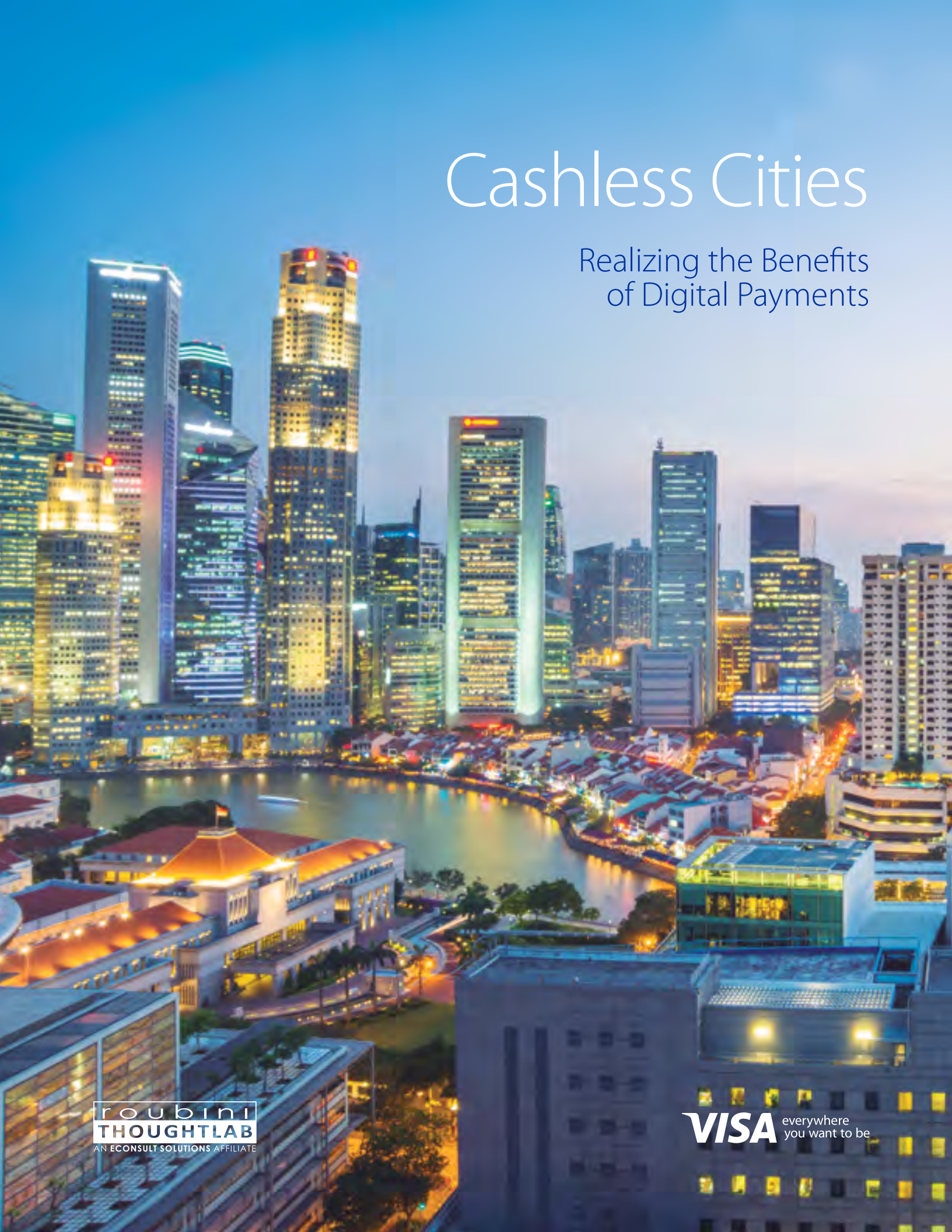
# Cashless Cities

## Realizing the Benefits of Digital Payments



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AN ECONSULT SOLUTIONS AFFILIATE

VISA everywhere you want to be

## About Roubini ThoughtLab

Roubini ThoughtLab is a research firm based in New York City that provides management thinking and evidence-based analysis to help corporate, financial, and government leaders cope with transformative change. Our clients include premier global consulting, financial, and technology companies and not-for-profit organizations. By applying advanced modeling tools, in-depth qualitative research, and high-level expert opinions, our firm offers actionable insights into industry, economic, and technology trends and their impact on the world.

Roubini ThoughtLab is a joint venture with Econsult Solutions Inc., a leading economics consultancy. With access to a global team of over 100 economists, industry analysts, and urban experts, our firm brings together macro-to-micro analytics with the ability to survey and interview executives, consumers, and policy-makers around the world. We provide our analysis in a variety of engaging executive formats, from global ranking and benchmarking tools to cost-benefit and economic impact models.

## About Visa

Visa Inc. (NYSE: V) is a global payments technology company that connects consumers, businesses, financial institutions, and governments in more than 200 countries and territories to fast, secure and reliable electronic payments. We operate one of the world's most advanced processing networks — VisaNet — that is capable of handling more than 65,000 transaction messages a second, with fraud protection for consumers and assured payment for merchants. Visa is not a bank and does not issue cards, extend credit or set rates and fees for consumers. Visa's innovations, however, enable its financial institution customers to offer consumers more choices: pay now with debit, pay ahead with prepaid or pay later with credit products. For more information, visit https://usa.visa.com/ and @VisaNews.

Visa's Global Public Policy group, established in 2015, commissioned this study. The group's mission is to inform public policy dialogue globally through thought leadership.

**Terms of reference**

This study quantifies the benefits associated with use of digital payments. In doing so, costs and benefits of various payment methods were assessed. This report covers 100 cities from across 80 countries. The net benefit figures for the 100 cities covered in this study are approximations based on a combination of primary survey data gathered from across a sample of six representative cities globally (please refer to the Technical Appendix for more details), and secondary data from well-recognized organizations such as the World Bank, Organization for Economic Cooperation and Development (OECD) Union Internationale des Transports Publics (UITP), and McKinsey and Company. The numbers in this report are quoted in US Dollars and generally pertain to averages across the 100 cities, unless otherwise stated. Some benefits of digital payments (e.g. increased convenience, personalized services, improved expense tracking and efficient inventory management) and costs of cash payments (e.g. health and environmental impacts) are difficult to quantify and are not within the scope of this research. For a more detailed note on the costs and benefits, please refer to the Technical Appendix. Therefore, the digital payments net benefit figures presented are a conservative estimate. While the report provides net benefit estimates for three main stakeholder segments (consumers, businesses and governments), it does not make a distinction within these segments. As such, the benefits are not broken down based on different types of businesses, consumers and levels of government. Specifically, estimates for government benefits are based on city-level data. However, fiscal arrangements among different levels of government in each country will determine how these benefits get distributed. It is also important to recognize that as payment service providers, financial institutions both benefit and incur significant costs associated with supporting different forms of payment methods. This study does not consider costs and benefits to financial institutions since such data is commercially sensitive and not readily available. The catalytic impact (GDP, employment, wages, and productivity) estimates are provided for the 15-year horizon from 2017-2032. Estimates are based on average annual growth over the projected 15-year period, unless otherwise stated. These estimates are derived using the National Institute Global Econometric Model (NiGEM), which provides a 15-year forecast. The report makes reference to "physical money" and "digital payments". "Physical Money" in this report includes cash, checks and money orders while "digital payments" includes debit cards, credit cards, prepaid and/or stored-value cards, online/mobile electronic bill payments, mobile money/e-wallet transactions, and bank wire transfers. All references to data that aren't linked to another source are direct findings from this study. Please refer to the Technical appendix for additional details about the methodology.

# Cashless Cities:
# Realizing the Benefits of Digital Payments

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# Executive Summary

Cities account for a large proportion of the global population and its economic activity. Today, over half of the world population lives in cities[1]. By 2050, this number will increase to two-thirds[2]. Currently, over 80% of global economic activity takes place in cities and it is expected that the vast majority of future economic growth will come from cities[3].

With such a significant share of a country's population and economic output concentrated in its cities, there is an immense opportunity to further increase economic growth and improve quality of life for billions of people.

In recognition of this opportunity, a number of cities globally have introduced smart city initiatives, and are utilizing a wide range of digital technologies to improve the lives of their residents. Smart city initiatives and supporting policies could potentially become critical pathways for governments seeking to foster economic growth, improve safety, attract businesses and provide better services to their citizens. Digital payments technology is a crucial enabler of smart cities, and could contribute significant benefits to consumers, businesses, governments and economies. Since digital payments are a means to an end, the scale of benefit they bring has not been broadly understood or studied.

This study is unique in that for the first time it looks at the net benefits associated with adopting digital payments and does so at the city-level. The assessment is carried out for 100 cities across 80 countries, segmented by stage of digital maturity, with these cities modelled to an "achievable cashless scenario". This scenario is defined as the entire population moving to digital payment usage equal to the top 10% of the users in that city today. The findings provide compelling support for greater adoption of digital payments.

This study estimates that increasing digital payments across the 100 cities could result in total direct net benefits of US$470 billion per year. On average, these net benefits represent slightly over 3% of a city's current GDP. Greater economic activity spurred by digital payments also supports higher employment as well as improvements in wages and workers' productivity. This study also finds that on average, across the 100 cities, increased usage of digital payments could add 19 basis points to a city's GDP and support over 45,000 additional jobs per year per city, while worker productivity and wages could increase by 14 and 16 basis points per year per city, respectively. To put the GDP growth number in perspective, the 19 basis points increase in economic growth per year across the 100 cities translates to nearly $12 trillion of total additional economic activity over the next 15 years – an amount exceeding China's 2016 GDP.

Major findings from the analysis contained in this study include:

- Consumers across the 100 cities currently spend an average of 32 hours a year – nearly a full work week - on cash-related payment activities. Greater adoption of digital payments is estimated to reduce this figure to 24 hours a year, saving consumers in the 100 cities an average of over $126 million per year. When other benefits of digital payments are taken into account,

# Cities analyzed in this study, categorized according to their levels of digital maturity




References:

Cash Centric 1 Digitally Transitioning 2 Digitally Maturing




3 Digitally Advanced 4 Digital Leader 5

Graph of average net benefits

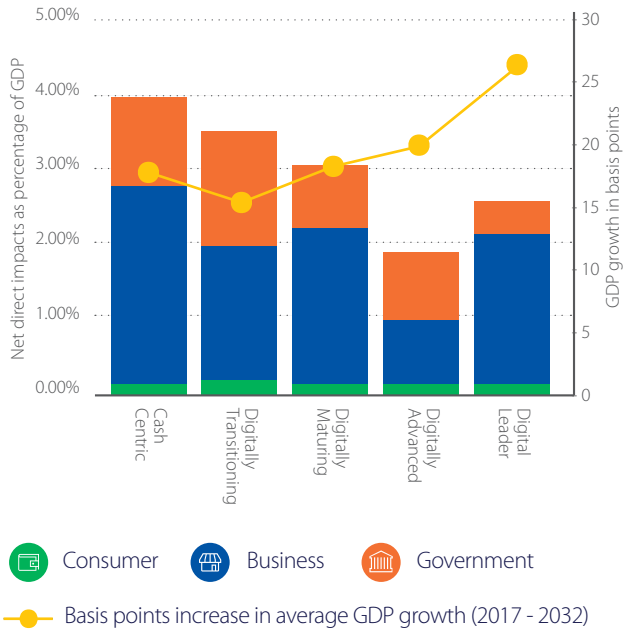



**Figure 1: Cities in each maturity category stand to benefit from greater adoption of digital payments.**
Source: Roubini ThoughtLab Model and Analysis

such as reduction in cash-related crime, these savings could increase to $278 million per city, equivalent to about $67 per adult per year.

- Accepting cash and checks costs businesses about 7 cents of every dollar received compared to 5 cents for every dollar collected from digital sources. When combining savings with increased sales from digital payments usage, our study projects that total net benefits to businesses across all 100 cities could amount to over $312 billion per year after transitioning to an achievable level of cashless activity.

- Average annual savings to governments in direct administrative expenditures by making greater use of digital payments amounts to $710 million. A reduction in cash-related crime could save an additional $53 million per year. Meanwhile, the estimated potential increase in tax revenue from digital payment adoption amounts to an average of $534 million per year.

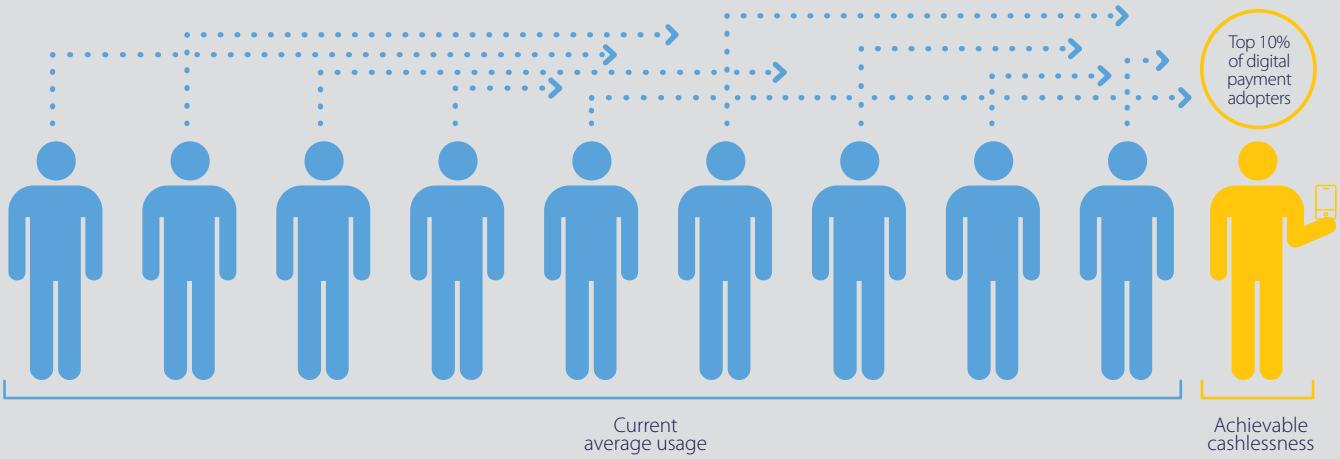
- As shown in Figure 1, cities at every level of digital payments maturity could benefit when moving from cash to digital payments.

For this study, Roubini ThoughtLab researchers first surveyed consumers and businesses[4] located in six cities representing five different stages of digital payment maturity. Survey results were extrapolated to an additional 94 cities (See pages 2-3) using supplemental data from the World Bank, OECD, and other secondary data sources. The 100 cities studied represent 80 countries. The net direct benefits presented in this study are based on this 100 cities analysis under an achievable cashless scenario. The National Institute Global Econometric Model (NiGEM) was then used to determine catalytic economic effects.

Finally, this study identifies several high-level barriers to a city's successful transition to digital payments. These are matched to an Action Roadmap directed at policy-makers, consumers and industry participants, aimed at overcoming these highlighted barriers. These actions are offered as an indicative guide for stakeholders to consider.

