

the PYMNTS.com

Global Cash Index™

a **CARDTRONICS** collaboration

Mexico Analysis | APRIL 2017



Introduction

Mexico, the fifteenth largest economy in the world, runs on cash.

Despite the rise of electronic banking and alternate forms of payment in the past 15 years, nearly 90 percent of consumer transactions in Mexico are still paid using cash.¹

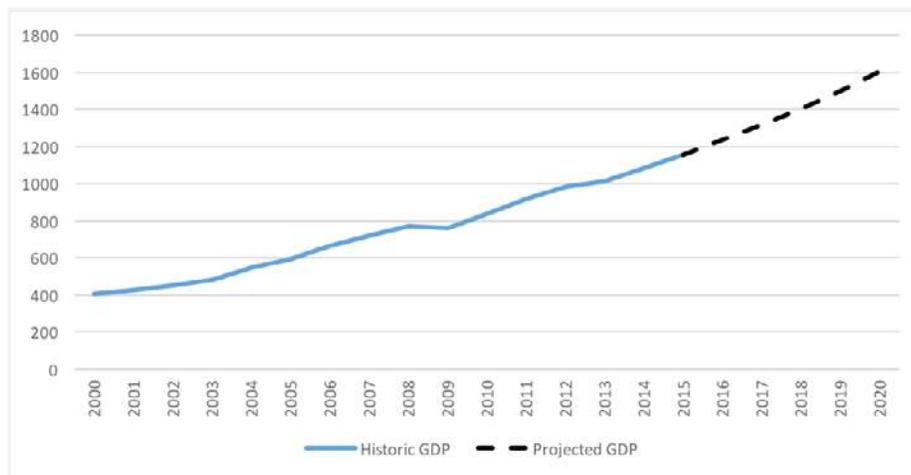
The popularity of the age-old payment method is, in fact, so high that Mexicans have a higher propensity for cash than any other country in North America.

As of 2015, cash usage in Mexico as a percent of its gross domestic product (GDP) stood at 26.7 percent.

And with the growth in Mexico's economy, overall use of cash is bound to go up. As of 2015, with a GDP of \$1,153 billion, Mexico was the third largest economy in North America. Its GDP is expected to grow by 6.8 percent compound annual growth rate (CAGR), reaching \$1.6 trillion between 2015 and 2020.

Figure 1 shows the evolution of historic GDP and the projection until 2020.

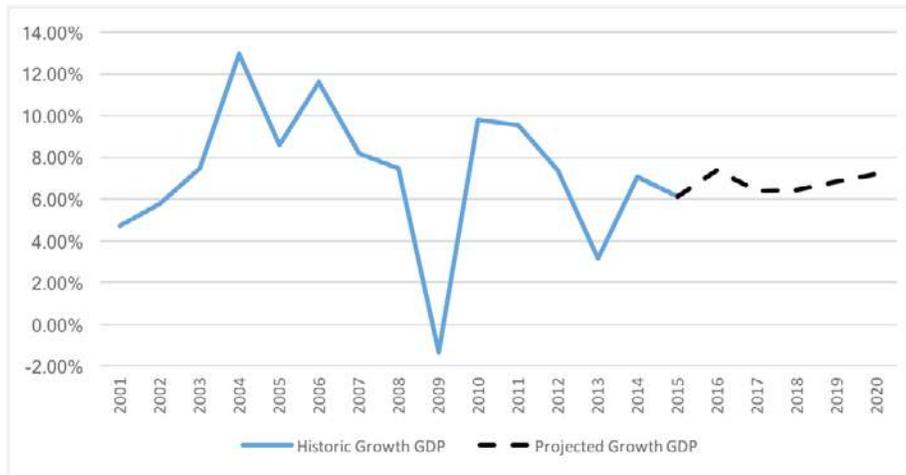
Figure 1. Historic and Projected GDP for Mexico, 2000-2020 (Nominal in Billion Dollars)Cash Share Projection



¹ Mazzota B, Chakravorti B. The Cost of Cash in Mexico. The Fletcher School, Tufts University. December 2014. <http://fletcher.tufts.edu/~media/Fletcher/Microsites/Cost%20of%20Cash/CCMEX-final-web.pdf>. Accessed April 3, 2017.

Figure 2 shows the historic growth rate of GDP and the projected growth for Mexico's GDP until 2020. The biggest drop was during the subprime crisis (2008–2009) when GDP dipped by 1.3 percent.

