AT Kearney

VISA

Digital Payments and the Global Informal Economy

About Visa Inc.

Visa Inc. 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. Visa operates one of the world's most advanced processing networks, VisaNet, which is capable of handling more than 65,000 transaction messages a second, with fraud protection for consumers and reliable 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.

The Global Public Policy team at Visa commissioned this independent research. The mission of the Global Public Policy team is to promote Visa's leadership in shaping public policies that expand digital payments and enable an open and competitive environment, helping individuals, businesses, and economies to thrive. It supports this mission by promoting a knowledge-led dialogue on digital payments and illustrating Visa's shared value with governments through thought leadership and evidence-driven research. For more information, visit usa.visa.com/about-visa.html, visacorporate.tumblr.com, and @VisaNews.

About A.T. Kearney

A.T. Kearney is a leading global management consulting firm with offices in more than 40 countries. Since 1926, we have been trusted advisors to the world's foremost organizations. We work with more than three-quarters of the Fortune Global 500 as well as with the most influential governmental and non-profit organizations. We work in all major industries providing expertise on cost transformation, mergers and acquisitions, digital transformation, procurement, operations and performance transformation, strategy and top-line transformation, analytics, leadership, change and organization, and business policy. This is the fifth paper Visa has commissioned to A.T. Kearney so we can independently conduct a research study on the role of digital payments and the informal economy.

A.T. Kearney is a partner-owned firm with a distinctive, collegial culture that transcends organizational and geographic boundaries—and it shows. Regardless of location or rank, our consultants are down to earth and approachable and have a shared passion for doing innovative client work that provides clear benefits to the organizations we work with in both the short and long term. To learn more about A.T. Kearney, please visit www.atkearney.com.

About Professor Friedrich Schneider, PhD

Friedrich Schneider is a leading expert on the informal economy who has published an array of articles and books on the topic. Before retiring in September 2017, he was a professor of economics and chair of the economics department at the Johannes Kepler University Linz in Austria.

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Executive Summary

- For the purposes of this study, the global informal economy is made up of legal income-generating activities conducted out of sight of the government and tax authorities.
- In every corner of the world, the informal economy is having profound negative impacts—limiting government ability to provide services, damaging competition, fostering unfair labor practices, and leaving workers vulnerable in an unregulated economy that has no safety net. Moving these transactions into the formal economy could bring a wide array of benefits, including less poverty, more job security, and greater access to social benefits as well as additional tax revenue to boost the development of infrastructure, education, and healthcare.
- Governments around the world are focused on improving their understanding of the informal economy. They are primarily motivated by the need for a more accurate picture of the overall economic activity taking place within their borders and addressing the fiscal and social challenges that come with widespread prevalence of the informal economy.
- The global informal economy is substantial, exceeding US$10.7 trillion, or 23 percent of global economic activity in 2016.[1] To put this number in perspective, this amount is approximately three times the GDP of Germany (Europe's largest economy and the fourth-largest economy in the world).
- This study represents a comprehensive global analysis of the size of the informal economy. The study uses a rigorous methodology and comprehensive data and examines 60 markets in the 10 years starting in 2007.

The informal economy is pervasive in most economies around the world and has a negative impact on many aspects of a country and its society.

- The informal economy obscures a country's real economic value and output.
- As a share of national GDP, the informal economy is largest in Africa, Asia, and Latin America and smallest in Europe, North America, Australia, and New Zealand. In terms of US dollars, the United States, China, Brazil, India, the Russian Federation, Japan, and Italy together account for half of the total size of the global informal economy.
- For individuals, engaging in the informal economy can lead to unfavorable working conditions such as fewer benefits and the lack of fair market wages, health coverage, and other social services.
- Off-the-books businesses engaged in informal activity pay less than their fair share of taxes. This harms competition by disadvantaging businesses in the formal economy that experience a relatively higher cost of doing business.
- For governments, the most detrimental effects of the informal economy are lower GDP and tax revenue, which leads to lower levels and misallocation of financial resources available to invest in economic development and social programs.

[1] All amounts in USD unless otherwise specified.

Digital payments can significantly reduce the size of the informal economy and are now an essential component in the public policies governments can implement.

- Our study shows that there is a strong inverse relationship between digital payments and the informal economy. The higher the use of digital payments in a country, generally, the smaller the size of the informal economy.
- Cash is an important enabler of the informal economy because it facilitates transactions that sidestep government regulations and oversight.
- Our study found that if all 60 markets increase digital payments by 10 percent per year for a period of five consecutive years, this could collectively add US$1.5 trillion to GDP between 2017 and 2021. In other words, digital payments growth of 10 percent per year could add an equivalent of Canada's economy (in 2017) to the world economy after the full impact of the increase in digital payments takes place.
- Over the past decade, the countries that have been the most successful in reducing the size of the informal economy have one thing in common: they focus on reducing the use of cash and improving the acceptance and adoption of digital payments. Umbrella efforts, such as financial inclusion programs, have a strong record of growing digital payments and driving increased participation in the formal economy.
- Our analysis shows that many governments are aware that digital payments offer a strong solution to addressing informal activities. More than 65 percent of government policies to combat the informal economy now focus on digital payments instead of punitive enforcement measures, compared with only a third in 2007.