# Overall Benefits

Greater levels of cashlessness generate positive net benefits for cities




A selection of benefits if cities moved to achievable levels of cashlessness

## Consumer

- Time savings in banking, transit and retail transactions
- Float savings
- Savings from avoidance of late payment fees
- Savings from reduced crime
- Increased convenience
- Improved budgeting and expense tracking
- More personalized customer service
- Better data to build credit profiles

## Business

- Reduced theft and pilferage
- Labor time savings
- Savings from reduced float times and costs
- Potential for greater sales through digital channels
- Better data to improve customer service
- Leverage data for targeted promotional campaigns
- Convenient inventory and expense tracking
- Utilize data to improve loyalty schemes

## Government

- Savings from more efficient government processes
- Increased tax revenues from recaptured informal economy
- Increased tax revenues from greater business sales
- Criminal justice costs savings from reduced crime
- Toll-road and transit agency cost savings
- Better data on citizen needs
- Lower costs of managing cash
- Smart cities to enhance quality of life for citizens

Total net benefits

**$470 billion#**

Potential net direct benefits across 100 cities per year for payments industry stakeholders

Total consumer net benefits

**$28 billion**

Total business net benefits

**$312 billion**

Total government net benefits

**$130 billion**

# This translates to an average of 3.08% of GDP per city

Total additional economic activity*

**$12 trillion**

Economic impacts for 100 cities when moving to achievable levels of cashlessness over 15 years (2017-2032)

GDP

**19**

average annual basis point increase

Employment

**5**

million jobs supported over 15 years

Productivity

**0.14%**

increase in baseline CAGR

Wages

**0.16%**

increase in baseline CAGR

*Between 2017 and 2032
CAGR: Compound Annual Growth Rate

# 1. Introduction

Policymakers around the world are increasingly focused on the economic and social development of major urban areas. This attention is due to several reasons. First, the world's population is increasingly located in urban centers. According to the UN, 60% of the global population is expected to be living in cities by 2030, up from only 30% in 1950.[5]

Second, large urban centers are engines of economic growth for the entire country in which they are located. For example, São Paulo, which is home to approximately ten percent of Brazil's total population, accounts for roughly a fifth of the country's total economic output as measured by GDP.[6] Moreover due to a concentration of residents and businesses, economic initiatives that start in major urban centers can often be expanded more efficiently to smaller cities and rural areas based on existing economies of scale. Large urban areas can act as an incubator for initiatives that can eventually benefit a country's entire population.

Finally, perhaps because of the economic impact cities have on a nation's economy and certainly due to the enhanced mobility of both labor and capital in today's increasingly connected economy, large global cities compete with one another for business headquarters, manufacturing facilities, transportation hubs, educated professionals, arts and entertainment events, and international tourism. Municipal governments routinely offer tax, land use, and other incentives in an attempt to attract such economic activity. At the same time, global corporations and even top-tier professionals routinely "shop around" for the most advantageous investment destination or home.

To fully realize their potential impact, cities across the world are undertaking "smart city" initiatives.[7] Generally, smart cities are defined as those with ubiquitous digital technologies that aim to improve city living, promote commerce, and drive economic growth, ultimately attracting more business investment, residents and visitors. While the specifics of each city's smart city strategy vary, common core elements tend to include public Wi-Fi, high-speed broadband connectivity for key urban zones, traffic control systems, and extensive use of digital payments.

The next wave of technologies—the Internet of Things, driverless cars, wearables, robotics, blockchain, biometrics, and artificial intelligence, to name just a few — may fuel even greater investments in smart city initiatives. Gartner, a research firm, predicts that the Internet of Things will connect 20.4 billion devices by 2020[8], about three times the number of people in the world.

This paper is focused on the digital payments component of cities' smart strategies. The reality in cities around the globe is that more and more people are adopting digital payments and "cashing out" in their daily lives. A cashless society, says Michael Busk-Jepsen of the Danish Bankers Association, "is no longer an illusion but a vision that can be fulfilled in a reasonable time frame."[9] Some believe

# Stages of Digital Maturity



3

Digitally Maturing

Mostly composed of cities from Asia Pacific (9 cities – driven by China and Southeast Asian countries)

São Paulo / Tokyo

Sao Paulo

Low readiness, high usage

High unbanked population

Tokyo

High readiness, low usage

Cultural inclination toward cash

Beijing
Belgrade
Budapest
Brasilia
Bratislava
Dubai
Durban
Johannesburg
Kuala Lumpur
Kuwait City
Lisbon
Osaka
Prague
Rome
Shanghai
Shenzhen
Taipei
Tehran
Tianjin
Ulaanbaatar
Warsaw
Zurich

4

Digitally Advanced

Composed by more advanced cities in Asia, Europe, and the U.S.

Chicago

Developed digital infrastructure, but maintains considerable cash usage

Low levels of unbanked population

Amsterdam
Austin
Barcelona
Berlin
Brussels
Dublin
Frankfurt
Hong Kong
Madrid
New York City
Oslo
Paris
San Francisco
Seoul
Singapore
Tel Aviv
Vienna
Washington, DC

5

Digital Leader

European, Canadian and Australian cities that have the most advanced digital payment usage

Stockholm

Developed banking and digital payment system

High usage, high readiness

Population nearly fully banked

Auckland
Canberra
Copenhagen
Helsinki
London
Ottawa
Sydney
Toronto

they will eventually be living in a cashless society. A recent survey in the U.K., showed that a majority of respondents (68% of the 2,000 surveyed) believe that cash will no longer exist within 20 years. Surveys in other countries have shown similar results.[10]

With the pace of this digital change accelerating around the world, national and municipal governments are embracing smart technology and cashless payment solutions. For example, Bucharest recently installed contactless payment terminals in all of its metro stations.[11] The Bank of Korea announced in December 2016 that it plans to eliminate physical coins by 2020, a first step toward making South Korea a cashless society.[12] Dubai is developing the use of smart receipts – digital receipts that can be directly stored in a mobile device - that will replace paper and email receipts to enhance transparency in retailing, boost consumer confidence, and improve personal financial management.[13]

Business leaders are also responding to consumer expectations and contributing to a more cashless future. For example, Samsung has introduced a smart refrigerator that allows one to order and pay for food through a Wi-Fi-enabled touch screen.[14] The U.S. salad chain, Sweetgreen, is eliminating the use of paper money in many of its restaurants to make them more efficient, and safe.[15] Honda is partnering with Visa to facilitate in-car payments so drivers can pay for fuel and parking without leaving the car.[16] Amazon is testing a new retail model, Amazon Go, which eliminates checkout lines by drawing on sensor technology to add goods removed from shelves directly to a shopper's virtual payment cart and automatically debits a consumer's payment account upon leaving the store.[17]

To our knowledge, this report is the first attempt to quantify the net benefits associated with digital payments adoption at the city-level. Visa commissioned Roubini ThoughtLab to conduct a comprehensive review of the current state of digital payments in key urban areas around the world to quantify the net benefits to consumers, businesses, and governments, and outline critical steps that each of these stakeholder groups can take to increase the use of digital payments in their own urban centers.

Roubini ThoughtLab surveyed over 3,000 consumers and 900 businesses across six cities around the world. These cities cumulatively represent five levels of digital payment maturity, as referenced in pages 8-9. Those at the lower end of the digital payment maturity spectrum, referred to as Cash Centric, are typically characterized by a high proportion of unbanked population, low availability of digital payments infrastructure, and under-utilization of digital payments. Those at the highest digital payment maturity level, Digital Leaders, are known to have highly developed banking and digital payment systems, nearly fully-banked populations, and lead the world in digital payment usage.

Surveys were conducted in Lagos, Bangkok, Sao Paulo, Tokyo, Chicago and Stockholm, with each city representing a different level of digital payment maturity. Usage and readiness scores drive a city's classification, which ultimately led Sao Paulo (lower readiness) and Tokyo (lower usage) to both be classified as Digitally Maturing. This separation into clear categories allowed for a more accurate assessment of the impact that moving toward more digital payments will have on a city's residents and overall economy. This categorization also enabled specific action roadmap to be identified and tailored to the city's level of digital payment maturity.

Researchers then used demographic and economic data to extrapolate these survey results to another 94 cities around the world (see Chapter 7) to estimate the net impact of greater digital payments usage on consumers, businesses and governments in each city. In measuring the net impact, researchers assumed that each individual city's entire population would achieve the same use of digital payments as that of the city's most advanced local consumers and businesses—those in the 90th percentile. Thus, our analysis did not assume that cash would be completely eliminated, but merely reduced significantly. We considered this level of adoption a city's "achievable cashless level." That said, an accompanying data visualization tool does allow stakeholders to explore potential benefits of a completely cashless future state.

Finally, our analysis used the NiGeM model, an econometric model used by prominent central banks around the world such as the Bank of England, the European Central Bank and others, to estimate the "catalytic" impacts—economic growth, productivity, employment and wages—that a move toward digital payments would have on each of the 100 cities analyzed.

# Lagos

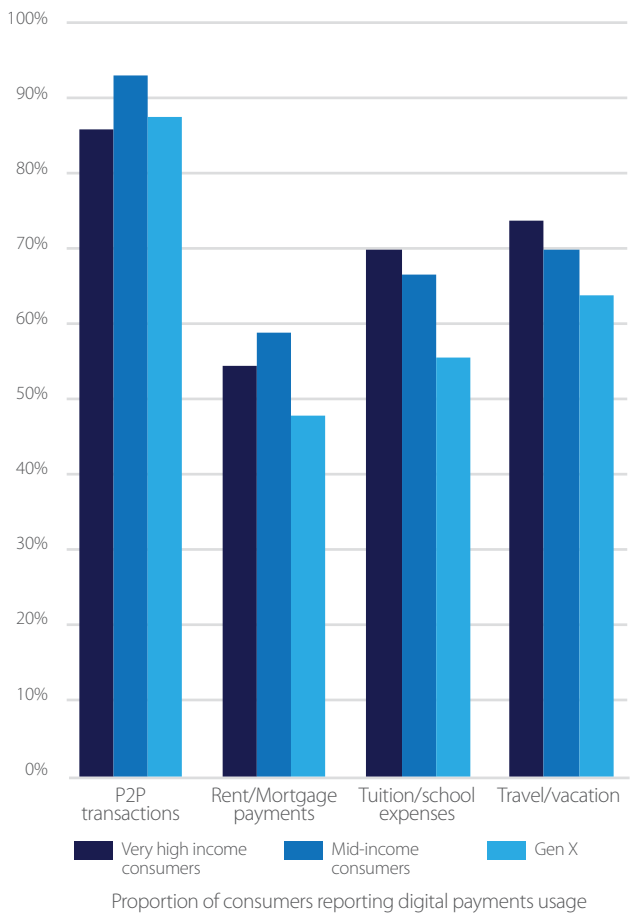
Cash Centric

Lagos recently launched its ambitious Smart City initiative. Interestingly, even in a Cash Centric city like Lagos, a significant number of citizens are using digital payments. By transitioning to an achievable cashless level, Lagos may potentially stand to gain over $2.7 billion in direct net benefits.

## Current Usage in Lagos

### 12% of consumers reported using only digital payments for transactions over the past month

Transaction categories witnessing high current usage of digital payments




Proportion of consumers reporting digital payments usage

Source: Roubini ThoughtLab Consumer Survey, Roubini ThoughtLab Analysis, & NiGEM Model

Note: Income intervals broadly defined as follows – Mid-income: Between 340,000 and 510,000 Naira per year; Very high income: Above 1.3 million Naira per year.

## Achievable Cashless Impacts

### How could Lagos benefit if all stakeholders started transacting like the top 10% of its users?

#### Potential annual cumulative benefits

**Consumers**

$175 million per year

$18 per adult per year

**Businesses**

$2 billion per year

$16,020 in net benefits per million dollars of revenue per year

**Governments**

$265 million per year

6% total increase in tax revenue as a percentage of baseline tax revenues per year

#### Potential catalytic impacts over the next 15 years

**GDP Growth**

28 basis points annual increase from 2017 to 2032

**Wages**

0.5% bump up in compound annual growth rate from 2017 to 2032

**Employment Growth**

134,600 new jobs supported by 2032

**Productivity**

0.2% bump up in compound annual growth rate from 2017 to 2032

# Stockholm

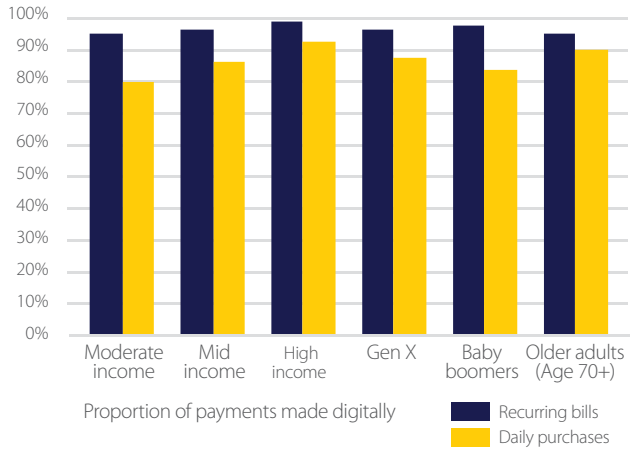
Digital Leader

## Stockholm leads in its digital payments adoption.

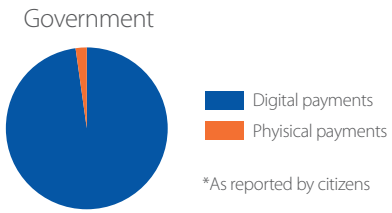
### Current Usage in Stockholm

Nearly 30% of low-income respondents used only digital payments for purchases over the past month. Close to 47% of mid-income respondents expect a reduction in cash usage over the next year

Over 80% of recurring bills and daily purchases are paid for through digital payments by mid-high income and older working age consumers




The government has digitized almost all of its payments to citizens.*




Source: Roubini ThoughtLab Consumer Survey, Roubini ThoughtLab Analysis, & NiGEM Model

Note: Income intervals broadly defined as follows – Moderate income: Between 180,000 and 289,000 kronor; Mid-income: Between 289,000 and 434,000 kronor; High-income: Between 434,000 and 1.1 million kronor.

### Achievable Cashless Impacts

How could Stockholm benefit if all stakeholders started transacting like the top 10% of its users?

Potential annual cumulative benefits

**Consumers**

$264 million per year

$143 per adult per year

**Businesses**

$3 billion per year

$10,234 in net benefits per million dollars of revenue per year

**Governments**

$1 billion per year

2% total increase in tax revenue as a percentage of baseline tax revenues per year

Potential catalytic impacts over the next 15 years

**GDP Growth**

57 basis points annual increase from 2017 to 2032

**Wages**

0.7% bump up in compound annual growth rate from 2017 to 2032

**Employment growth**

1,700 new jobs supported by 2032

**Productivity**

0.6% bump up in compound annual growth rate from 2017 to 2032

The research demonstrates that consumers, businesses, and governments could all benefit substantially from deepening and expanding their use of digital payments.

Digital payments make it easier and safer for people to shop, bank, travel and manage their lives; they help businesses thrive and cut costs; and enable governments to collect more taxes, manage budgets, and reduce crime and corruption. Specifically, across the 100 cities modeled, the average net benefit to consumers, businesses and governments when increasing digital payments use is equivalent on average to slightly over 3% of current GDP, or nearly US$470 billion in annual total net benefits. Moreover, the average city could expect an average annual GDP growth rate increase of 19.4 basis points over the next 15 years if it were to embrace digital payments more fully.

# 2. The High Cost of Cash

# While people often see physical money as a cost-free means of payment, closer analysis shows that there are a variety of costs borne by consumers, businesses and governments in using cash.

Research has found that in the U.S. alone, cash carries a cost of $200 billion annually, while in India, cash is estimated to cost $28 billion.[18] In today's digital age, "coins and notes are in fact an anachronism," said Peter Bofinger, a member of the German Council of Economic Experts. "They make payments incredibly difficult, with people wasting all sorts of time at the cashier as they wait for the person ahead of them…to find some cash, and for the cashier to render change".[19] The research highlighted in this paper sheds further light on the high costs of cash. For example, in cities across all five stages of digital maturity, consumers spend 32 hours a year, nearly a full work week, on banking, getting cash, and paying bills. (see page 16)

In addition, there are direct costs of cash to consumers, particularly low-income citizens who do not have bank accounts and therefore tend to face higher out-of-pocket expenses to access the cash required to complete their financial transactions. Our analysis found that unbanked consumers in cities across all five stages of digital maturity spend on average $7 to $15 a month on cash withdrawal activities, such as check cashing.