Figure 2. Historic and Projected GDP Growth for Mexico, 2000-2020



While with growth in GDP, overall cash usage is bound to go up, the proliferation of alternate forms of payment has led to slowing of cash's growth rate. In 2006, cash usage represented 35.7 percent of GDP and is expected to represent 22.4 percent in 2020.

This relative slowing of cash use's growth rate is in line with the rest of the world when it comes to cash usage. Nonetheless, various socioeconomic factors such as low bank penetration and financial literacy have contributed toward a greater share of cash usage in Mexico and kept people from rapidly adopting alternative forms of payment.

This report continues with a more extensive study of cash share in Mexico, some of the alternative payments methods that have gained traction and total cash usage.

Cash Share

In the past 10 years, much of the reduction in cash usage in Mexico has come from a decline in over-the-counter (OTC) withdrawals, which decreased from \$147.8 billion in 2006 to \$132.2 billion in 2015.

Meanwhile, use of ATMs for cash withdrawals spiked during the same period of time. In 2006, ATM withdrawals represented 13.4 percent of GDP, which then increased to 15.3 percent in 2015.

However, despite a decline of over \$15 billion in OTC withdrawals, a growth in the number of ATM withdrawals helped offset a sharp decline in overall use of cash.

Figure 3 maps the gradual decline in OTC withdrawals and increase in share of ATM transactions.

Figure 3. Historic ATM, OTC and Cash Share as Percentage of GDP

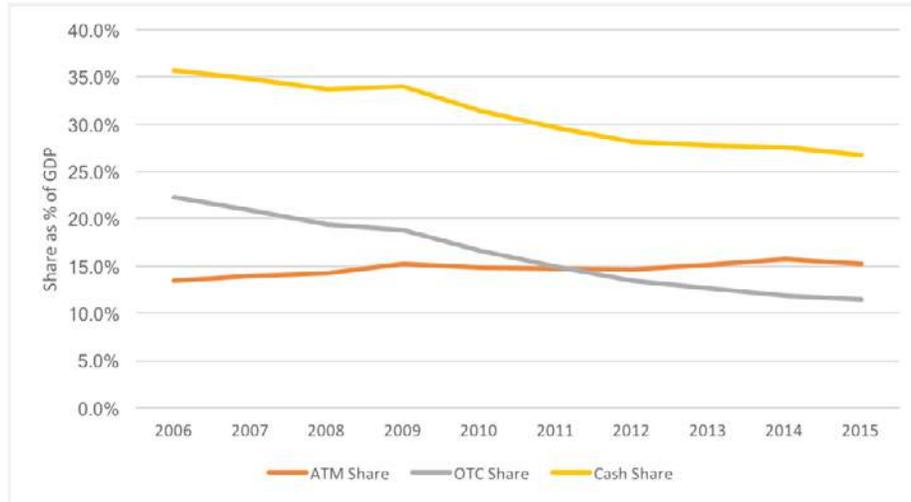


Table 1. GDP and Cash Usage Data for Mexico (in Billion Dollars)

Year	Nominal GDP	Cash Usage			ATM Share	OTC Share	Cash Share
		ATM	OTC	Total			
2006	663.5	89.1	147.8	236.8	13.4%	22.3%	35.7%
2007	717.9	100.0	150.0	250.0	13.9%	20.9%	34.8%
2008	771.7	110.1	149.7	259.8	14.3%	19.4%	33.7%
2009	761.4	115.9	143.0	258.9	15.2%	18.8%	34.0%
2010	836.2	124.1	139.0	263.1	14.8%	16.6%	31.5%
2011	916.0	134.6	136.9	271.5	14.7%	14.9%	29.6%
2012	983.8	143.9	132.6	276.4	14.6%	13.5%	28.1%
2013	1014.8	153.7	128.1	281.8	15.1%	12.6%	27.8%
2014	1086.4	170.7	128.3	299.0	15.7%	11.8%	27.5%
2015	1153.0	176.0	132.2	308.3	15.3%	11.5%	26.7%

Other than a slump in OTC withdrawals, one of the other factors that has contributed to the decline in cash's growth rate has been the slow but constant increase in the use of alternative payment methods, such as credit, debit and prepaid cards; electronic funds transfers; and mobile payments. Nonetheless, the majority of Mexicans today prefer to use cash due to the characteristics of the Mexican economy and Mexicans' habits and beliefs.

