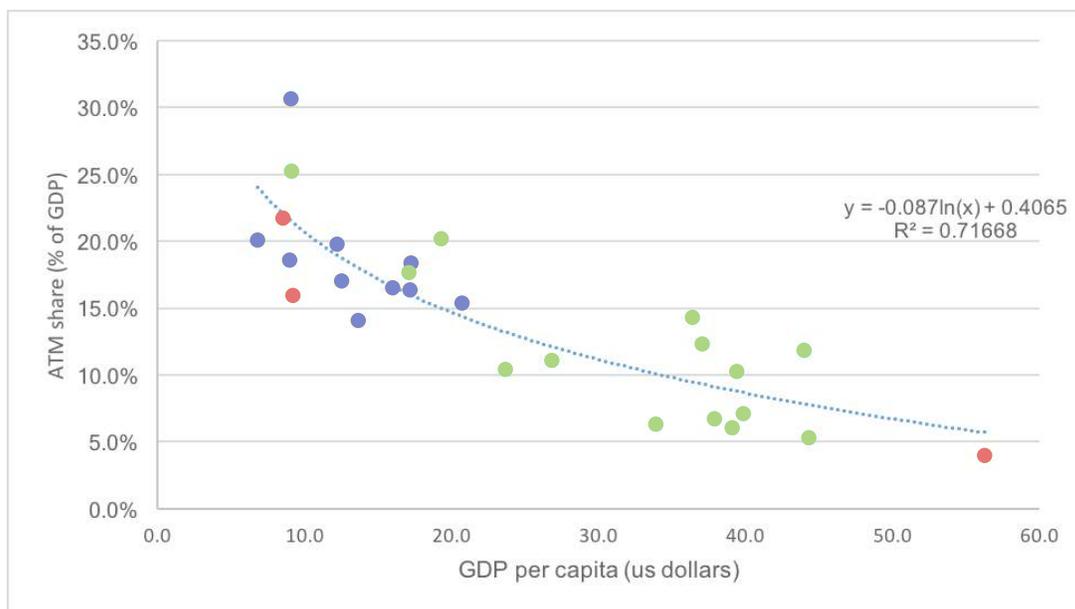
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We believe that some of the countries in our sample behave as outliers for different reasons. On the one hand, we have Greece, which has a very high cash share considering its GDP per capita. The severe economic and financial crisis and the deterioration of balance sheets of Greek banks could explain why people prefer to rely on cash. Lithuania and Croatia are so small that it is not quite an apples-to-apples comparison to compare them to other countries, so we've dropped them from our analysis. (A full breakdown is available in Table 5.)

The relationship between GDP per capita and cash share is logarithmic (with a correlation coefficient of -0.46 after removing outliers) rather than linear.¹⁵ In other words, the GDP per capita must be very high in order for cash share to start decreasing.

Since ATM withdrawals are an important part of cash usage, we have also compared the relationship between GDP per capita and ATM share for the three regions in Figure 4.

Figure 4. Relationship between GDP per capita and ATM share in 2015: Americas, Western and Eastern Europe: logarithmic trend



GDP, gross domestic product

We actually found that the relationship between GDP per capita and declining use of ATMs is even stronger than GDP per capita and declining cash share. Therefore, the higher the GDP per capita is, the fewer ATM withdrawals there are.

Table 5 below contains the GDP per capita, cash share and ATM share of the countries plotted on the graphs.

¹⁵ The case for Western European countries was different, as after we removed a few outliers, we found a very strong negative relationship between GDP per capita and cash shares, as shown in the previous report.

Cash Use Index: The Americas Edition

Table 5. Full sample of countries analyzed (excludes outliers)