Our survey analysis reveals that as with consumers, cash exposes merchants and businesses to a host of direct and indirect costs:

- **Transportation, security, and banking expenses.** On average, businesses spend 2% of revenue per month for incoming non-digital payments. The percentage increases to 3% for some cities, like São Paulo and Tokyo, and for larger businesses. The average float time (the time it takes for funds to show up in a bank account) on physical money can range from a day and a half for cash to three days for checks in markets where check use is common.

- **Handling, counting, and processing costs.** While the level varies by size of business, companies spend on average about 68 hours per week managing cash. The number of hours is even higher in certain cities such as Bangkok (89 hours) and Tokyo (about 86 hours).

- **Theft, shortages, and counterfeit money.** Businesses lose an equivalent of 4% of their revenues per month due to theft, counterfeit money, and cash register shortages. While the amounts tend to be lower in developed market cities such as Chicago (1%) and Tokyo (2%), they can be very high in emerging market cities such as São Paulo and Lagos (9% each).

- **Expenses for outgoing payments to suppliers.** Businesses generally spend just over 88 hours a month processing the roughly 45% of their payments that they make using cash, checks, and money orders. They spend a similar amount of time processing the 55% of their payments that they make digitally, which means these payments on average take less time.

- **Opportunity cost of only accepting cash.** Often, consumers opt to not carry large sums of cash and instead, have access to their funds through digital payments. As a result, when stores only accept cash, there could be instances when consumers forego purchasing item(s) because they do not have sufficient cash on hand. Our survey found that consumers typically forego one purchase per month with an average value of about $73.

## Getting cash from an ATM



# 6.4 hrs/yr

On average consumers make 3-4 ATM visits per month and spend almost 8 minutes each time.

## Visiting a check-cashing facility



# 3.3 hrs/yr

Consumers make one visit each month and spend on average 16.5 minutes each time.

## Visiting a bank



# 7.3 hrs/yr

Consumers make about two bank visits a month and spend an average of 18 minutes each time.

## Paying bills in person



# 12 hrs/yr

At least 4% of residents, mainly from more cash-oriented economies, spend over an hour each month paying bills in person.

## Writing checks and balancing a checkbook



# 3 hrs/yr

Consumers in markets where paying by check is an option, typically spend over 15 minutes per month writing checks and balancing a checkbook.

**Current consumer time spending**

Source: Roubini ThoughtLab Consumer Survey

Governments carry many of the same handling and processing expenses as businesses since governments also accept and make payments such as tax collections, parking fines, licenses, social welfare payments, and pension payments. However, tax evasion is often the biggest cost for governments, especially for those with substantial informal economies. In his annual budget speech in 2017, the Finance Minister of India highlighted India's low tax-to-GDP ratio and remarked that direct tax collections are not "commensurate with income and consumption patterns of the Indian economy."[20] Previous research has pegged the loss to the government from underreporting of incomes at over $314 billion annually.[21] This study estimates that governments across 100 cities, on average, could capture additional tax revenues of 2.8% of the current tax base from greater digital payments usage.

The highest cost of cash compared to digital payments, however, may be the crime that it fuels. This impacts consumers, businesses, and governments. As Robert Wainwright, Director of Europol noted: "Money laundering and cash have been the stock of criminals for decades."[22] Cash is easy to hide, and it facilitates bribery and tax evasion. Cash is the motivation for various crimes against merchants and individuals, such as burglary and robbery, which often involve assault. For example, a switch to accepting cash by the car share service Uber is reported to have led to an increase in robberies of drivers in São Paulo.[23] Studies from research organizations, like the US's National Bureau of Economic Research, reveal a strong correlation between the amount of cash in circulation and crime rates.[24] [25]

In our survey, an average of 19.4% of consumers said they or an immediate family member were robbed of their cash over the past three years; in Lagos, Bangkok, and São Paulo, this figure was over 30%. The amounts taken varied widely from less than $25 to more than $1,000, with the average around $262. Unfortunately, low-income families were most often the victim of these crimes (nearly 28% compared to under 10% for high-income families). Our analysis demonstrates that cash-related crime could be reduced by almost 90% in some cities (see figure 2) if they were to reach their achievable cashless level, resulting in well over $13 billion in cost savings across the 100 cities.

| | Current annual average number of cash- related crimes | Average expected decrease in number of cash-related crimes (%) | Value of potential average annual decrease in cash crime (in $ millions) |
|---|---|---|---|
| Cash Centric | 216,451 | 52% | 71 |
| Digitally Transitioning | 165,325 | 74% | 110 |
| Digitally Mature | 92,035 | 70% | 78 |
| Digitally Advanced | 63,313 | 78% | 242 |
| Digital Leader | 62,564 | 88% | 296 |
| **Average (100 cities)** | **133,289** | **69%** | **134** |

**Figure 2: In an achievable cashless scenario, cities across the spectrum could benefit substantially from a reduction in the number of cash-related crimes.**
Source: Roubini ThoughtLab Model and Analysis

# 3. Net Direct Benefits of Moving Toward Cashless

# Moving from cash to digital can provide enormous direct advantages to consumers, businesses, and governments. Digital payments generally are far more convenient and can save costs, labor, and time for all parties.

In addition, digital payments enable businesses to drive growth and profits, help governments reduce crime, raise tax receipts, and deliver public services more efficiently. Our research finds that the direct net benefit to consumers, businesses, and governments across the 100 cities could total nearly US$470 billion, equivalent to an average of over 3% of these cities' current GDP.

The incremental benefits accumulate across all stages of digital payment maturity and are the largest when graduating from Digitally Advanced to Digital Leader stages. As an example, if a Cash Centric city like Lagos increased its digital payments use to reach the next stage, Digitally Transitioning, it could realize a direct net benefit of over 0.8% of its GDP. If Lagos were to reach its achievable cashless level, these benefits could increase to close to 4% of GDP. If Lagos eliminated use of physical money altogether, the city's cumulative benefits could be as high as 5% of GDP. (See Figure 3)

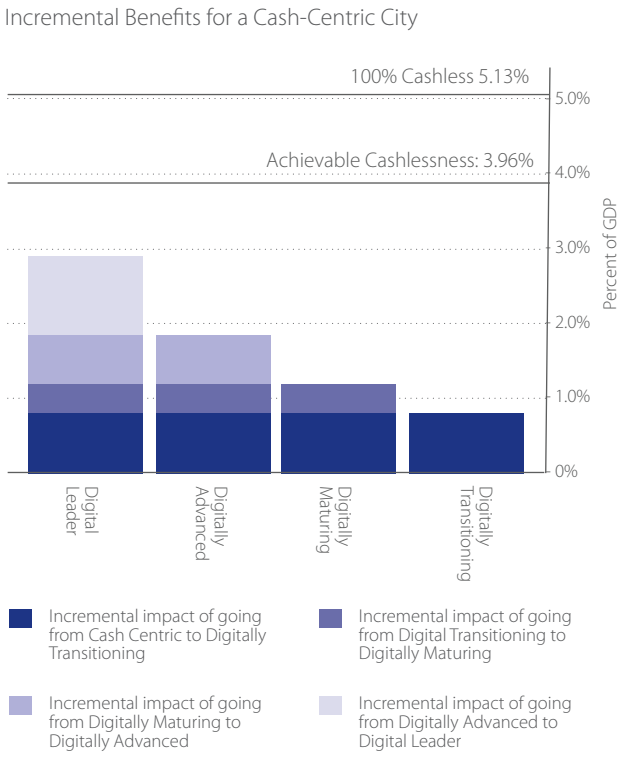



**Figure 3: A cash centric city like Lagos is expected to experience the biggest benefits when moving from Digitally Advanced to Digital Leader stages. However, total benefits accrue across all stages of digital payment maturity, with gains equivalent to almost 3% of GDP when it reaches the Digital Leader stage.**

Source: Roubini ThoughtLab Model and Analysis

## 3.1 Consumers

Given the drawbacks of physical money and the ubiquity of digital technology, it is no wonder that consumers around the world are embracing digital payments. Digital commerce is multiplying at four times the rate of traditional commerce, and mobile commerce at eight times.[26] Another research study forsees explosive growth in mobile payments, which is expected to reach $3.4 trillion globally by 2022.[27]

The results from our survey of consumers bear this out. On average, about 11% of consumers expect to use

# Chicago

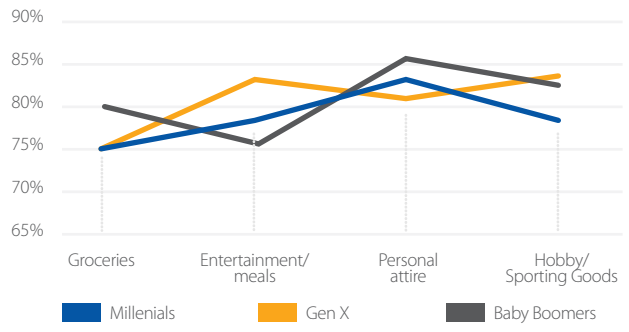
Digitally Advanced

In Chicago, consumers across income and age groups use digital payments for some daily purchases and travel expenses.

## Current Usage in Chicago

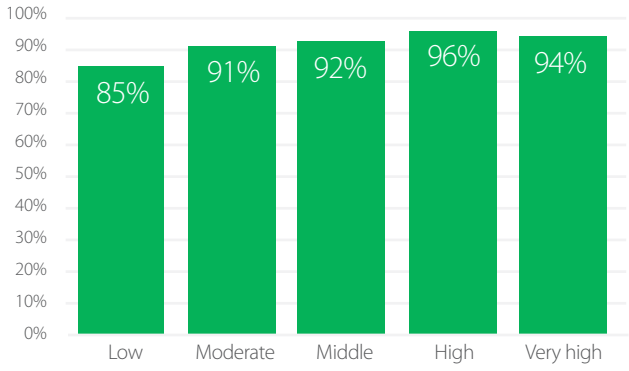
### Over 11% of millennials reported using only digital payments to make purchases over the past month

Consumers across different age brackets have incorporated digital payments in their daily purchase behavior




Proportion of consumers reporting using digital payments

Consumers across all income groups overwhelmingly prefer digital payments for travel and vacation-related expenses




Proportion of consumers reporting using digital payments

Source: Roubini ThoughtLab Consumer Survey, Roubini ThoughtLab Analysis, & NiGEM Model

Note: Income intervals broadly defined as follows – Low income: Below $21,800; Moderate income: Between $21,800 and $32,700; Mid-income: Between $32,700 and $81,200; High income: Between $87,200 and $174,300; Very high income: Above $174,300

## Achievable Cashless Impacts

### How could Chicago benefit if all stakeholders started transacting like the top 10% of its users?

Potential annual cumulative benefits

**Consumers**

$793 million per year

$112 per adult per year

**Businesses**

$6 billion per year

$5,573 in net benefits per million dollars of revenue per year

**Governments**

$3 billion per year

2% total increase in tax revenue as a percentage of baseline tax revenues per year

Potential catalytic impacts over the next 15 years

**GDP Growth**

41 basis points annual increase from 2017 to 2032

**Wages**

0.3% bump up in compound annual growth rate from 2017 to 2032

**Employment Growth**

16,900 new jobs supported by 2032

**Productivity**

0.4% bump up in compound annual growth rate from 2017 to 2032

physical money less often over the next year, and 24% expect to use digital payments more. Digital payment usage continues to break records.[28] This trend towards a consumer preference for digital payments carries across all 100 cities and extends to all consumer groups in these cities regardless of income level or age.

It is also noteworthy that our research finds that when payment-use intentions are analyzed by income and age, low-income consumers and those in the 18-34 age group expect to increase their usage of digital payments significantly over the next year. Specifically, on average, 29% of low-income consumers expect to use digital payments more compared with under 20% of middle- and high-income consumers. This is a fact that shows up in each of the cities we analyzed, from emerging market cities, such as Bangkok and São Paolo, to developed market cities like Stockholm and Tokyo. The data indicates that any moves toward a lower usage of cash will significantly benefit low-income consumers, resulting in a positive social impact.

When age is considered, consumers of all ages expect to increase their use of digital payments, and those in the 18-34 age group are relatively the most interested in moving to digital. Over 34% of consumers between the ages of 18-34 expect to use digital payments more in the future, compared to nearly 14% of consumers older than 70.

Consumers in every city expect to use digital payments more often to pay for almost every type of transaction in the future. However, the most interest among those consumers surveyed is for an increased ability to pay recurring bills. Our survey found that over 65% of consumers now pay their recurring bills digitally, and about 76% prefer this method, with some of the biggest jumps in paying government taxes and school expenses. Similarly, about 59% of people currently make their day-to-day purchases digitally, while over 73% would prefer this method.[29]

Consumers expect to increase their use of every digital payment category in the future. However, electronic bill payment and mobile payment usage are expected to expand the most, followed by debit and credit cards.Specifically, nearly 35% of consumers plan to expand their use of electronic bill payments and over 26% expect to turn increasingly to debit cards. Nearly 30% of all consumers expect to increase their use of mobile payments. In particular, consumers on average expect their cash payments to decrease by over 18%.

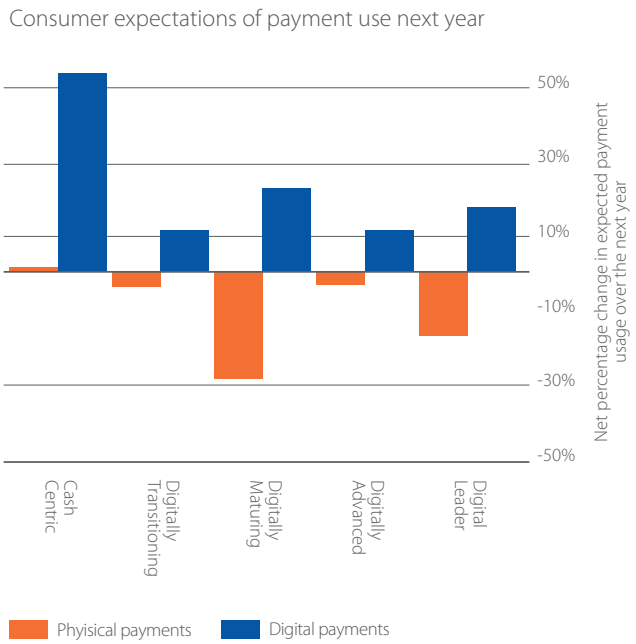



**Figure 4: Consumers across most cities expect to significantly reduce their usage of physical money over the next year, with consumers in digitally maturing cities expected to see the largest decline.**
Source: Roubini ThoughtLab Consumer Survey

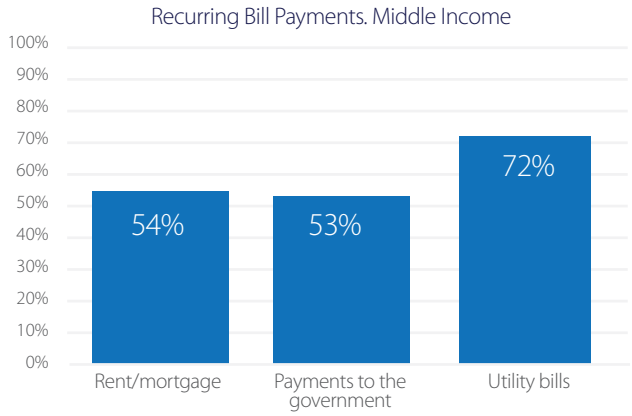
# Tokyo

Digitally Maturing

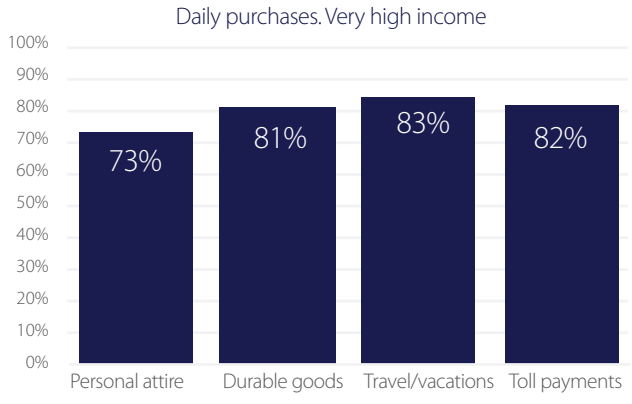
Despite having a cultural inclination towards using cash, some of Tokyo's income segments generally prefer to use digital payments for recurring bills and daily purchases.