Some of the characteristic features of the Mexican economy that have encouraged high usage of cash include existence of informal sectors in the economy and limited access to financial services.

Mexicans working in informal sectors are paid in cash and often do not have access to banking services, which in turn limits access to payment options for day-to-day transactions. On the other hand, most banking products are often designed to cater to the needs of the middle- and upper-class segments of society, which usually encompasses people with higher levels of education, financial literacy and easier access to banks.

These factors, when put together, have over the years shaped the spending habits and payment preferences of Mexicans. Many of those who prefer to pay and save in cash mistrust banking services due to non-transparent fee structures, tax withholding on cash deposits, malfunctioning ATMs, risk of consumer fraud, and card cloning.²

Cash Versus Alternative Payment Methods

Over the past 10 years, alternate forms of payments, including card-based payments, electronic funds transfers, online banking and mobile payments, have seen an increase in usage.

Debit and credit cards, which were introduced in the 1960s, didn't gain much traction in Mexico for much of their existence until the past few years. According to the Americas Market Intelligence report, by 2015 there were 33 million cards in Mexico, distributed among 18 percent of the adult population.³

An increase in their adoption came as a result of "a combination of industry strategies and regulatory factors."⁴ The pillars of these reforms, which were authorized in January 2014, include⁵:

1. Development of banking: The reform called for additional regulatory flexibility aimed at improving access to loans in areas that are considered a priority for national development. This improved credit access to families, small businesses and sectors that up until then were excluded.
2. Banks not allowed to offer "tied sales:" Sales that are contingent to the acquisition of a different product were outlawed. This was also aimed at simplifying operations between institutions and simultaneously increasing competition in the sector.
3. Mitigating risk for financial institutions: Banks were granted more security in the execution of contracts and the creation of safety nets for banks. This helped lower risks when it came to collecting dues from customers who didn't pay.
4. Sector strengthening: There was an implementation of tougher capital quality requirements for banks to help prevent customers from losing their money in case of bank collapse.

² Ibid.
³ Payments in Latin America: Under Digital Transformation. Americas Market Intelligence. 2016. <https://static1.squarespace.com/static/557dd429e4b035c8591b78e0/t/5807dfdfbe6594bf4a4a3769/1476911083917/AMI+Latam+Payments+Digital+Transformation+Oct+2016.pdf>. Accessed April 3, 2017.
⁴ Del Angel G. Cashless Payments and the Persistence of Cash. Hoover Institution. 2016. <http://www.hoover.org/research/cashless-payments-and-persistence-cash-open-questions-about-mexico>. Accessed April 3, 2017.
⁵ PwC Mexico. Retail Banking in Mexico: An Industry Outlook. 2015. <https://www.pwc.com/mx/es/knowledge-center/archivo/20150604-gx-publication-retail-banking.pdf>. Accessed April 3, 2017.

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Electronic funds transfers and online banking transactions also experienced an increase due to the introduction of SPEI (Sistema de Pagos Electrónicos Interbancarios) by the Central Bank of Mexico in 2004. Through this system, the bank has fostered the use of electronic funds transfers and digital transfers for payrolls,⁶ its benefits and procedures, according to a Hoover Institution report.

Mobile banking, on the other hand, has so far seen slower growth, but is projected to make a significant impact on the payment choices of Mexicans – over 100 million of whom are projected to have access to smartphones by 2020.⁷

It is estimated that in 2011, approximately 247,000 bank accounts were associated with mobile phones, and by 2013, they had increased to 2.7 million accounts. By 2016, Mexico saw the third highest use of mobile payments in Latin America, with 21.8 percent of people in Mexico city using these services, right behind Brazil and Chile.⁸ Much of these mobile banking customers also have access to cards for their day-to-day payments.

Additionally, Mexico has attracted the interest of several international payment companies that have invested or rolled out new products that enable digital and mobile payment services in the country.