For the first time, this paper models four digital payment-related solutions that can help reduce the size of the informal economy, increase GDP, and boost tax revenue.

The impact analysis of digital payments policies was conducted for 10 focus countries and considered four different measures that can significantly reduce the size of a country's informal economy:

- Government adoption of digital payments
- Use of acceptance development funds
- Value-added tax (VAT) rebates to incentivize the use of digital payments
- Contactless payments

Joint action from public authorities, financial institutions, and payment systems, along with a strategic road map and a strong public and institutional commitment to change, are key to successfully addressing informal activities.

I. Introduction

The informal economy is found in many facets of our everyday lives. Although its size and visibility differ, every country and every industry has some level of informal activities or off-the-books transactions—from a rickshaw puller on the streets of Kolkata or an au pair in Dublin to a street cook in Mexico City or a seasonal crop worker in California. From something as simple as buying an off-the-books coffee at a café to something as complex as textile workers making clothing in a major textile factory, informal transactions are happening all around the world, and they all have one thing in common: most of the transactions are made with cash.

Our study provides a comprehensive overview of the informal economy to give policymakers around the world a better understanding of its effects and the solutions available to lessen its impact. Today, many governments are using digital payments to reduce the size of their informal economy.[2]

Our study finds that increasing digital payments by 10 percent per year for five consecutive years could lift global GDP by up to US$1.5 trillion by 2021. To provide a global perspective, we looked at 60 markets, which account for 94 percent of the world's GDP (see sidebar: About the Study on page 4).

As digital payments become more common, various stakeholders—from public authorities, financial institutions, and payment service providers to mobile operators, merchants, and businesses—have a role to play in reducing the size of the informal economy.

The study begins with the introduction in chapter one. In chapter two, we assess the size of the global informal economy and its drivers. Then, in chapter three, we turn our attention to the effects informality has on the economy and on society, and we review the various public policy responses to the informal economy, discovering that there has been an evolution from punitive measures to positive measures. In chapter four, which is the core of our report, we demonstrate that there exists a negative correlation between the use of digital payments and the informal economy. Having shown that digital payments strategies are now playing a greater role than in the past when an enforcement-based approach predominated, we then examine and showcase examples of three of the most commonly used digital payment policy levers to tackle informality: discouraging the use of cash, creating acceptance development funds, and incentivizing the use of digital payments. We then review financial inclusion measures as part of the wider strategy to tackle informality.

Finally, and for the first time, we assess the impact of four digital payment measures on the size of the informal economy, GDP, and tax revenues for governments. We conclude with an overview of how policymakers can shift informal economic activities into the formal economy.

[2] Digital payments include card payments (debit and credit card payments, excluding ATM withdrawals), direct debits, credit transfers, and e-money (for example, various payments not requiring a bank account, such as online payment schemes, e-purses, and smartcards for public transport).

About the Study

In this study, Visa and A.T. Kearney joined forces to size the informal economy in 60 markets around the world in the decade starting in 2007. Rooted in a series of studies (from 2009 to 2013) of the informal economy in Europe and the use of digital payments, this study goes beyond the borders of Europe to cover every continent, consider countries at all levels of economic development, and provide a range of experience in tackling the informal economy.

In this paper, we assess the size of the informal economy in major markets that account for 94 percent of global economic output and look at the common drivers of the informal economy, including GDP growth, level of taxation, and the public sector's reputation and integrity. We then explore the strong inverse relationship between digital payments and the informal economy. The correlation between the informal economy and the number of digital payments per capita builds the core of our analysis.

For the first time, our study analyzes the five-year cumulative effect of increasing digital payments in 60 markets, assessing the impact on the informal economy, GDP, and tax revenues. Along with sizing the informal economy in these 60 markets, we conduct an in-depth analysis for 10 focus countries, chosen for their diversity in terms of geography, level of economic development, and use of digital payments. For these 10 countries, we analyze the size of the informal economy by sector and the tax impact of increasing digital payments, including personal income taxes, corporate taxes, and value-added taxes. We also assess the impact on social security (see figure).