## Current Usage in Tokyo

### In Tokyo, digital payments adoption is driven by mid-income consumers for some recurring bills, and by very high income consumers for some daily and travel-related purchases




Proportion of respondents reporting digital payments usage




Proportion of respondents reporting digital payments usage

Source: Roubini ThoughtLab Consumer Survey, Roubini ThoughtLab Analysis, & NiGEM Model

Note: Income intervals broadly defined as follows – Middle income: Between 2.2 million and 3.2 million yen; Very high income – Above 8.1 million yen

## Achievable Cashless Impacts

### How could Tokyo benefit if all stakeholders started transacting like the top 10% of its users?

Potential annual cumulative benefits

**Consumers**

$2 billion per year

$70 per adult per year

**Businesses**

$35 billion per year

$11,080 in net benefits per million dollars of revenue per year

**Governments**

$12 billion per year

2% total increase in tax revenue as a percentage of baseline tax revenues per year

Potential catalytic impacts over the next 15 years

**GDP Growth**

31 basis points annual increase from 2017 to 2032

**Wages**

0.1% bump up in compound annual growth rate from 2017 to 2032

**Employment Growth**

39,400 new jobs supported by 2032

**Productivity**

0.3% bump up in compound annual growth rate from 2017 to 2032

The high expectations that consumers have for moving toward digital payments are supported by our analysis of the significant net benefits that consumers could see from cashless cities. Specifically, our 100 cities analysis estimates net consumer benefits—which include direct time savings, lower cash withdrawal costs, and less cash-related crime, offset by the costs of equipping consumers with bank accounts —averaging over $278 million annually per city.[30]

As Figure 6 shows, consumers in digital leader cities are likely to realize the most substantial net benefits if all consumers converge to the achievable cashless level. Cash Centric cities that reach their full achievable cashless level could see average net direct consumer benefits equal to nearly $29 per adult while Digital Leaders see an average net impact of nearly $140 per adult.

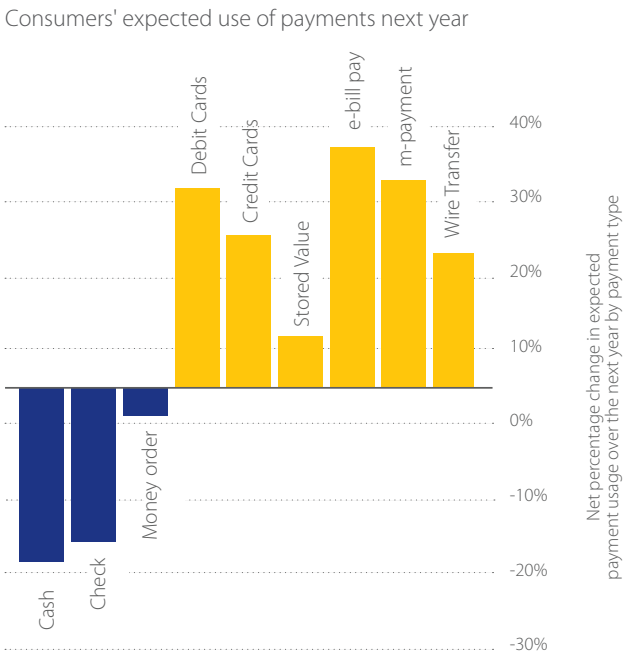



**Figure 5: All forms of physical payments are expected to see a decline in usage. Cash in particular, is expected to be used least often by consumers across cities, income classes and age groups.**
Source: Roubini ThoughtLab Consumer Survey

## 3.1.1. Consumer Time Savings

The primary benefit for consumers when moving away from cash and toward digital payments is reduced time spent managing money. While this sounds self-evident, recall that the average urban consumer spends 32 hours per year on banking, getting cash, and paying bills, spending additional hours in line at the checkout and waiting to pay transit fees. Our analysis indicates that consumers could expect to save an average of 8 hours each year if their home city were to reach its achievable cashless level. Across the 100 cities in our analysis, this translates to a total of over $12 billion in time savings.[31]

Our research has found that as a city moves up the digital payment maturity curve, the amount of time that the average citizen spends on these banking-related activities decreases significantly. Our surveys indicated that an average consumer in Lagos spends nearly 22 minutes per month on banking-related activities, while in Stockholm, the average consumer spends only about 10 minutes per month. Over the course of a year, that means millions of adults living in Cash Centric cities are spending on average nearly 3.5 hours on banking-related activities, while those in Digital Leader cities spend just under an hour.

The results clearly show that the greater a city's dependence on physical money, the more time its consumers can save by moving to digital payments. Our analysis found that the average adult in Cash Centric cities could save over 11 hours

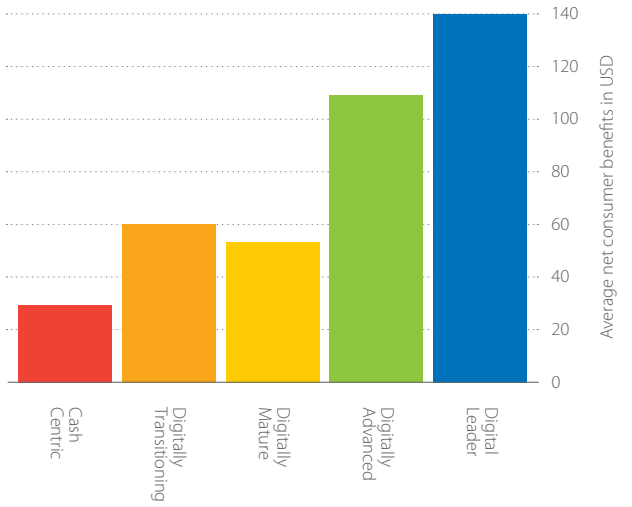



**Figure 6: Consumers across all 100 cities could gain from reducing their usage of physical payments.**
Source: Roubini ThoughtLab Model and Analysis

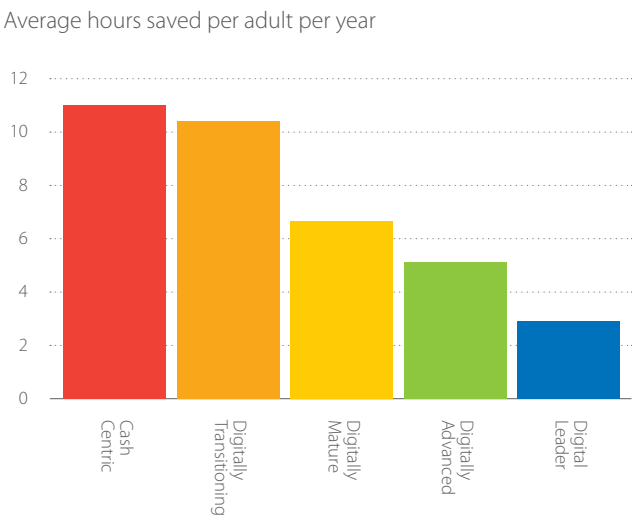



**Figure 7: Adult consumers could experience substantial time savings from increased usage of digital payments, with more cash-based economies experiencing greater impact.**
Source: Roubini ThoughtLab Model and Analysis

per year from reduced banking time and retail transaction times, while for the average adult in Digital Leader cities, further increasing usage of digital payments could save nearly 3 hours per year. (see Figure 7)

## 3.1.2. Consumer Banking Fees

In transacting digitally, consumers benefit greatly from having direct access to a personal bank account. The standard fees associated with such accounts represent a new incremental cost for some previously unbanked consumers.[32] According to our model, these additional fees could range from zero in cities such as Stockholm and Tokyo, which have a small percentage of unbanked consumers, to nearly $97 million in Mexico City, where unbanked citizens constitute nearly 45% of the population.

New account-related fees associated with increasingly banked populations are offset, however, by the elimination of much more expensive cash-access fees such as check cashing charges, late payment fees for utilities, and other everyday charges. For example, the use of digital payments can help reduce late fees that consumers pay on their monthly bills. According to research from Citi, 61% of American consumers that make late payments do so because of forgetfulness and 39% because they are busy.[33] However, by automating electronic bill payments, individuals could potentially reduce the number of expensive late fees.

In our survey, consumers in Lagos and Sao Paulo report paying annual late payment fees averaging $10 and $15 respectively. The percentage of the adult population that pays them varies tremendously by region and by age, with generally the youngest groups paying the most, and consumers in Asian cities the least. In Tokyo about 7% of consumers pay late fees, while in São Paulo, over 45% do so. If São Paulo's use of digital payments increased, this average would drop to 27%, and the city could see an annual reduction of over $7 per capita in late fees. For the city as a whole, that amounts to about $102 million in savings for the residents in the city.

## 3.1.3. Float Savings

Time value of money is also another important consideration. Maintaining funds in an electronic account can amount to additional earnings from interest relative to maintaining physical cash on hand. The amount of interest earned can vary. In São Paulo, where interest rates are running at close to 6%[34], our model estimates potential additional interest income at over $370 million annually, while in Stockholm, where interest rates are nearly zero and the country boasts a nearly fully banked population of proficient digital payment users, potential gains amounts to just about $1 million annually.

## 3.1.4. Reduced Crime

One of the biggest benefits for consumers comes from less crime. It has been long recognized that cash plays a critical role in motivating crime such as robbery and assault, so a reduction in the amount of cash in circulation could result in a concomitant decrease in such crimes. Research from the US has found that the costs for victims of cash-related crimes are about $1,550 per person, plus "pain and suffering"[35] of $1,650 per victim.[36]

In our survey, we asked respondents whether they or a family member had been robbed of cash in the last three years and how much was stolen. This allowed us to determine a crime rate in each city independent of official statistics, which do not capture unreported crimes. Across all 100 cities, our estimate is that consumers currently lose approximately $5.8 billion per year due to cash-related crimes, an average of about $8.40 per capita.

This study estimates that cities reaching their achievable cashless level, on average, will see a 69% reduction in cash-related crimes (see Figure 2). Digital Leader cities stand to gain the most, averaging annual consumer benefits of approximately $296 million. But even the average Cash Centric city, which as a category could see the least benefit from a reduction in cash-related crime, could experience average consumer benefits of more than $71 million per city.

Businesses' stages of digital transformation:
Now and in three years

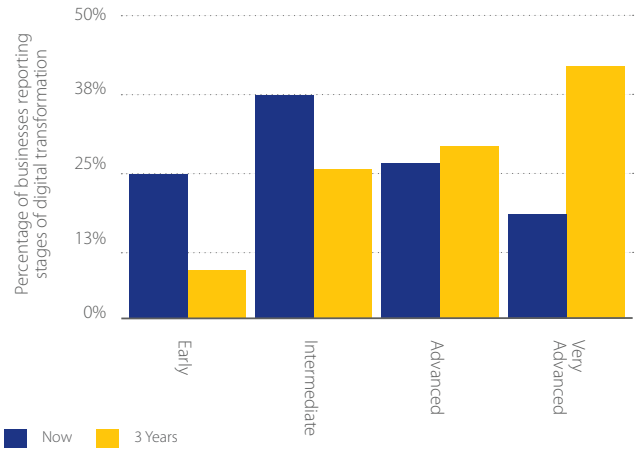



**Figure 8: Businesses across all different levels of digital payment maturity expect to integrate greater levels of digital technologies within their business processes over the next three years.**
Source: Roubini ThoughLab Business Survey

Average business benefits per millions of $ of revenue

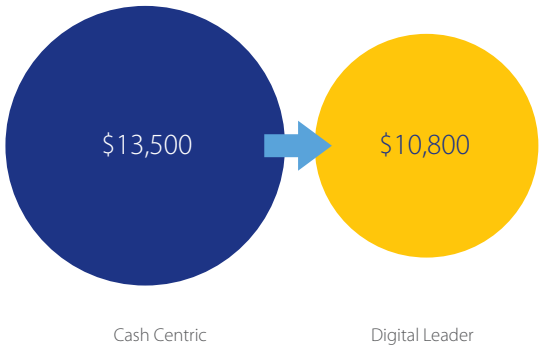



**Figure 9: Businesses could experience considerable gains from greater usage of digital payments, including those situated in highly digitally advanced cities**
Source: Roubini ThoughtLab Model and Analysis

## 3.2 Businesses

Like consumers, businesses increasingly expect to move toward digital forms of payment and away from cash and checks. Our survey data shows that currently, only about 36% of businesses consider themselves digitally advanced or very advanced, but 56% expect to be in three years. (see Figure 8)

By transitioning to digital payments, businesses realize many benefits, including increased labor productivity, lower costs, reduced crime, a seamless customer experience and greater sales. The result is both a larger average purchase amount and additional sales activity. Specifically, our 100-cities analysis estimates net business benefits—which include lower direct net costs, significantly lower labor expenses, and increased sales—totaling $312 billion across the 100 cities.

There are significant benefits for businesses across different stages of digital payment maturity. Businesses in the Cash Centric cities could stand to gain the most, with an average net impact of almost $13,500 per million dollars of revenue. Benefits could be substantial even for businesses located in the Digital Leader cities – an average of over $10,800 per million dollars of revenue. (see Figure 9)

### 3.2.1 Lower Direct Net Costs for Businesses

As businesses move toward digital payments there are two additional costs they will incur: direct fees for accepting digital payments and float costs due to the settlement time required to pay merchants following a digital payment.[37] Direct costs for accepting digital payments include purchase or lease of point of sale terminals, the electric and telecommunications infrastructure to support terminals, and transaction fees.

In our survey, some businesses reported that payments made through cash are immediately available for use, while those made through digital payments are not. This results in float costs associated with digital payments. According to our survey data, about 55% of businesses reported that cash was available immediately after a bank deposit or within less than a day. For digital methods, times vary. 47% of businesses said they could get access to debit card income immediately or within one day, but the remainder said it took one or more days to access the money. For some respondents, time taken to access credit card payments tended to be longer.