Country	GDP per Capita 2014	Cash Share	ATM Share	Region
Bulgaria	6.8	48.56%	20.1%	Eastern Europe
Czech Republic	17.2	27.79%	16.4%	Eastern Europe
Estonia	17.3	19.21%	18.4%	Eastern Europe
Hungary	12.3	36.66%	19.7%	Eastern Europe
Latvia	13.7	29.28%	14.0%	Eastern Europe
Poland	12.5	40.97%	17.0%	Eastern Europe
Romania	9.0	43.13%	18.5%	Eastern Europe
Russia	9.1	39.72%	30.6%	Eastern Europe
Slovakia	16.0	46.78%	16.5%	Eastern Europe
Slovenia	20.7	33.01%	15.3%	Eastern Europe
Turkey	9.1	25.93%	25.3%	Eastern Europe
Austria	39.1	17.01%	6.0%	Western Europe
Belgium	36.3	15.69%	14.3%	Western Europe
Finland	37.9	7.69%	6.7%	Western Europe
France	33.9	7.10%	6.3%	Western Europe
Germany	37.1	21.40%	12.3%	Western Europe
Ireland	44.0	11.62%	11.9% ¹⁶	Western Europe
Italy	26.8	22.80%	11.1%	Western Europe
Malta	19.3	20.72%	20.2%	Western Europe
Netherlands	39.8	7.40%	7.1%	Western Europe
Portugal	17.1	21.60%	17.7%	Western Europe
Spain	23.7	29.00%	10.4%	Western Europe
Sweden	44.3	5.60%	5.3%	Western Europe
United Kingdom	39.4	11.60%	10.24%	Western Europe
Brazil	8.52	22.19%	21.70%	Americas
Mexico	9.20	26.74%	15.90%	Americas
United States	56.34	13.10%	3.90%	Americas

GDP, gross domestic product

¹⁶ We have adjusted the numbers for Ireland since our previous report of Western Europe.

Feature Story



With Millennials Picking Cash Over Cards, Cash Gains Steam

At the 2014 Worldwide Developers Conference (WWDC), Apple's CEO Tim Cook announced the launch of iPhone 6, which would come equipped with Apple Pay – a solution that promised to replace the good old-fashioned fat wallet.

Almost three years and four new iPhones later, the company is seemingly far from replacing the average consumer's traditional wallet. The culprit? Consumers' undying love for cards and cash.

Unlike cards, the share of cash in the U.S. is slowly but surely decreasing. However, it's far from going out of fashion.

As of 2015, cash usage represented 13.1 percent of overall U.S. gross domestic product (GDP), the latest [PYMNTS Global Cash Index™](#) found.

And while there has been some decline, nearly a third of retail purchases made in the U.S. today are still paid for with cash, making it the most popular form of retail payment instrument, according to San Francisco Federal Reserve's 2015 [Diary of Consumer Payment Choice](#).

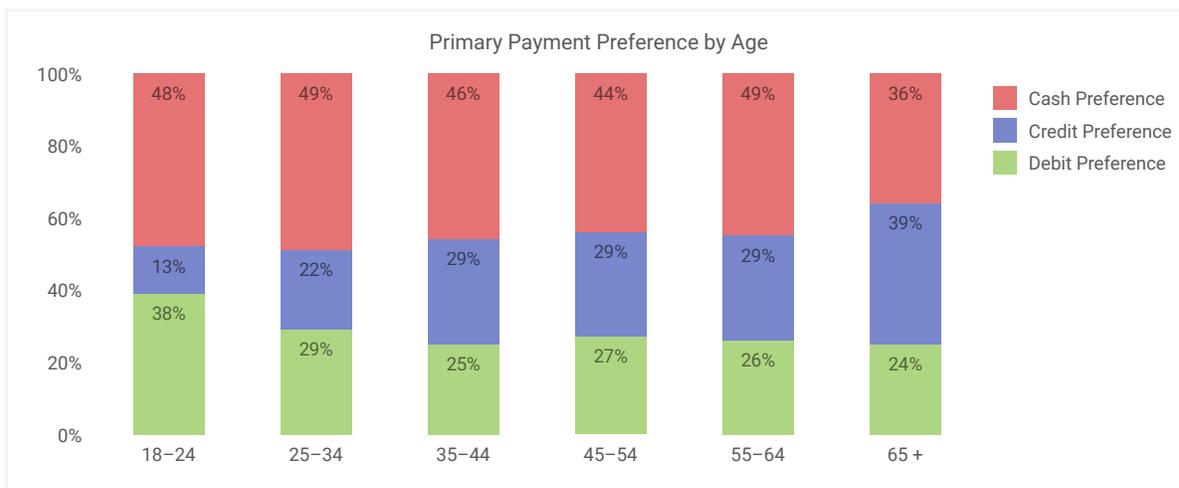
PYMNTS recently caught up with Claire Wang and Wendy Matheny, co-authors of the Federal Reserve's study, to dig into the changing consumer payment habits across the U.S.