Analyzing a database of more than 700 measures that governments have been using to address the informal economy reveals that the focus has shifted from punitive policies to proactive measures that encourage a transition to the formal economy. As digital payments are now top policy agendas around the world, we consider how the four most common measures to grow digital payments—government adoption, VAT rebates for card payments, acceptance development funds, and contactless payments—impact the informal economy, GDP, and tax revenues of the 10 focus countries.

For more details about the study's performed analyses, see Appendix 1.

A comparison of the analyses for 60 in-scope countries and 10 focus countries

Analysis	60 in-scope countries	10 focus countries
• Sizing of the informal economy—decade of 2007 (see Appendix 5)	✓	✓
• Assessment of 700+ measures to tackle the informal economy around the world (see Appendix 4)	✓	✓
• Correlation analysis between the informal economy and selected variables related to the payment behavior in a country (see figure 13)	✓	✓
• Five-year cumulative effect on the informal economy, GDP, and tax revenue from increasing digital payments (by 5, 10, 15, or 20%) (see Appendices 7, 8, 9)	✓	✓
• GVA sector breakdown of the informal economy (see Appendix 6)		✓
• Five-year cumulative effect on the informal economy, GDP, and tax revenue from increasing four specific digital payment measures (see figures 16–19): 1. Government adoption of digital payments 2. VAT rebates for card payments 3. Use of acceptance development funds 4. Contactless payments		✓
• Five-year cumulative effect on tax revenue by tax type from increasing digital payments—by 5, 10, 15, 20% (see Appendix 10)		✓
• In-depth analyses and market profile (see Appendix 2)		✓

Source: The authors

II. The Global Informal Economy

1. Definition and Scope

The informal economy goes by many names, including the shadow economy, the parallel economy, and the unofficial economy. Regardless of the terminology used, the defining characteristic is that it encompasses largely legal income-generating activities conducted beyond the visibility and reach of public authorities—for example, and a very common one, a food vendor in the streets of any country around the world who transacts only in cash and then does not declare his income.

Measuring the informal economy is difficult; measuring it on a global scale is even more challenging. Therefore, the first step in accomplishing this task is defining the scope of the "informal economy." Our study takes a comprehensive approach to what constitutes informal economic activities, focusing on productive economic activities that would normally be included in national accounts but remain unaccounted for because they are not reported to a tax authority. As a result, such legal income-generating activities do not contribute to a country's gross value-added statistics.

These informal activities fall into one of two areas: undeclared work and underreported sales.

The category **undeclared work** includes labor activities where all or part of a worker's compensation is typically paid in cash, which reduces labor-related taxes and social security contributions. According to the latest International Labour Organization (ILO) report, 2 billion of the world's employed population age 15 and over work informally, representing 61.2 percent of global employment.[3] Our previous work on this topic has shown that undeclared work is concentrated in certain sectors, including construction, household services (such as cleaning and babysitting), agriculture, forestry, and fishing, but it also exists in certain areas of manufacturing with international production and high pressure on costs, such as garment manufacturing.[4]

The category **underreported sales** includes business activities that are not recorded or reported to tax authorities, for example, by not issuing a receipt for product purchases or provided services. Underreported revenues reduce the amount of taxes paid to government agencies. Self-employment and unincorporated enterprises in the household sector are occasionally part of this category as well as retail trade such as small independent shops, hospitality (family-owned hotels and vacation homes, restaurants, cafés, and bars), and transportation services (taxis). Do-it-yourself (DIY) activities, hiring or paying friends and neighbors for work, and purchasing legal materials for use in the informal economy and DIY projects are also an intrinsic part of the informal economy.[5]

By definition, the informal economy is difficult to measure because it is not recorded or reported in official government statistics. Therefore, this study makes use of a well-regarded economic model and a leading world expert in the field, Professor Friedrich Schneider (see sidebar: Methodology and Data on page 7).

[3] International Labour Organization, "Women and men in the informal economy: A statistical picture," 2018

[4] This has been discussed in other studies, including the following: Bishwanath Goldar, Suresh Aggarwal, Deb Kusum Das, Abdul A. Erumban, and Pilu Chandra Das, "Productivity Growth and Levels: A Comparison of Formal and Informal Manufacturing in India," May 2016; Erika Kraemer-Mbula, "Informal Manufacturing of Home and Personal Care Products in South Africa," October 2016; "Case Studies: Garment Workers Around the Globe," WIEGO; Ana I. Moreno-Monroy, Janneke Pieters, and Abdul A. Erumban, "Subcontracting and the Size and Composition of the Informal Sector: Evidence from Indian Manufacturing," August 2012.

[5] Our study separates the effects of DIY activities, help from friends and neighbors, and materials officially purchased in the formal economy for informal or DIY activities from the calculation of the informal economy as defined above. See the appendix for an estimate of the informal economy net of these effects.