# Bangkok

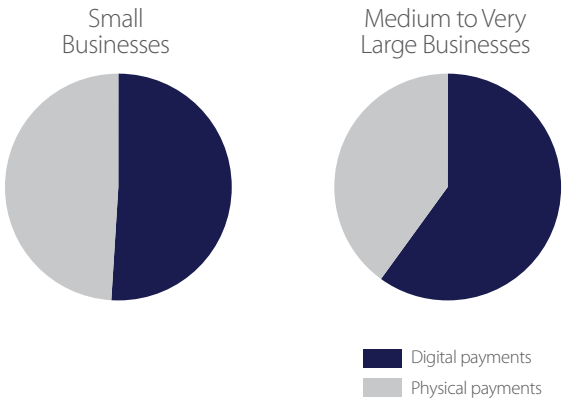
Digitally Transitioning

## Digital payment usage is common for businesses in Bangkok.

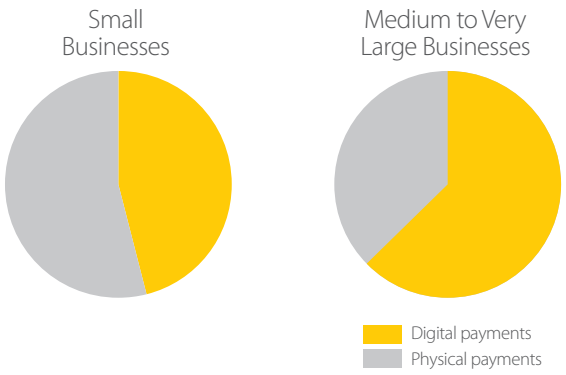
### Current Usage in Bangkok

Over 43% of the total number of incoming payments are received digitally by Bangkok businesses.

Proportion of incoming payments (value) received digitally




Proportion of outgoing payments (value) made digitally




Source: Roubini ThoughtLab Business Survey, Roubini ThoughtLab Analysis, & NiGEM Model

Note: Roubini ThoughtLab Business Survey, Roubini ThoughtLab Analysis, & NiGEM Model
Business sizes are based on number of employees. Small businesses: Less than 20 employees, Medium businesses: 20 to 50 employees, Large businesses: 50 to 250 employees.

### Achievable Cashless Impacts

How could Bangkok benefit if all stakeholders started transacting like the top 10% of its users?

Potential annual cumulative benefits

**Consumers**

$134 million per year

$17 per adult per year

**Businesses**

$2 billion per year

$10,862 in net benefits per million dollars of revenue per year

**Governments**

$2 billion per year

6% total increase in tax revenue as a percentage of baseline tax revenues per year

Potential catalytic impacts over the next 15 years

**GDP Growth**

34 basis points annual increase from 2017 to 2032

**Wages**

0.2% bump up in compound annual growth rate from 2017 to 2032

**Employment Growth**

35,500 new jobs supported by 2032

**Productivity**

0.2% bump up in compound annual growth rate from 2017 to 2032

The cost of foregoing cash in hand for a few days is certainly evident in Cash Centric cities where small businesses may pay employees and suppliers in cash at the end of each work day, but impacts all businesses as they forego interest earned on having funds on hand instantaneously.

Our model showed that businesses could incur float costs ranging from an average of nearly $3 million in Digitally Advanced cities to an average of almost $0.5 million in Digitally Transitioning cities. This is in addition to costs associated with continued investments in keeping digital payments secure (such as maintaining PCI-compliant terminals), while enhancing customer experience. While the industry continues to improve these circumstances and develop better transaction management to reduce delays, this remains a present concern for businesses.

The direct savings to businesses transitioning to digital payments more than make up for these increased fees and float. When businesses receive physical money, they incur a variety of costs associated with processing, securing, managing, and transporting this money. They suffer losses from employee theft, inaccurate cash handling, check fraud, and expensive procedures required to minimize these losses. When fully analyzed, the costs of accepting cash and checks are higher for businesses than the costs for digital payments. Across the 100 cities analyzed in our study, we found that accepting physical money costs business about 7 cents of every dollar received, compared to 5 cents of every dollar collected from digital sources, a 28% lowering of cost.

### 3.2.2 Labor Savings for Businesses

Businesses also spend an inordinate amount of employee time processing various paper-based transactions including incoming payments, outgoing payments, and, for retail businesses, point of sale transactions. For cash and check payments, this includes cash counting and reconciliation, preparing and filling cash registers, preparing deposits, transporting physical money to and from the bank, security monitoring, and processing and reconciling paper invoices.

While digital payments also require some investment of employee time—including learning new software systems, filing card signature slips, handling card reconciliation, training staff and dealing with card fraud investigations—

# São Paulo

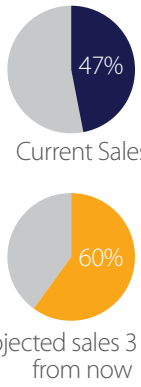
Digitally Maturing

Businesses in São Paulo are increasingly transitioning to digital platforms, experiencing significant gains from adopting digital payments.

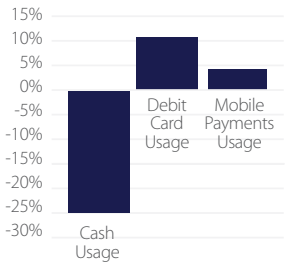
## Current Usage in São Paulo

In São Paulo, businesses report a reduction in usage of cash over the past year. This trend can be partially attributed to the rise in sales through digital platforms.

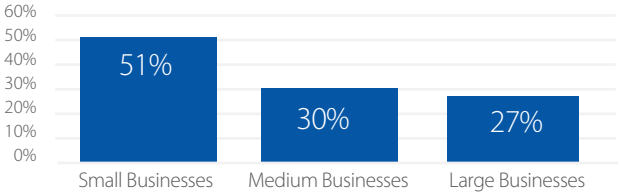
Average monthly sales through digital channels




Proportion of businesses reporting changes in payment method for incoming transactions over the last year




### Small to large businesses in São Paulo have gained substantially from accepting digital payments




Average percentage increase in sales across business categories when transitioning to digital payments

Source: Roubini ThoughtLab Business Survey, Roubini ThoughtLab Analysis, & NiGEM Model

Note: Business sizes are based on number of employees. Small businesses: Less than 20 employees, Medium businesses: 20 to 50 employees, Large businesses: 50 to 250 employees.

## Achievable Cashless Impacts

### How could São Paulo benefit if all stakeholders started transacting like the top 10% of its users?

Potential annual cumulative benefits

**Consumers**

$1 billion per year

$72 per adult per year

**Businesses**

$7 billion per year

$13,199 in net benefits per million dollars of revenue per year

**Governments**

$3 billion per year

4% total increase in tax revenue as a percentage of baseline tax revenues per year

Potential catalytic impacts over the next 15 years

**GDP Growth**

23 basis points annual increase from 2017 to 2032

**Wages**

1.1% bump up in compound average growth rate from 2017 to 2032

**Employment Growth**

105,900 new jobs supported by 2032

**Productivity**

0.2% bump up in compound annual growth rate from 2017 to 2032

| | Baseline average labor time (millions of hours) | Achievable cashless scenario average labor time (millions of hours) | Average value of time savings ($ milions) |
|---|---|---|---|
| Cash Centric | 126 | 108 | $54 |
| Digitally Transitioning | 124 | 98 | $160 |
| Digitally Mature | 352 | 307 | $517 |
| Digitally Advanced | 344 | 307 | $935 |
| Digital Leader | 247 | 220 | $751 |

**Figure 10: While all businesses could potentially benefit from labor time savings, digitally maturing, advanced and leader cities could experience the largest gains.**
Source: Roubini ThoughtLab Model and Analysis

merchants can typically handle these tasks in less time than managing physical money. Our research shows that digital payments can generate significant labor cost savings in each category (see figure 10):

**Incoming payments.**

Our research found that time savings for businesses add up. These savings amount to an average of nearly $197 million across all 100 cities. For instance, in a city like Chicago, increased use of digital payments could save businesses nearly 19 million hours annually, amounting to over $522 million in labor savings.

**Outgoing payments.**

Research has found that companies that use a more automated approach can process more than three times as many invoices per employee than companies that use little or no automation.[38] Increased usage of digital technologies could generate an average labor time savings of about two and a half hours per employee across all 100 cities in our analysis. At local wage rates, this means average savings of nearly $119 million per year to businesses.

**Point of sale transactions.**

A shift toward digital methods—particularly contactless cards and mobile, which take on average 12.5 seconds to complete (a little more than a third the time of a cash transaction)[39] —can produce significant time savings for retail businesses. When averaged across 100 cities, this can be significant and amount to over 10 million hours, translating to nearly $104 million in savings.

## 3.2.3 Increased sales for Businesses

Consumers are often reluctant to carry large sums of cash, but typically have access to a larger pool of funds through their digital payments. As a result, there are instances in which consumers may not have sufficient cash at the point of sale to purchase large-ticket items. In such cases, businesses accepting digital payments ensure that they do not forego these transaction opportunities. Accepting digital payments also allows businesses to sell their products to customers outside of their local markets through e-commerce.

As our research found, once businesses begin accepting digital payments, their revenues increase an average of 17%. In general, the bigger the business, the greater the boost it gets from turning to digital payments. For example, the largest enterprises in our survey reported a 22% leap in sales from using digital payments, while micro-businesses experienced a 17% increase. While the gains from digital payments will vary by business, they are clearly significant, and not just for sales. They also provide businesses enhanced data to better understand their customer base and effectively market their products, build loyalty programs, create targeted incentives etc.

As businesses go through the stages of digital transformation, they gain from bigger revenues. For instance, businesses in the early stages of digital transformation have experienced a 7% rise in sales compared to 24% for the very digitally advanced (see figure 11).

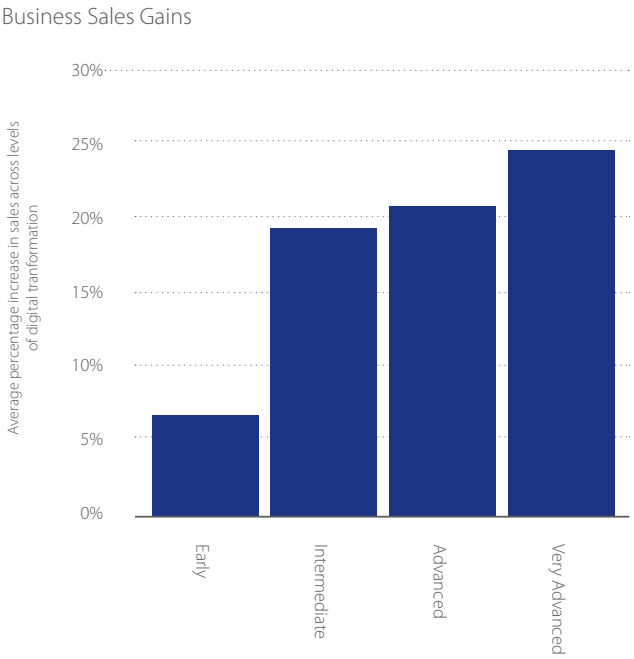



**Figure 11: Even businesses with minimal current levels of digital integration experience substantial sales gains.**
Source: Roubini ThoughtLab Business Survey

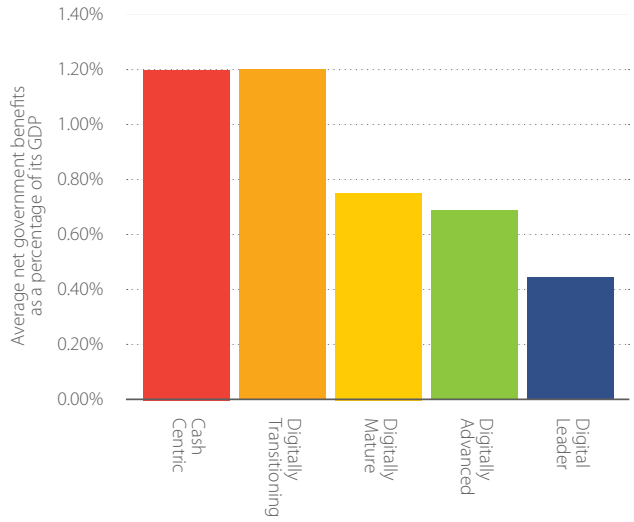



**Figure 12: Governments in 100 cities could gain from lower costs and greater tax revenues if they increased usage of digital payments.**
Source: Roubini ThoughtLab Model and Analysis

## 3.3 Governments

Governments also stand to benefit directly from a transition toward digital payments. The widespread adoption of digital payments reduces crime and cuts costs related to handling of administrative tasks, running public transit and toll roads, and administering criminal justice. Equally important, moving from cash increases tax revenue in two ways:

- Higher business revenue generated by digital payments; and
- Increased tax base resulting from a smaller informal economy.

On average, governments could expect to save close to $710 million per year in administrative costs by making greater use of digital payments. A reduction in crime can potentially save an additional $53 million per year on average. Meanwhile, the potential increase in tax revenue amounts to an average of $534 million per year.

As with business impacts, when a city moves from Cash Centric to Digitally Transitioning, the potential benefits to government increase and then moderate as a city continues to progress along the digital payment maturity curve (see figure 12). This is particularly the case with increases in tax revenues, which are largest when a city initially captures a substantial proportion of the informal economy.

### 3.3.1 Lower Administrative Costs for Governments

As governments start thinking about moving to digital payments, costs are an important consideration. Enabling widespread digital payments acceptance requires foundational elements such as critical supporting infrastructure (electricity, internet), availability of the right technology and some level of consumer awareness. Governments do not necessarily need to incur these costs – private sector innovations can often reduce or even eliminate public costs of providing these services.[40]

There are, however, direct costs that governments will incur for accepting digital payments, such as:

- Equipping acceptance locations with terminals and other infrastructure;
- IT system upgrades to track payment receipts and disbursals in real-time; and
- Training sessions to familiarize implementing agents and government officials with the digital payments system requirements.

In this study, the government net benefit estimates accounted for as many of these direct costs as could be credibly quantified. The results indicate that benefits of digital payments to governments greatly outweigh the costs. Digital payments help governments improve transparency, strengthen financial controls, and minimize fraud. They streamline administrative processes, cut paperwork, and improve productivity. This includes employee payroll, benefit, and pension payments, payments to suppliers and contractors, and receipts of taxes and fees for everything from parking fines to licenses and permits. Research has found that increased use of digital payments could lead to substantial cost savings.[41] Digital transactions also facilitate better integration and information sharing across all levels of government. These cost savings[42] stem from various sources, including:

- Significantly lower travel times (for picking up and depositing petty cash);
- Shorter reconciliation times;
- Reduced costs from accounting and reconciliation errors; and
- Lower risks of theft and leakages.

Digital payments also have the potential to significantly decrease costs associated with transit and toll systems maintained by municipal governments. Research has found that transit agencies spend an average of 14.5 cents of every physical dollar collected, compared to only 4.2 cents for every digital dollar.[43] Similarly, for toll roads it costs approximately half as much to process

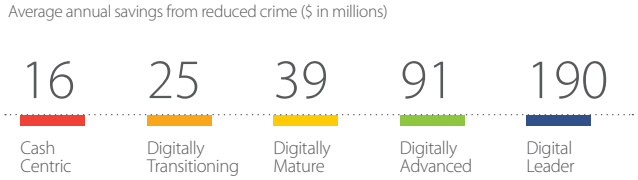



**Figure 13: Governments in cities across digital payments maturity spectrum could potentially benefit from criminal justice cost savings**
Source: Roubini ThoughtLab Model and Analysis

digital payments compared to physical money: 6.4 cents as compared to 12.2 cents respectively.[44]

Potential direct cost savings vary widely across the 100 cities we modeled due to factors including an individual city's current digital maturity, prevailing wage rates, and size of transit and toll road networks. Nevertheless, the potential savings are significant in every case. Our research shows that average direct cost savings for governments is approximately $710 million per year. Governments in Digitally Advanced cities stand to gain the most from adopting digital payments, an average of almost $1.3 billion.