Feature Story

Millennials dig cash

The recently published study, which analyzed spending behavior and payment experiences of 2,500 Americans, found older consumers, aged 35 to 44, increasingly using card- and mobile-based payments. Younger millennials, on the other hand, showed a higher propensity for cash.

“The fact that 18-to-24-year-olds made a larger share of people who prefer using cash pretty much throws cold water on the idea that only older people use cash or that younger consumers don’t like cash,” Matheny said.



Source: Cash Product Office

The preference for cash among younger millennials can be partly explained by the fact that younger consumers may not necessarily have the same access to credit that older consumers have or that they may have access to credit but their credit score is a lot lower, which restricts their access to different payment products, Matheny explained.

A high preference for using cash was also found on the opposite end of the spectrum among consumers aged 65 or older, who used it for 36 percent of their transactions, the study found.

“When you look at older consumers, they have always used cash, and they are going to continue using cash. For younger consumers, it again might be that this is the option they have on hand,” Matheny said.

Another factor that seems to influence consumers’ payment preference is income. According to the Federal Reserve study, households earning less than \$25,000 annually showed a higher preference for cash than those making over \$75,000 per year.

Overall, whether young or old, American consumers are increasingly preferring to use cash for small-value transactions. In 2015, nearly 50 percent of transactions under \$25 and 60 percent of transactions valued under \$10 were paid in cash, according to the Federal Reserve.

One might think that consumers are using cash for smaller transactions because many stores have a fixed minimum transaction value to accept cards, but that's not the case, Wang explained. "It's just probably out of convenience, out of not knowing to ask whether there's a card minimum, [which is perhaps why] consumers are still using cash," she said.

Consumers might also be willing to get change for \$5 and not for a \$50 bill, Matheny added.

P2P is cash's forte

Other than small-value purchases, cash is gaining popularity as a payment method for peer-to-peer money transactions. In 2015 and 2016, cash was used for purchasing 75 percent of gifts and transfers to people – an 8 percent increase since 2012, the study noted.

The high usage of cash for P2P transactions comes against the proliferation of P2P settlement apps such as Venmo, which are inserting themselves into day-to-day situations where consumers settle money with their friends and family.

Despite the ease of use that these apps offer, their ubiquity is an impediment that hinders their widespread use.

There are so many apps and so many options in the market," Matheny pointed out. Until one or two really take hold, cash will continue to be the go-to payment method for P2P transactions, she added.

Oftentimes, it's also just easier to pay someone in cash rather than using an app. If a user is trying to settle a transaction through a credit card associated with their P2P app account, it's just easier for them to skip the process and hand over a \$5 bill instead of Venmo-ing it to their friends, Matheny said.

Another reason that makes cash more popular for P2P transactions is the security it offers, Wang pointed out.

"There are so many issues with data security breaches that people don't trust using a specific P2P app," Wang said. "It's a lot safer to use cash."

Cash's ageless future

Cash usage in the U.S. might be on a decline, but it doesn't appear to be going away anytime soon. In fact, the overall circulation of the U.S. dollar is now at an all-time high, according to the Fed.

Today, consumers heavily prefer to use cash for paying their food and personal care supplies, auto expenses, entertainment, and transportation. Among different cash spending categories, food and personal care supplies account for 52 percent of cash transactions – an important category that continues to fuel the high usage of cash, the Federal Reserve research suggests.

“The overall circulation of the U.S. dollar is now at an all-time high, according to the Fed.”

“If all of a sudden for that small transaction you're no longer paying cash, that's when we'd expect to see more dramatic changes in cash usage.”

“If things continue as they have been, cash is maintaining its own and holding strong even with more and more payment options available out there,” Matheny said. “If all of a sudden, for your pack of gum and your soda, you’re no longer paying cash – for that small, food or personal care transaction – that’s when we would expect to see more dramatic changes in cash [usage].”

Even though it’s not on a widespread scale, the change does seem to be happening. Retailers like Starbucks are starting to train their customers to buy that \$3 or \$5 cup of coffee with their mobile app instead of using cash, Wang pointed out.

While it remains to be seen whether the change in usage of cash will dramatically accelerate or not, with a majority of U.S. consumers continuing to carry cash, the age-old payment form is likely to remain king.

Appendix

Methodology and Data

The PYMNTS.com 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		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			

Total cash usage is the combination of two overall factors.