Argentine eCommerce marketplace MercadoLibre, for instance, launched its own point-of-sale (POS) system called Mercadopago Point that enables merchants to accept payments through credit, debit and prepaid cards and smartphones.⁹ Dutch security and payments technology company Gemalto, on the other hand, entered a partnership with PROSA, a Mexican payments company, in 2016 to offer mobile payments in the country.¹⁰ Gemalto is also working on the implementation of payment authentication technologies, such as silent authentication and e-SIMs.¹¹

Meanwhile, telecom companies are speeding to win the payments race. In 2017, Telcel, a Mexican wireless telecommunication company, which owns 70 percent of market share, partnered with PayPal to launch Telcel Pay, a new mobile payments app.¹² Traditional banks are also stepping up their game. BBVA Bancomer, one of the largest banks in Mexico, acquired OpenPay in 2017, a Mexican FinTech startup, that offers several payment solutions and antifraud tools.¹³

While the development and growing availability of digital payment methods promise to alleviate pain points such as waiting in lines to access services at physical bank branches and carrying large amounts of cash,

⁶ Del Angel G. Cashless Payments and the Persistence of Cash.

⁷ Ibid., 5.

⁸ García MP. México tercer lugar en AL en pago de móviles; detrás de Brasil y Chile. La Jornada. July 21, 2016. <http://www.jornada.unam.mx/ultimas/2016/07/21/mexico-tercer-lugar-en-al-en-pago-de-moviles-detras-de-brasil-y-chile-1>. Accessed April 3, 2017.

⁹ Mercado Libre lanza dispositivo para realizar pagos móviles. Forbes Mexico. July 26, 2016.

¹⁰ PROSA and Gemalto Partner to Offer Mobile Payments in Mexico. Gemalto. February 24, 2016. <http://www.gemalto.com/press/Pages/PROSA-and-Gemalto-Partner-to-Offer-Mobile-Payments-in-Mexico.aspx>. Accessed April 3, 2017.

¹¹ Hernandez A. Gemalto busca ser disruptivo; impulse tecnología en México. Excelsior. January 18, 2017. <http://www.excelsior.com.mx/hack-er/2017/01/18/1140550>. Accessed April 3, 2017.

¹² Rios V. Telcel y Paypal lanzan su propio sistema de pagos en México. Hipertextual. January 11, 2017. <https://hipertextual.com/2017/01/telcel-paypal-mexico>. Accessed April 3, 2017.

¹³ BBVA adquiere en Mexico la fintech para pagos digitales OpenPay. ABC Tecnología. January 17, 2017. http://www.abc.es/tecnologia/informatica/soluciones/abci-bbva-adquiere-mexico-fintech-para-pagos-digitales-openpay-201701162235_noticia.html. Accessed April 3, 2017.

they also come with a downside. Rampant card fraud, identity theft, malfunctioning ATMs, hidden or poorly understood account fees are just some of the factors that have led many Mexicans to continue picking cash over cards.

Additionally, card acceptance is not widespread and remains quite low, which makes it difficult to solely rely on cards for making purchases at every store.

Cash and the State of ATMs in Mexico

To analyze the relative use of cash in Mexico, we studied the evolution of ATMs, POS terminals and bank branches in Mexico compared to other countries studied in our Americas cash analysis. While there is no updated data available for some of the variables for the U.S., Mexico when compared to Brazil was found to have a very low number of ATM and POS terminals per 100,000 people.

Today, Mexico has nearly 34 ATMs per 100,000 people – less than half than Brazil, which has 80 ATMs available per 100,000 people.

On the other hand, Mexico has 610 POS terminals per 100,000 people compared to 2,419 in Brazil. Their distribution is concentrated in six states, while the remaining 12 states have fewer than 10,000 terminals in total,¹⁴ according to the Bank of Mexico.

This suggests that when it comes to widespread adoption of electronic payments, Mexico still has a long way to go.

Table 2. Comparison of Features Between Brazil, Mexico and the United States, 2014

Description	Brazil	Mexico	United States
Bank branches per 100,000 people	18.09	10.67	35.92
ATM terminals per 100,000 people	80	34	N/A
POS terminals per 100,000 people	2,419	610	N/A
ATM withdrawals per capita (USD)	1,719	1,362	2,195
OTC withdrawals per capita (USD)	45	1,023	5,202
Card payments per capita	1,411	648	17,937
ATM withdrawal per ATM terminal (MM USD)	2.1	4.0	N/A
OTC withdrawals per bank branch (MM USD)	0.2	9.6	14.5

MM, millions; OTC, over-the-counter; POS, point-of-sale; USD, U.S. dollars

¹⁴ Mazzota B, Chakravorti B. The Cost of Cash in Mexico.