## 3.3.2 Reduced Crime Costs for Government

"In terms of public safety and national security," writes Jonathan Lipow, Professor of Economics at the Naval Postgraduate School, "the sooner the world moves to a cashless society the better."[45] After the Charlie Hebdo terror attack in 2015, Michel Sapin, France's Finance Minister, said that prohibiting cash payments of more than €1,000 would be necessary to "fight against the use of cash and anonymity in the French economy."[46]

While protecting citizens would be enough of a motive for foregoing cash, governments also find that reducing crime can help slash costs. Government expenses include those associated with investigating crimes, prosecuting criminals, and incarceration. Criminal justice costs in the US for roberry and other cash-related crimes are estimated to be $7,750 per criminal.[47]

As with consumer crime costs, the potential impacts for governments will depend on the crime rate and local costs and wage rates, as well as the size of the city. Cities in the Digital Leader category are the biggest beneficiaries from reduced crime, with average potential savings of almost $190 million annually. (see Figure 13)

## 3.3.3 Increased Tax Revenue for Governments

This study finds that for governments, higher tax collections are a key benefit of moving toward digital payments. Digital payments reduce the size of a city's informal economy as transactions become traceable and taxable. Previous research has suggested that digital payments play an important role in reducing the size of informal economies.[48] This reduction not only limits leakage from simple tax avoidance, but also crime and corruption.

Digital payments also boost sales for local businesses and increase GDP growth, both of which increase the city's tax base and therefore government tax collections. Across all 100 cities in our analysis, increased tax collections could average around $534 million, ranging from a little over 4% of current national tax revenues in Cash Centric cities to nearly 1% in Digital Leader cities. (see Figure 14)

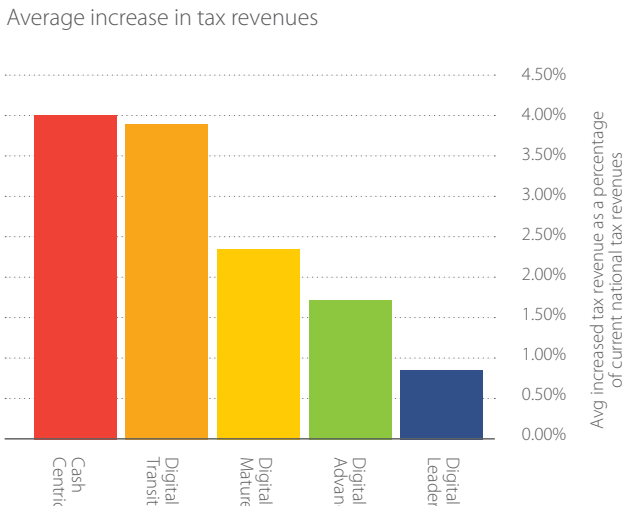



**Figure 14: Largest source of tax revenue gains for governments is a result of broader tax base.**
Source: Roubini ThoughtLab Model and Analysis

# 4. Catalytic Impacts

As cities increase use of digital payments, the positive impacts go well beyond the direct net benefit to consumers, businesses and governments. The shift to digital payments also has a catalytic effect on the city's overall economic performance (GDP growth, new jobs[49], increased wages and productivity), competitiveness, and livability.

Local economies get a boost from digital payments because greater productivity attracts more business activity, increases employment, and subsequently generates higher tax revenues. When combining lower crime and greater ease of living, cities with increasing rates of digital payment usage become more attractive to businesses, talent and tourists.

In cash-dependent cities, the move to digital payments—particularly mobile methods—can help promote financial inclusion by giving more individuals access to financial services. Previous research indicates that this will result in productivity and investment increases that could boost GDP by an average of 6% by 2025 over a business-as-usual scenario.[50] Almost two thirds of that increase would come from greater productivity from increased digital payment usage, and the other third would come from the additional investment generated by broader financial inclusion.

Due primarily to higher productivity levels, the catalytic impact of moving toward a cashless economy might be even greater for more economically advanced cities. For example, Seong-Hoon Kim, an economist with the Korea Economic Research Institute, believes South Korea would see 1.2% extra economic growth a year if it were to fully transition to digital payments. He sees other knock-on economic benefits from going digital: "A cashless society can help us tackle low growth and low inflation."[51]

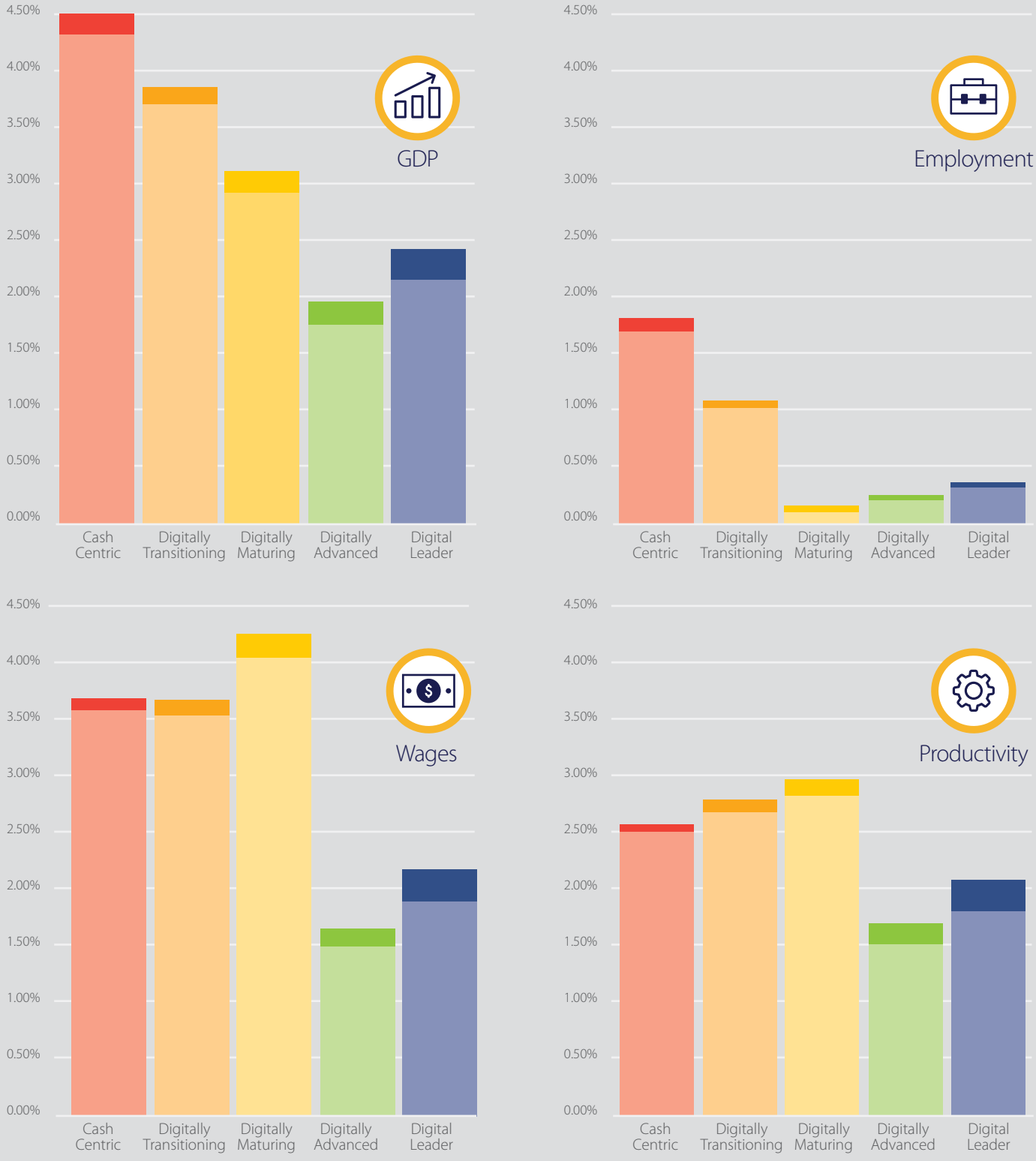
This study quantifies catalytic benefits that emerge when a city increases its digital payments adoption. As highlighted in the preceding chapters, digital payments directly boost consumer, business and government productivity by significantly reducing the amount of time spent on payment-related activities. Using the NiGEM model, we evaluated how these productivity gains translate into catalytic impacts (GDP growth, wages, productivity, and employment). Our research shows that catalytic impacts gather strength as a city moves from Cash Centric to Digitally Maturing to Digital Leader. We assessed these impacts over a 15-year horizon, from 2017-2032.

## 4.1 GDP growth

We find a consistent boost in GDP growth as cities move up the digital payment curve, over and above what would have otherwise been achieved. Specifically, the average annual

# Estimated average economic growth impacts over 15 years (2017-2032)

Catalytic impacts for cities transitioning from current level to achievable cashless scenario.



GDP growth rate across all cities could increase by nearly 20 basis points. The impact ranges from an average of 19 basis points for Cash Centric cities to 27 for Digital Leader cities. This translates to an average of $119 billion in additional aggregate GDP per city over the 15-year period. Cash centric cities could see an average of $54 billion in additional aggregate GDP, while Digital Leader cities could see $198 billion.

## 4.2 Employment growth

Moving to digital payments would stimulate employment growth across cities. The biggest impact could occur during the earlier stages of digital payment maturity. As businesses move up the digital maturity curve, employment growth moderates as productivity increases. By 2032, greater usage of digital payments is expected to support an average of over 45,000 additional jobs across the 100 cities. This potential impact ranges from an average of over 13,000 jobs for Digital Leader cities to nearly 91,000 additional jobs for Cash Centric cities. (see figure 15)

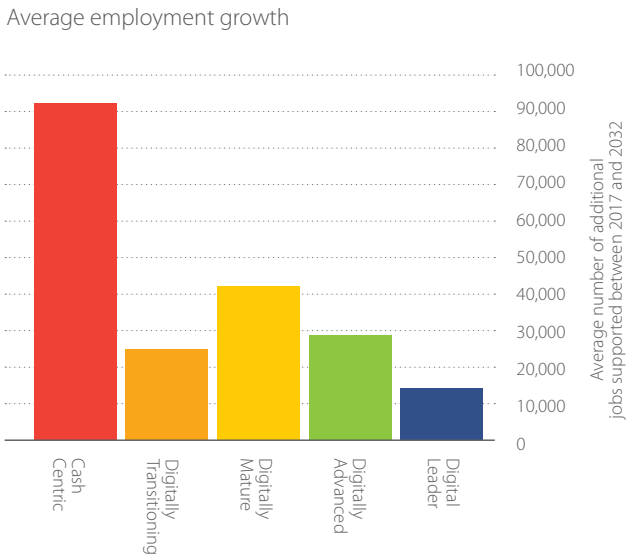



**Figure 15: Increased use of digital payments is estimated to support jobs across all 100 cities.**
Source: Roubini ThoughtLab Analysis and NiGEM Model

## 4.3 Productivity and wage growth

Time savings in the public and private sector resulting from a move toward digital payments could lift workforce productivity and wages. Across the 100 cities, this study estimates that moving to digital payments raises productivity to a compound annual growth rate (CAGR) of 2.5% over the 2017-2032 period – this is a 0.14% increase over the baseline projections, which is estimated at 2.36% for the same time period. The potential CAGR for Cash Centric cities in the achievable cashless scenario averages 2.6% (compared to 2.5% growth in the baseline scenario), and for Digital Leader cities the average potential CAGR is 2.1%, nearly 0.3% over the baseline estimates. Likewise, average wages over the next 15 years are estimated to get a boost of nearly 0.2% from a move toward digital payments, raising baseline average projections from 3.1% to 3.3%.

# 5. Barriers and Action Roadmap

Where cities can go from here, and what might be holding them back

# Barriers to a Cashless City

This study shows clear benefits for consumers, businesses and governments when moving toward digital payments. Such a transformation would yield considerable benefits that include time savings and improved quality of life for residents; cost savings and greater sales for businesses; cost savings and increased tax collections for governments; and higher economic growth, productivity, wages and employment that benefit all stakeholders.

Yet, despite clear evidence of the benefits of digital payments and its role as an enabler of smart cities, there are barriers to digital payments adoption that must be acknowledged and managed as a city moves toward a less-cash future.

- **Inadequate digital infrastructure**. The lack of reliable electricity infrastructure, underdeveloped internet connectivity, and low rates of computer and smart device ownership all impede progress toward a less-cash economy. Such broad infrastructure gaps can hinder consumer use of digital payments and the penetration of digital point-of-sale terminals in retail outlets. For example, smaller businesses in emerging markets often are wary of investing in a terminal. "At the point of sale, devices suddenly go offline, fail to complete transactions or charge customer accounts without subsequently crediting the merchant's account," according to a 2016 report by Visa and GDI Dalberg when describing conditions in Nigeria. "These experiences erode trust in digital payments for both merchants and their customers."[52]

- **Misperception that costs of accepting digital payments are higher than cash.** Merchants, and sometimes governments, can be reluctant to use digital payments because of perceived costs. Unlike digital payments there isn't an explicit fee for accepting cash – however, as this study demonstrates, merchants do in fact incur a number of costs when handling cash. The fact that these costs are not presented as a singular fee to the merchant is likely to lead to the misperception that digital payments are costlier than cash.

- **Limited access to digital payment products.** An underdeveloped banking and payment system can also directly impede the use of digital payments. Previous research estimates suggest that more than two billion people and 200 million small businesses around the world lack access to financial services for a number of reasons, including limited product availability, cumbersome administrative requirements and high upfront costs, among others.[53] The percentage is

especially high in emerging economies, where roughly 54% of adults do not have access to a bank account.[54] Even in many advanced economies, a proportion of consumers remains financially excluded. In the US, 7% of the population is without a bank account according to a 2015 FDIC national survey.[55]

- **Security, risk, and privacy concerns.** Some consumers are reluctant to adopt digital payments because of worries about identity theft and loss of privacy. For example, a recent Gallup poll found that nearly two-thirds of Americans worry about cyber-hacking—the highest percentage for any crime, including home break-ins (45%), terrorism (28%), and murder (18%).[56]

  Loss of privacy may also be an obstacle for consumers and businesses that prefer the anonymity of cash. Obviously, this comes into play in the informal economy where tax avoidance is the aim, and especially in criminal transactions. In some cities, such off-the-books activities make up a substantial proportion of the economy. In Lagos, for example, research estimates such off-the-books activities to be as high as 63%.[57]

  Law-abiding consumers are also concerned with privacy. Some are sensitive that their data may be shared without their consent with third parties, ultimately leading to misuse.

- **Cultural and habitual attachment to cash.** Individuals' varying comfort levels with new technologies in addition to lower financial literacy rates can substantially impact digital payments adoption. Cultural factors like the habitual use of checks to pay bills, feeling more secure with cash in the wallet or the connection of cash to certain cultural or religious practices could also affect adoption potential. Furthermore, some consumers may feel that cash enables them to better manage personal finances. Smaller businesses may also not fully understand the benefits of digital solutions and how best to engage them.

## An Action Roadmap – What Can Be Done?[58]

These barriers, while in some cases substantial, are not insurmountable, and cities around the world are making major inroads to overcoming them. Common themes emerge when looking at cities that have made meaningful gains in adopting digital payments. These include:

- All stakeholders—consumers, businesses, governments and payment service providers[59] — must take action;
- Combining actions will likely lead to amplified positive effects; and
- Actions must be tailored to a city's current stage of digital maturity to be most effective.

With this in mind, we've developed an Action Roadmap that each stakeholder group can take to increase the digital payments adoption of its home city. Each action addresses at least one of the five barriers to digital payment usage. These actions do not seek to be prescriptive, but together they offer a guide for stakeholders seeking to realize the benefits of digital payments.