- The first 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 annual GDP of the country. 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 is how the overall economy is growing. Total cash usage is estimated as the total cash share multiplied by the GDP of the country. As a country's economy develops and grows, more overall spending occurs, which means more cash spending is occurring.

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

In order to calculate the results in this report, we do 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 the cash share for 2015 forward.
- Estimate the total cash usage for 2015 forward.

Gather historic and projected data

For each country, we collect historic data from 2000 through 2014 on the total population, the GDP, cash withdrawals from ATMs and OTC, total card spending data, and data on payment infrastructures, including the number of POS machines, the number of ATMs, and the number of bank branches.¹⁷ We also gather data to project cash usage including projected GDP and projected population by age group.

We gather data from 2000 through 2014 and use as much 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 collect projections for the GDP and for population by age group. This data comes from the IMF and World Bank, respectively, and is from the same source as the historic data. Population projections are available for every five years, and we use a linear interpolation for the years that are not reported. GDP projections are by year and if we need time periods beyond the last projected data point, we assume that final GDP growth rate will be consistent over time.

¹⁷ 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 withdrawals, 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]

Estimate OTC cash withdrawals for countries that 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 produce 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 provide ATM data, only 12 provide data on OTC cash withdrawals. This means that for the other 28 countries, we have to estimate the level of OTC withdrawals. We do 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 do 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.

Two: Estimate the logarithm trend of the OTC to ATM ratio from 2000 through 2014 for each of the potentially comparable countries.¹⁹

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

We do this to remove any data jumps or movements due to factors specific to the country. This provides a long-term 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 those that do provide OTC data. The comparable country is selected by comparing the trends and levels in five different variables:

- ATM withdrawals as a percentage of GDP
- Card Spending as a % of GDP
- Bank Branches per 1,000 people
- ATM terminals per 1,000 people
- POS terminals per 1,000 people

¹⁹ For three countries, the reduction in OTC to ATM ratio has been so strong, that we used a polynomial trend. These three countries are Latvia, Romania and Slovakia.

Appendix

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:

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

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

In the formula above, i is the year and “Variable” refers to each of the 5 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 5 variables for each combination of a target country and a comparable comparison country. We then assign a weight of 2/3rd to the difference in levels and 1/3rd difference in changes and for each target and comparable country, we calculate a Weighted Average Difference:

$$\begin{aligned} \text{Weighted Average Difference}_{ij} \\ = 0.667 * \text{Avg difference in levels} + 0.333 * \text{Avg difference in changes} \end{aligned}$$

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

No	Target	Comparable	No	Target	Comparable	No	Target	Comparable
1	Australia	United Kingdom	11	Greece	Hungary	21	Saudi Arabia	Slovakia
2	Austria	Italy	12	India	Slovakia	22	Singapore	Netherlands
3	Belgium	Netherlands	13	Ireland	Latvia	23	Slovenia	Hungary
4	Brazil	Malta	14	Japan	Germany	24	South Africa	Slovakia
5	Bulgaria	Hungary	15	Korea	United Kingdom	25	Sweden	Netherlands
6	China	Slovakia	16	Luxembourg	Italy	26	Switzerland	Netherlands
7	Croatia	Malta	17	Mexico	Czech Republic	27	Turkey	Malta
8	Estonia	Netherlands	18	Poland	Hungary	28	United States	United Kingdom
9	Finland	Netherlands	19	Portugal	United Kingdom			
10	France	Italy	20	Russia	Romania			

Four: Calculate the estimated level of OTC withdrawals for the target country

We have 28 target countries we are estimating the level of OTC withdrawals. For 9 of these countries we do have data on the OTC to ATM ratio for a single year but have no other data that would 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 9 countries 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.

No	Target	OTC data available	Known data point	Value is derived
Western Europe				
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	✓		

No	Target	OTC data available	Known data point	Value is derived
Eastern Europe				
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			✓

Table continues on next page

No	Target	OTC data available	Known data point	Value is derived
Americas				
1	United States		✓	
2	Mexico			✓
3	Brazil			✓

No	Target	OTC data available	Known data point	Value is derived
Asia and other				
1	Australia		✓	
2	China			✓
3	India			✓
4	Japan			✓
5	Korea			✓
6	Singapore			✓
7	Saudi Arabia			✓
8	South Africa			✓

Calculate the historic 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 historic data. We use this estimated trend line and adjust it 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 would be more prone to shift away from cash and 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 less 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 the 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.

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