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In comparison, the U.S., the largest economy in the world, sees higher per-capita ATM and OTC withdrawals than Brazil and Mexico.

When it comes to OTC withdrawals, Mexico's per capita share is higher than Brazil's but lower than the United States. Almost 43 percent of the cash used in Mexico comes from OTC withdrawals, compared to 3 percent in Brazil. In terms of OTC withdrawals per bank branch, Mexico sees withdrawals of nearly \$9.6 million, compared to \$200,000 in Brazil. Mexico also sees nearly twice the number of ATM withdrawals per ATM terminal than Brazil.

A look at Mexico's share of card-based payments reveals that overall usage of cards is much lower than the other two countries. The usage of cards per capita in the U.S. is 2,668 percent higher than that in Mexico.

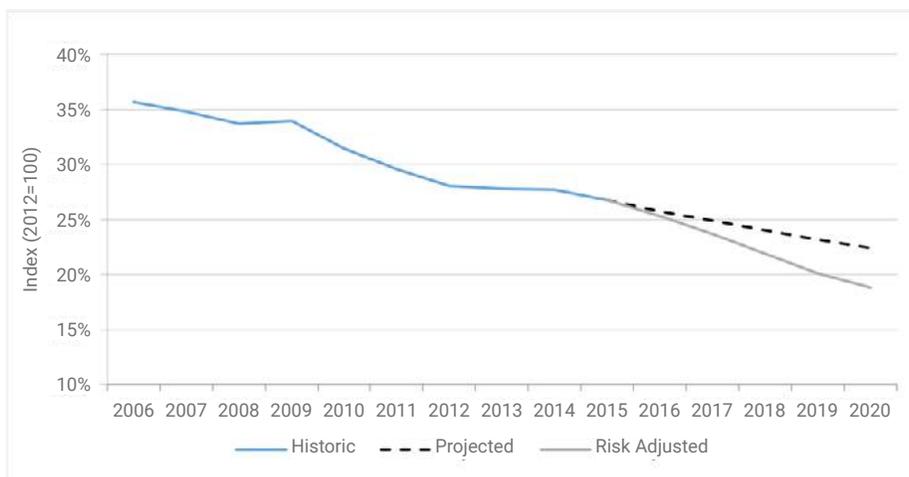
This data corroborates Mexico's high preference for cash. It is also indicative of poor acceptance of card-based payments in Mexico.

One other measure that validates our assessments is the ratio of cash to card-based payments per capita for the three countries. For every dollar spent with cards, \$0.41 is spent with cash in the U.S., \$1.25 is spent with cash in Brazil, and \$3.68 is spent in Mexico. To summarize, Mexico's use of cash per capita is 195 percent higher than Brazil's and 793 percent higher than that of the U.S.

Risk Adjustments

We calculated the risk-adjusted projection of cash usage in Mexico considering the country's population and its distribution among different age groups. By our estimates, the reduction of cash could be accelerated by 50 percent among 19-to-24-year-olds, 30 percent among 25-to-34-year-olds, 15 percent among 35-to-44-year-olds and 2 percent among 45-to-54-year-olds. Assuming that these reductions are realized over a five-year time period, the risk-adjusted cash share, as depicted in Figure 4, could reach 18.8 percent by 2020.

Figure 4. Historic and Risk-adjusted Cash Projection



Total Cash Usage

Despite the estimated reduction of cash share in Mexico, total use of cash is positioned to increase in the upcoming years with growing economic activity, as depicted in Figures 5 and 6.

While cash share is projected to decline, it's not expected to accelerate as its CAGR for 2015–2020 is nearly the same as observed between 2010 and 2015.

Meanwhile, Mexico's GDP is expected to continue to grow at rate of 6.85 percent between 2015 and 2020, along with total cash usage, which is projected to reach \$360 billion by 2020. The resulting CAGR of total cash usage between 2015 and 2020 is slightly lower than the CAGR for 2010–2015.