# Barriers to Adopting Electronic Payments



Limited Access to Digital Payment Products

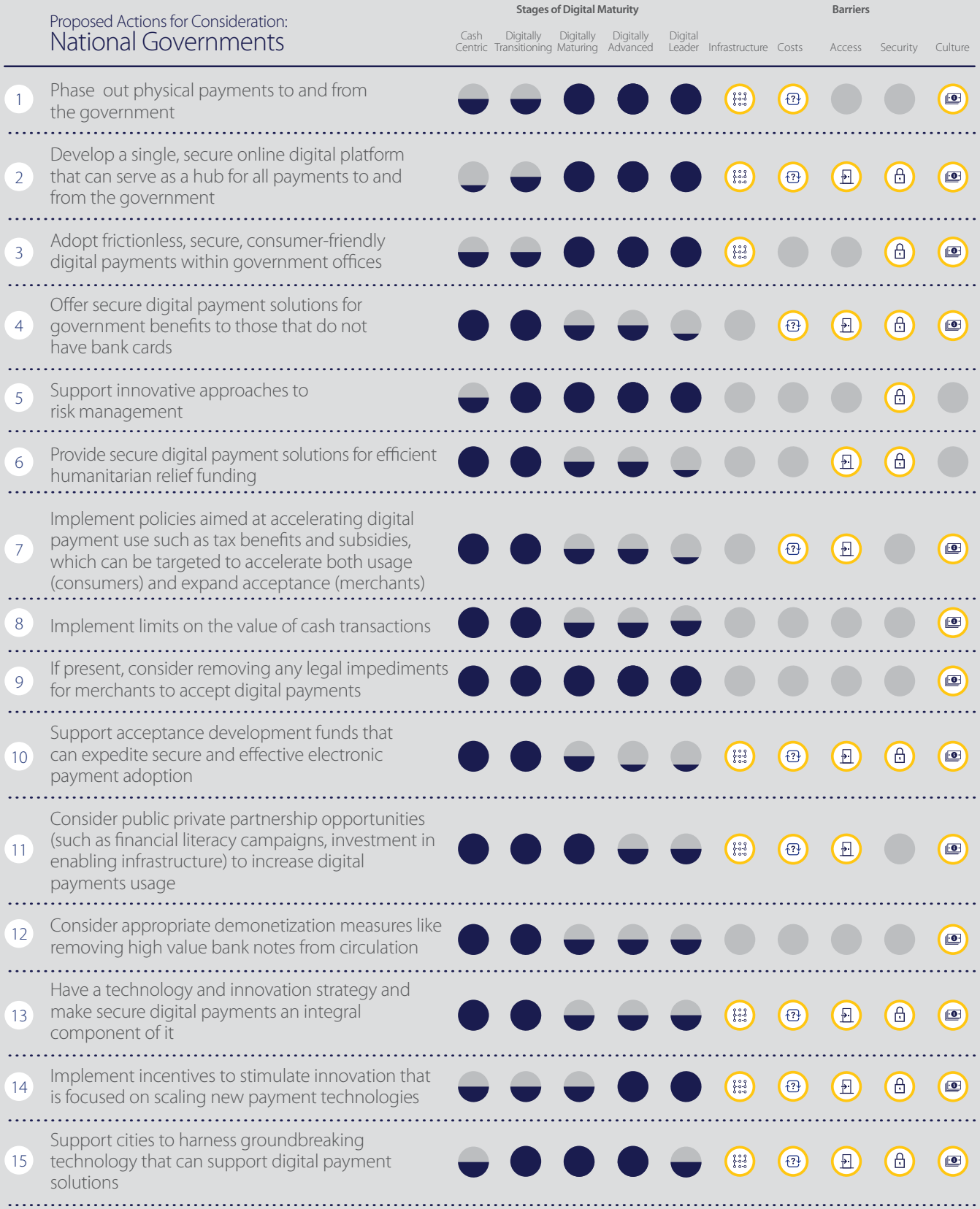
Inadequate Digital Infrastructure

Cultural and Habitual Attachment to Cash

Security and Privacy Concerns

Misperception that Costs of Accepting Digital Payments are Higher than Cash

## Proposed Actions for Consideration: National Governments




References:

- High impact: Can be implemented without delay and/or expected to significantly increase digital payments usage
- Moderate impact: Can be implemented with some potential delays and/or expected to moderately increase digital payments usage
- Low impact: Market has either already significantly implemented action or is not ready for implementation

| | | Stages of Digital Maturity | | | | | Barriers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cash Centric | Digitally Transitioning | Digitally Maturing | Digitally Advanced | Digital Leader | Infrastructure | Costs | Access | Security | Culture |
| 16 | Promote a clear, innovation-friendly regulation framework | ◔ | ● | ● | ● | ● | | ● | ● | | ● |
| 17 | Establish a pro-innovation financial consumer protection framework | ◔ | ● | ● | ◔ | ◔ | | ● | ● | ● | ● |
| 18 | Support access to secure digital payments for micro and small enterprises | ● | ● | ◔ | ◔ | ◔ | ● | ● | ● | ● | ● |
| 19 | Ensure new market players meet established industry standards | ◔ | ◔ | ◔ | ● | ● | | | | ● | |
| 20 | Promote a fair, competitive marketplace for all financial institutions | ◔ | ◔ | ● | ● | ● | ● | ● | ● | | |
| 21 | Share best practices for transitioning to secure digital payments that create value for all stakeholders | ◔ | ◔ | ◔ | ● | ● | ● | ● | ● | ● | ● |
| 22 | Support best-in-class privacy standards | ◔ | ◔ | ◔ | ● | ● | | | | ● | |
| 23 | Create reliable, secure connectivity to facilitate digital transactions | ● | ● | ◔ | ◔ | ◔ | ● | | | ● | |
| 24 | Collaborate with industry to develop a national strategy to increase financial inclusion | ● | ● | ◔ | ◔ | ◔ | ● | ● | ● | | ● |
| 25 | Undertake targeted financial literacy campaigns | ● | ● | ● | ◔ | ◔ | | ● | | | ● |
| 26 | Reasonably remove regulatory barriers to cross-border commerce | ● | ● | ● | ● | ● | | ● | | | ● |

Proposed Calls to Action for Consideration:

## Sub-national Governments Including Cities

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | Partner with innovative companies, other cities/ regions, and research institutions to bring groundbreaking technology that can support digital payments to the city | ● | ● | ● | ◔ | ◔ | ● | ● | ● | ● | ● |
| 28 | Develop and implement a "smart city" or similar strategy that includes digital payments as a key component | ◔ | ◔ | ● | ● | ● | ● | ● | ● | ● | ● |
| 29 | Implement secure open-loop payment systems across all transportation networks | ◔ | ◔ | ● | ● | ● | ● | | ● | ● | ● |
| 30 | Offer incentives for frequent ridership on an open-loop transit payment account | ◔ | ● | ● | ◔ | ◔ | | | | | ● |
| 31 | Provide a convenient, secure online portal where commuters can track amount spent and usage | ◔ | ● | ● | ◔ | ◔ | ● | | ● | ● | ● |

References:

- Inadequate digital **infrastructure**
- Misperception that **costs** of accepting digital payments are higher than cash
- Limited **access** to digital payment products
- **Security**, risk and privacy concerns
- **Cultural** and habitual attachment to cash

| | | Stages of Digital Maturity | | | | | Barriers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cash Centric | Digitally Transitioning | Digitally Maturing | Digitally Advanced | Digital Leader | Infrastructure | Costs | Access | Security | Culture |
| 32 | Implement secure digital-only toll collection | ◔ | ◔ | ● | ● | ◔ | ○ | | | ○ | ○ |
| 33 | Promote and allow for usage of small transaction digital payments in public places, like parking meters and cafes | ◔ | ● | ● | ◔ | ◔ | ○ | | | | ○ |
| 34 | Implement policies aimed at accelerating digital payment use such as tax benefits and subsidies, which can be targeted to accelerate both usage (consumers) and expand acceptance (merchants) | ● | ● | ◔ | ◔ | ◔ | | ○ | ○ | | ○ |
| 35 | Phase out non-digital payments to and from the government | ◔ | ◔ | ● | ● | ● | ○ | ○ | | | ○ |
| 36 | Develop a single, secure online digital platform that can serve as a hub for all payments to and from the government | ◔ | ◔ | ● | ● | ● | ○ | ○ | ○ | ○ | ○ |
| 37 | Adopt frictionless, secure, consumer-friendly digital payments within government offices. | ◔ | ◔ | ● | ● | ● | ○ | | | ○ | ○ |
| 38 | Offer secure digital payment solutions for government benefits to those that do not have bank cards | ● | ● | ◔ | ◔ | ◔ | | ○ | ○ | ○ | ○ |
| 39 | Undertake targeted financial literacy campaigns | ● | ● | ● | ◔ | ◔ | | ○ | | | ○ |

Proposed Calls to Action for Consideration:

## Merchants

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | Accept digital payment methods that are widely used, secure and preferred by consumers | ● | ● | ● | ◔ | ◔ | | | ○ | ○ | ○ |
| 41 | Clearly indicate the various payment methods accepted within a store | ● | ● | ● | ◔ | ◔ | | | | | ○ |
| 42 | Adopt frictionless and secure digital payment technology | ◔ | ◔ | ● | ● | ◔ | | | | ○ | ○ |
| 43 | Consider cash-free check-out lanes for customers using digital payments | ◔ | ◔ | ● | ◔ | ◔ | | | | | ○ |
| 44 | Charge customers the same price regardless of type of payment used | ● | ● | ● | ● | ◔ | | ○ | | | ○ |
| 45 | Train customer-facing staff on digital payment technology and security best practice | ● | ● | ◔ | ◔ | ◔ | | ○ | | ○ | ○ |
| 46 | Pay employees and suppliers electronically | ◔ | ● | ● | ◔ | ◔ | | ○ | | | ○ |

References:

● High impact: Can be implemented without delay and/or expected to significantly increase digital payments usage

◔ Moderate impact: Can be implemented with some potential delays and/or expected to moderately increase digital payments usage

◔ Low impact: Market has either already significantly implemented action or is not ready for implementation

## Proposed Calls to Action for Consideration: Consumers

| | | Stages of Digital Maturity | | | | | Barriers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cash Centric | Digitally Transitioning | Digitally Maturing | Digitally Advanced | Digital Leader | Infrastructure | Costs | Access | Security | Culture |
| 47 | Establish a formal relationship with a financial institution and open a secure digital payment account | ● | ● | ◒ | ◒ | ◒ | | ○ | | ○ | ○ |
| 48 | Use digital payment account and set up secure automatic payments for recurring transactions whenever possible | ◒ | ● | ● | ● | ◒ | | ○ | ○ | ○ | ○ |
| 49 | Help prevent fraudulent activity by opting into security services provided by financial institutions, such as transaction alerts | ◒ | ● | ● | ● | ● | | | | ○ | |
| 50 | Participate in consumer interest groups to promote balanced and informed recommendations to industry decision-makers and policymakers. | ◒ | ◒ | ◒ | ◒ | ◒ | ○ | | ○ | ○ | ○ |
| 51 | Convey payment product preferences to financial institutions and merchants when provided with the opportunity | ◒ | ◒ | ◒ | ◒ | ◒ | | | ○ | | ○ |

## Proposed Calls to Action for Consideration: Digital Payment Service Providers

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 52 | Tailor digital products to meet distinct customer needs | ◒ | ● | ● | ● | ◒ | | | ○ | | ○ |
| 53 | Develop solutions that would support acceptance and usage of low-value digital transactions | ◒ | ● | ● | ● | ● | | ○ | ○ | | ○ |
| 54 | Improve Know Your Customer processes to reduce the burden on potential new customers, while complying with all applicable laws and regulations | ● | ● | ● | ◒ | ◒ | | | ○ | ○ | |
| 55 | Undertake targeted financial literacy campaigns | ● | ● | ◒ | ◒ | ◒ | ○ | ○ | ○ | | ○ |
| 56 | Educate merchants on the protections and payment certainty offered by accepting digital payments | ◒ | ● | ● | ◒ | ◒ | | ○ | ○ | ○ | ○ |
| 57 | Implement processes that allow consumers to quickly and confidently address instances of fraud | ● | ● | ● | ◒ | ◒ | | | | ○ | |
| 58 | Implement payment acceptance technologies that offer security proportional to transaction risk | ◒ | ● | ● | ◒ | ◒ | | | | ○ | |
| 59 | Prioritize security standards in product development | ◒ | ● | ● | ◒ | ◒ | | | | ○ | |
| 60 | Offer consumers, merchants and other stakeholders opportunities to suggest product enhancements | ◒ | ● | ● | ◒ | ◒ | | | ○ | | |
| 61 | Explore cross-industry collaboration opportunities | ◒ | ◒ | ● | ● | ◒ | | ○ | ○ | ○ | |

References:

- Inadequate digital **infrastructure**
- Misperception that **costs** of accepting digital payments are higher than cash
- Limited **access** to digital payment products
- **Security**, risk and privacy concerns
- **Cultural** and habitual attachment to cash

# 6. Conclusions

The ideas behind the smart cities movement have been around for a long time. In 1968, Disney's vision for the Epcot Center in Florida - which was intended to be a real town, rather than a theme park - was a "checkless/cashless society (with purchases) accomplished through automatic debiting of bank accounts," reads the original brochure.[60] "On line remote terminals (at the point of purchase) will handle the transactions. Credit card operations will be expanded to include transportation and entertainment."[61]

It is only within the past two decades, however, that creating a real smart city has become truly possible. Technological advances such as high-speed broadband, public Wi-Fi, and the Internet of Things, coupled with an active digital policy agenda has seen the smart city movement reach new heights. Local governments in cities as diverse as New York, Manila, Casablanca, and Oslo have all implemented components of smart city initiatives, including digital payment technologies.[62] These municipal plans are supported by numerous national government investments. For example, the US government's smart city initiative has funneled over $80 million into seventy cities nationwide,[63] while the national government of India has allocated an estimated $7.5 billion to its smart city mission.[64]

This study provides support that cities cannot reach their full potential without also having a robust digital payment system. Digital payments, and the policy and industry measures that support them, mean urban consumers spend less time waiting in banking, transit and retail lines, make fewer trips to expensive check-cashing venues, and experience lower overall fees associated with financial transactions. A city's businesses benefit when going cashless from not just greater labor efficiencies and lower direct costs, but also from increased revenues.

Additionally, governments benefit from lower transaction costs and increased tax collections primarily due to economic growth and a shrinking informal economy. The catalytic effects of going cashless improve the wealth and general quality of life for a city's residents, also making it more appealing to visitors, creative talent and innovative businesses that cities need to reach their full potential.

While local conditions in every city will define its unique path to a cashless future, this study shows that regardless of the current level of digital maturity or unique local circumstances, consumers, businesses and governments in cities around the world would benefit from an increased usage of digital payments.