Table 3. Mexico Cash Share, GDP and Total Cash Usage

	Cash usage and projections					CAGR	
	2000	2006	2010	2015	2020	2010–2015	2015–2020
Cash share	--	35.7%	31.5%	26.7%	22.4%	-0.54%	-0.53%
GDP	407	663	836	1,153	1,606	6.64%	6.85%
Total cash usage	--	237	263	308	360	3.22%	3.14%

CAGR, compound annual growth rate; GDP, gross domestic product

Figure 5. Historic and Projected Cash Share

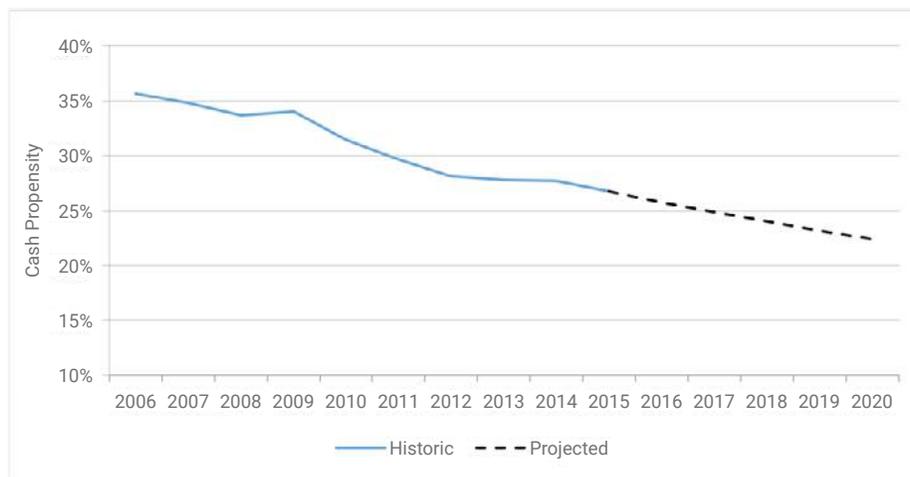
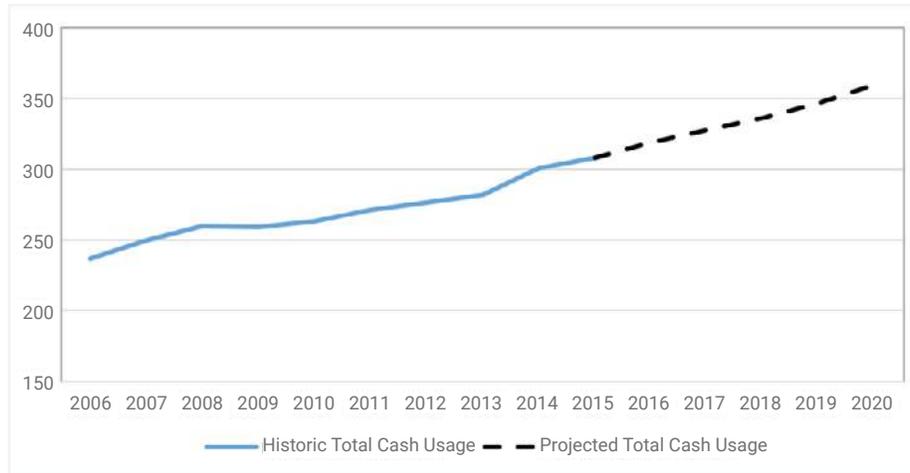


Figure 6. Historic and Projected Total Cash Usage (in Billion Dollars)



The State of Cash in Mexico

Mexico has a great affinity for cash. At \$308 billion, Mexico used more cash than any other country in the Americas in 2015. Despite this fact, cash use is decreasing in Mexico. Cash share has decreased from 35.7 percent of GDP in 2006 to 26.7 percent in 2015.

Nonetheless, the decrease in cash share has not been enough to significantly dent the total use of cash. Between 2010 and 2015, total use of cash increased at 3.2 percent CAGR, and it is projected to increase by 3.1 percent between 2015 and 2020.

Growth in use of alternative payment methods does not pose a threat to cash share in Mexico. Compared to other countries in Americas and around the world, adoption of alternate forms of payment continues to be low in Mexico. Even though in recent years alternative forms of payments have attracted investments and innovations, their low adoption due to poor financial literacy and inclusion and presence of large informal sectors have made them a poor contender to compete with cash, which continues to be the leader in payment methods.

Feature Story



Is Cash Having An E-Renaissance?

In June 2015, when eCommerce giant Amazon rolled out operations in Mexico, it entered a market where online shopping accounted for a mere 2 percent of the country's \$203 billion in retail sales and the number of credit cards equaled a fifth of the country's population of 120 million citizens.

For Amazon, finding success in Mexico meant adapting to market conditions, where credit and debit cards remain accessible to the working population in urban areas, but not so much in other parts of the country.

Almost six months after its launch, the company began selling gift cards at thousands of Oxxo convenience stores to tap into cash-paying consumers.

And Amazon isn't alone. Linio, the largest eCommerce company in Latin America, now [reportedly](#) allows Mexican shoppers to pay by cash on delivery or at an Oxxo retail location.

Meanwhile, Walmart, the largest brick-and-mortar retailer in Mexico, has also found a way to woo online shoppers without access to credit cards by also enabling them to pay at physical store locations.

When it comes to payments, the common lesson these retailers have learned is this: In Mexico, cash is a way of life.

In the past 15 years, despite the rise of online banking and other forms of payment in Mexico, nearly 90 percent of consumer transactions are still paid using cash, according to research by [Tufts University](#).

And to stay competitive, according to Javier Vallaura, chief business development officer at Allpago, the largest payment processing company in Latin America, international retailers are keeping cash payments front and center in expansion strategies to tap into Mexican consumers, many of whom often do not have access to credit and debit cards.

For these e-tailers, bringing cash into their B2C payment equation has meant tapping into the vast network of convenience store locations spread across the country.

Cashing in on convenience stores

Shopping online and then running to a nearby convenience store to make payments in cash may be a concept unheard of in the U.S., but it's commonplace in Mexico.

Much like Oxxo, 7-Eleven (which has over 1,800 stores in Mexico) and several other drug and convenience stores have become quick stop shops for Mexican consumers choosing to pay in cash for their online transactions.

While some of these consumers do not have access to credit and debit cards, many pick cash over cards for security reasons, Vallaura said.

To pay for online transactions in cash at one of the participating 14,000 c-store locations, consumers check out with options such as "Pay at Oxxo," which generates a bar code that can be scanned at the store to pay and complete the transaction.

Allpago, which powers cash-based payments for online merchants through Oxxo, [reportedly](#) sees 18 percent of online shoppers pay through c-store locations and another 8 percent by cash-on delivery.

Overall, when it comes to online payments, "credit and debit are the most used payment forms, but for B2C transactions, it's paying through Oxxo," Vallaura said.

While paying in person at Oxxo may be a go-to payment method for many online shoppers in Mexico, it's also the one with higher checkout abandonment rate.

Only 30 to 40 percent of consumers who pick "Pay at Oxxo" actually end up going to the store to complete their transactions, Vallaura said, citing regretted impulse purchases as a primary reason.

And even though failing to capture impulse buyers checking out through "Pay at Oxxo" may seem like a pain point for eCommerce merchants, it doesn't necessarily affect their bottom line.

In test mode, when the option to check out with Oxxo is turned off, the volume of card-based transactions remains constant, which means cash-based payments through Oxxo, if anything, provide incremental value to merchants, Vallaura said.

“Shoppers that check out with Oxxo are people that couldn't or wouldn't pay with a card,” he said. “It's either because they don't have a bank account that they could use, the card is not working or they don't trust the merchant at the moment.”

Informal economy and the state of cash

One of the biggest factors powering cash's dominance in the Mexican economy is the significant presence of an untaxed informal economy, which has also contributed to a lack of financial inclusion.

A study published by the National Statistics Institute in [December 2016](#) found that 58 percent of Mexico's workforce is employed in informal sectors of the economy, including artisan and domestic work and unregistered vending.

While the Mexican government's effort to channel payroll through debit cards has led to an explosion in overall card volume, most consumers continue to use their cards mainly for withdrawing cash from ATMs, Vallauré said.

In 2015, Mexicans withdrew a total of \$176 billion from ATMs, a 41.82 percent increase since 2010, according to PYMNTS research.

However, slowly things are starting to change. With the growth of eCommerce, consumers are finally warming up to using debit cards for their online purchases, Vallauré said.

And even though debit and credit cards are projected to further increase their share in coming years, Vallauré believes the smart move for merchants is not to move away from facilitating cash-based payments, but to offer an array of payment methods to maximize outreach.

In the end, he believes that cash is anything but disappearing. “Not in the next five years, not even in the next 10 years. I don't even see that in the near future in U.S. or in Europe,” he said.

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.^a 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.

^a 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.^b

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

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

^b 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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