# 7. 100-City Impact Data

# Net benefits and catalytic benefits data for 100 cities in achievable cashless scenario.

| | | | DIRECT IMPACTS | | CATALYTIC IMPACTS (2017-32) | | | |
|---|---|---|---|---|---|---|---|---|
| City | Country | Category | Total net impact ($ m) | Net impact as % of GDP | Average annual GDP growth rate increase (bps) | Additional jobs created | Productivity growth | Wage growth |
| Accra | Ghana | Cash Centric | $590.5 | 3.8% | 22.0 | 139,000 | 0.01% | 0.02% |
| Algiers | Algeria | Cash Centric | $659.2 | 3.7% | 21.6 | 25,000 | 0.09% | 0.18% |
| Amman | Jordan | Cash Centric | $455.7 | 3.5% | 20.4 | 9,400 | 0.07% | 0.13% |
| Amsterdam | Netherlands | Digitally Advanced | $7,642.4 | 2.2% | 10 | 25,700 | 0.08% | 0.07% |
| Ankara | Turkey | Digitally Transitioning | $2,560.4 | 3.7% | 21.0 | 17,200 | 0.14% | 0.10% |
| Astana | Kazakhstan | Cash Centric | $774.7 | 3.6% | 20.8 | 6,500 | 0.13% | 0.18% |
| Athens | Greece | Digitally Transitioning | $3,958.5 | 4.3% | 16.3 | 10,400 | 0.13% | 0.17% |
| Auckland | New Zealand | Digital Leader | $1,374.0 | 2.8% | 15.6 | 5,800 | 0.14% | 0.22% |
| Austin | US | Digitally Advanced | $1,806.7 | 1.6% | 52.4 | 7,300 | 0.50% | 0.39% |
| Baku | Azerbaijan | Cash Centric | $1,949.0 | 3.6% | 18.7 | 32,700 | 0.05% | 0.07% |
| Bangalore | India | Digitally Transitioning | $1,279.6 | 2.9% | 7.7 | 48,000 | 0.03% | 0.03% |
| Bangkok | Thailand | Digitally Transitioning | $3,767.2 | 3.8% | 34.0 | 35,500 | 0.21% | 0.15% |
| Barcelona | Spain | Digitally Advanced | $2,584.4 | 1.8% | 5.7 | 14,100 | 0.03% | 0.03% |
| Beijing | China | Digitally Maturing | $11,503.3 | 2.8% | 17.5 | 142,100 | 0.13% | 0.20% |
| Beirut | Lebanon | Cash Centric | $1,166.3 | 3.6% | 9.4 | 23,500 | -0.02% | -0.04% |
| Belgrade | Serbia | Digitally Maturing | $324.3 | 2.6% | 23.1 | 4,300 | 0.19% | 0.54% |
| Berlin | Germany | Digitally Advanced | $3,467.9 | 1.9% | 6.9 | 16,600 | 0.05% | 0.05% |
| Bogota | Colombia | Cash Centric | $4,256.5 | 4.0% | 8.7 | 91,400 | -0.002% | -0.001% |
| Brasilia | Brazil | Digitally Maturing | $2,103.4 | 2.4% | 27.9 | 20,000 | 0.21% | 0.32% |
| Bratislava | Slovakia | Digitally Maturing | $3,477.9 | 2.6% | 40.9 | 5,000 | 0.33% | 0.25% |
| Brussels | Belgium | Digitally Advanced | $6,691.6 | 2.3% | 8.8 | 29,700 | 0.06% | 0.04% |
| Bucharest | Romania | Digitally Transitioning | $1,668.1 | 3.4% | 40.4 | 6,100 | 0.37% | 0.44% |
| Budapest | Hungary | Digitally Maturing | $2,145.1 | 3.2% | 16.9 | 14,300 | 0.13% | 0.11% |
| Buenos Aires | Argentina | Cash Centric | $12,414.3 | 4.8% | 5.8 | 80,700 | -0.03% | -0.06% |
| Cairo | Egypt | Cash Centric | $3,931.8 | 3.5% | 25.7 | 180,500 | 0.12% | 0.16% |
| Canberra | Australia | Digital Leader | $721.3 | 2.2% | 13.6 | 800 | 0.12% | 0.11% |
| Caracas | Venezuela | Digitally Transitioning | $3,139.4 | 3.4% | 1.1 | 38,800 | -0.05% | -0.08% |
| Casablanca | Morocco | Cash Centric | $933.8 | 3.9% | 11.5 | 35,300 | -0.01% | -0.02% |
| Chennai | India | Digitally Transitioning | $813.2 | 2.6% | 9.8 | 34,600 | 0.05% | 0.04% |
| Chicago | US | Digitally Advanced | $9,790.7 | 1.7% | 41 | 16,900 | 0.40% | 0.31% |
| Colombo | Sri Lanka | Digitally Transitioning | $174.6 | 2.7% | 20.4 | 5,100 | 0.13% | 0.12% |
| Copenhagen | Denmark | Digital Leader | $4,996.7 | 2.9% | 7.3 | 8,500 | 0.06% | 0.06% |
| Delhi | India | Digitally Transitioning | $2,200.7 | 3.0% | 8.4 | 21,600 | 0.04% | 0.03% |
| Dhaka | Bangladesh | Cash Centric | $1,498.0 | 3.1% | 34.9 | 284,200 | 0.20% | 0.12% |

# Net benefits and catalytic benefits data for 100 cities in achievable cashless scenario.

| | | | DIRECT IMPACTS | | CATALYTIC IMPACTS (2017-32) | | | |
|---|---|---|---|---|---|---|---|---|
| City | Country | Category | Total net impact ($ m) | Net impact as % of GDP | Average annual GDP growth rate increase (bps) | Additional jobs created | Productivity growth | Wage growth |
| Doha | Qatar | Digitally Transitioning | $4,811.7 | 3.4% | 18.5 | 26,400 | 0.11% | 0.21% |
| Dubai | UAE | Digitally Maturing | $2,188.7 | 3.1% | 10.8 | 18,900 | 0.08% | 0.05% |
| Dublin | Ireland | Digitally Advanced | $1,533.9 | 1.8% | 17.8 | 7,200 | 0.15% | 0.15% |
| Durban | South Africa | Digitally Maturing | $1,324.6 | 4.9% | 12.7 | 8,500 | 0.09% | 0.20% |
| Frankfurt | Germany | Digitally Advanced | $4,102.2 | 1.6% | 5.1 | 15,200 | 0.03% | 0.03% |
| Hanoi | Vietnam | Cash Centric | $580.5 | 3.3% | 36.4 | 67,000 | 0.23% | 0.21% |
| Helsinki | Finland | Digital Leader | $2,658.0 | 2.9% | 8.7 | 3,900 | 0.07% | 0.07% |
| Hong Kong | Hong Kong | Digitally Advanced | $4,621.6 | 1.5% | 4.7 | 28,700 | 0.01% | 0.01% |
| Istanbul | Turkey | Digitally Transitioning | $7,138.3 | 3.6% | 19.7 | 40,600 | 0.54% | 0.39% |
| Jakarta | Indonesia | Cash Centric | $4,614.0 | 3.1% | 37.4 | 281,200 | 0.22% | 0.38% |
| Johannesburg | South Africa | Digitally Maturing | $3,360.5 | 4.4% | 15.0 | 19,300 | 0.11% | 0.24% |
| Karachi | Pakistan | Cash Centric | $1,472.2 | 3.3% | 14.3 | 198,100 | 0.02% | 0.03% |
| Kigali | Rwanda | Cash Centric | $77.9 | 3.6% | 30.1 | 53,100 | 0.06% | 0.13% |
| Kingston | Jamaica | Cash Centric | $369.4 | 10.9% | 3.1 | 4,100 | -0.03% | -0.05% |
| Kuala Lumpur | Malaysia | Digitally Maturing | $3,958.4 | 2.6% | 19.9 | 92,000 | 0.16% | 0.15% |
| Kuwait City | Kuwait | Digitally Maturing | $2,271.3 | 2.7% | 8.1 | 17,500 | 0.05% | 0.04% |
| Kyiv | Ukraine | Cash Centric | $436.1 | 4.3% | 15 | 18,500 | 0.09% | 0.20% |
| Lagos | Nigeria | Cash Centric | $2,745.9 | 3.8% | 28.0 | 134,600 | 0.22% | 0.48% |
| Lima | Peru | Cash Centric | $4,084.7 | 3.8% | 7.1 | 140,400 | -0.06% | -0.06% |
| Lisbon | Portugal | Digitally Maturing | $1,314.4 | 3% | 4.6 | 11,100 | -0.02% | -0.03% |
| London | UK | Digital Leader | $24,973.8 | 2.5% | 65.4 | 71,400 | 0.70% | 0.62% |
| Luanda | Angola | Cash Centric | $2,312.7 | 3.7% | 28.7 | 120,800 | 0.07% | 0.15% |
| Madrid | Spain | Digitally Advanced | $4,073 | 1.8% | 8.3 | 20,500 | 0.05% | 0.07% |
| Manila | Philippines | Cash Centric | $4,0.9 | 3.4% | 16.5 | 114,900 | 0.03% | 0.03% |
| Mexico City | Mexico | Cash Centric | $12,187.9 | 3.8% | 9.2 | 154,900 | 0.03% | 0.05% |
| Minsk | Belarus | Digitally Transitioning | $896.5 | 3.5% | 14.3 | 7,200 | 0.11% | 0.21% |
| Monterrey | Mexico | Cash Centric | $3,626.5 | 4.0% | 10.8 | 29,400 | 0.04% | 0.07% |
| Montevideo | Uruguay | Digitally Transitioning | $1,995.7 | 4.0% | 16.3 | 16,400 | 0.09% | 0.09% |
| Moscow | Russia | Digitally Transitioning | $8,629.1 | 3.3% | 16.2 | 24,700 | 0.13% | 0.30% |
| Mumbai | India | Digitally Transitioning | $2,881.1 | 2.8% | 4.4 | 61,900 | 0.001% | 0.001% |
| Muscat | Oman | Digitally Transitioning | $687.0 | 3.1% | 11.7 | 7,800 | 0.05% | 0.09% |
| Nairobi | Kenya | Digitally Transitioning | $674.6 | 3.3% | 38.4 | 79,400 | 0.19% | 0.41% |
| New York City | US | Digitally Advanced | $20,473 | 1.4% | 48.7 | 183,600 | 0.38% | 0.30% |
| Osaka | Japan | Digitally Maturing | $21,271.0 | 2.9% | 31.4 | 103,800 | 0.28% | 0.09% |

| | | | DIRECT IMPACTS | | CATALYTIC IMPACTS (2017-32) | | | |
|---|---|---|---|---|---|---|---|---|
| City | Country | Category | Total net impact ($ m) | Net impact as % of GDP | Average annual GDP growth rate increase (bps) | Additional jobs created | Productivity growth | Wage growth |
| Oslo | Norway | Digitally Advanced | $2,360.2 | 2% | 17.6 | 11,500 | 0.15% | 0.23% |
| Ottawa | Canada | Digital Leader | $1,397.3 | 2.3% | 31.4 | 3,100 | 0.30% | 0.28% |
| Panama City | Panama | Cash Centric | $1,604.4 | 4.3% | 7.6 | 22,100 | -0.01% | -0.02% |
| Paris | France | Digitally Advanced | $10,623 | 1.9% | 20.8 | 8,900 | 0.22% | 0.22% |
| Phnom Penh | Cambodia | Cash Centric | $257.3 | 3.4% | 24.4 | 15,700 | 0.11% | 0.15% |
| Prague | Czech Republic | Digitally Maturing | $1,561.3 | 2.8% | 23.6 | 8,900 | 0.20% | 0.20% |
| Riyadh | Saudi Arabia | Digitally Transitioning | $6,739.2 | 3.8% | 11.6 | 40,800 | 0.08% | 0.07% |
| Rome | Italy | Digitally Maturing | $5,394.4 | 3.1% | 9.2 | 36,800 | 0.02% | 0.03% |
| Saint Petersburg | Russia | Digitally Transitioning | $1,540.8 | 3.3% | 15.3 | 11,200 | 0.12% | 0.28% |
| San Francisco | US | Digitally Advanced | $5,023.1 | 1.4% | 89.3 | 41,100 | 0.80% | 0.62% |
| San Jose | Costa Rica | Digitally Transitioning | $1,210.4 | 3.3% | 8.0 | 9,800 | 0.02% | 0.04% |
| San Juan | Puerto Rico | Digitally Transitioning | $2,040.0 | 2.7% | 1.4 | 13,500 | -0.02% | -0.04% |
| Santiago | Chile | Digitally Transitioning | $3,902.9 | 3.2% | 7.4 | 23,600 | 0.04% | 0.07% |
| Santo Domingo | Dominican Republic | Cash Centric | $1,315.2 | 3.7% | 16.6 | 44,900 | 0.06% | 0.03% |
| São Paulo | Brazil | Digitally Maturing | $11,268.3 | 3.1% | 23.0 | 105,900 | 0.20% | 1.05% |
| Seoul | South Korea | Digitally Advanced | $7,580.7 | 2.4% | 2.7 | 47,100 | -0.02% | -0.01% |
| Shanghai | China | Digitally Maturing | $13,448.8 | 2.8% | 9.1 | 113,600 | 0.05% | 0.07% |
| Shenzhen | China | Digitally Maturing | $8,727.8 | 3.0% | 5.2 | 64,900 | 0.01% | 0.01% |
| Singapore | Singapore | Digitally Advanced | $5,193.8 | 1.6% | 1.7 | 5,400 | -0.02% | -0.01% |
| Stockholm | Sweden | Digital Leader | $4,621.2 | 2.8% | 57 | 1,700 | 0.60% | 0.73% |
| Sydney | Australia | Digital Leader | $9,255.3 | 3.0% | 13.1 | 15,300 | 0.12% | 0.11% |
| Taipei | Taiwan | Digitally Maturing | $7,451.5 | 3.6% | 5.4 | 26,300 | 0% | 0% |
| Tehran | Iran | Digitally Maturing | $1,902.5 | 3.0% | 24.5 | 23,100 | 0.21% | 0.39% |
| Tel Aviv | Israel | Digitally Advanced | $3,259.1 | 2.0% | 10.8 | 28,100 | 0.07% | 0.12% |
| Tianjin | China | Digitally Maturing | $8,001.4 | 2.9% | 6.7 | 66,100 | 0.02% | 0.03% |
| Tokyo | Japan | Digitally Maturing | $48,923.9 | 2.9% | 31.0 | 39,400 | 0.33% | 0.11% |
| Toronto | Canada | Digital Leader | $6,956.4 | 2.6% | 30.2 | 12,000 | 0.29% | 0.27% |
| Ulaanbaatar | Mongolia | Digitally Maturing | $225.3 | 2.9% | 31.8 | 8,900 | 0.27% | 0.48% |
| Vienna | Austria | Digitally Advanced | $3,686.2 | 2.0% | 8 | 14,600 | 0.05% | 0.06% |
| Warsaw | Poland | Digitally Maturing | $3,715.8 | 4% | 46.4 | 13,900 | 0.40% | 0.47% |
| Washington, DC | US | Digitally Advanced | $6,231.7 | 1.4% | 45 | 29,700 | 0.41% | 0.32% |
| Zurich | Switzerland | Digitally Maturing | $5,246.6 | 2.7% | 16.4 | 37,900 | 0.09% | 0.08% |

Source: Roubini ThoughtLab Model and Analysis; NiGEM model

# Appendix: Endnotes

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**30** It is acknowledged that there are crime costs associated with payment activities moving online. However, such costs are potentially offsetting because fraud exists in the physical world as well, and there isn't sufficient evidence to suggest that overall fraud in the digital world will exceed what exists in the physical world today. The net impact is unclear, so this report does not consider these costs.

**31** This study uses industry-accepted methodology for converting time savings into monetary savings. Please refer to the Technical Appendix for additional details.

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**58** The calls to action in this study were developed by Visa Inc. staff in coordination with Roubini Thoughtlab and intend to be suggestions for relevant stakeholders to consider where appropriate.

**59** Payment service providers is defined here as entities supporting digital payments including, but not limited to, financial institutions and payment technology service providers.

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