Methodology and Data

Our study uses the MIMIC multiple indicators, multiple causes) methodology, which examines causal variables to estimate the size of the informal economy. This statistically rigorous, well-established, respected method makes it possible to examine the relationship between outcomes that are not directly observable—the informal economy, in this case—and observable input factors.*

Analyzing 10 years of data since 2007, we used more than 30 variables to calculate the size of the informal economy. These included economic indicators such as nominal and real GDP, unemployment, and taxation levels, along with socioeconomic indicators and indicators related to payment behaviors, such as the level of cash use.

It is important to note that the 60 markets in our study vary with respect to the activities that they deem legal and illegal. For example, gambling, tobacco sales, or the production of certain agricultural goods might be legal in some countries but forbidden in others. For our study, we used a consistent definition across all markets, excluding universally illegal activities such as human trafficking, illicit drug production and trade, and banned weapons.

In addition, we analyzed more than 700 measures that governments around the world have used to combat the informal economy since the year 2000. These measures are classified into enforcement measures and digital payment measures. We find a strong inverse relationship between the informal economy and digital payments. We define digital payments as including card payments (debit and credit card payments, excluding ATM withdrawals), direct debits, credit transfers, and e-money (for example, various payments not requiring a bank account, such as online payment schemes, e-purses, and smartcards for public transport). The higher the use of digital payments in a country, generally, the smaller the size of the informal economy. Because of the impact and relevance for developing countries, we also explore measures that focus on financial inclusion. Finally, to give a face and voice to these issues, we conducted interviews with small and medium-size enterprises, public officials, and managers in international organizations addressing their perceptions of the impact of the informal economy. For more information about the study's performed analysis, see Appendix 1. For more information about the MIMIC methodology, see Appendix 3.

* Although there has been criticism of the MIMIC method, this criticism is no more valid than against all other macro methods used for sizing the informal economy, including the currency demand approach or the electricity approach. For a detailed discussion, see "Implausible Large Differences in the Sizes of Underground Economies in Highly Developed European Countries? A Comparison of Different Estimation Methods" by Friedrich Schneider.

2. Size of the Informal Economy

No matter how you measure it, the global informal economy is huge—with a value of more than US$10.7 trillion, representing 23 percent of all economic activity in 2016. Our study shows that the size of the informal economy relative to GDP is highest in Africa, Asia, and Latin America, where more than half of the markets have an informal economy valued at more than 25 percent of GDP (see figure 1 on page 8).

Based on our estimates, the countries with the largest informal economies as a share of GDP in 2016 were Nigeria (53 percent of GDP), Bolivia (46 percent), and Thailand (45 percent). On the other end of the spectrum were the United States and Japan, where the informal economy is 8 percent of the official economic output, followed closely by Switzerland with 9 percent.

In absolute terms, the United States, China, Brazil, India, the Russian Federation, Japan, and Italy are home to half of the global informal economy, not necessarily surprising given the large GDP of these markets (see figure 2 on page 9). With 14 more countries accounting for another 30 percent, 81 percent of the world's informal economy is concentrated in only 21 countries.

Figure 1

The global informal economy by size

2016

Abbreviation	Country	Informal economy (% of GDP)	Abbreviation	Country	Informal economy (% of GDP)
NG	Nigeria	53.4	ZA	South Africa	22.4
BO	Bolivia	46.4	AE	United Arab Emirates	22.0
TH	Thailand	45.2	ES	Spain	21.7
UA	Ukraine	43.9	CR	Costa Rica	21.0
PE	Peru	42.2	HU	Hungary	20.6
BR	Brazil	36.5	IT	Italy	19.5
LK	Sri Lanka	36.4	BE	Belgium	19.0
VE	Venezuela	34.5	PT	Portugal	18.5
RU	Russian Federation	34.3	KR	South Korea	18.4
RS	Serbia	34.0	IL	Israel	18.0
KE	Kenya	33.7	PL	Poland	17.4
KZ	Kazakhstan	33.5	CZ	Czech Republic	15.7
EG	Egypt	32.6	SA	Saudi Arabia	14.9
PK	Pakistan	32.4	CN	China	14.5
ID	Indonesia	28.7	CL	Chile	13.2
DO	Dominican Republic	28.4	FR	France	12.1
TW	Taiwan	28.0	HK	Hong Kong	12.0
GR	Greece	28.0	IE	Ireland	11.5
MX	Mexico	27.9	NO	Norway	11.5
PH	Philippines	27.6	CA	Canada	11.0
BD	Bangladesh	25.8	SE	Sweden	10.7
MY	Malaysia	25.3	DE	Germany	10.2
AR	Argentina	25.2	UK	United Kingdom	9.5
TR	Turkey	25.1	NL	The Netherlands	9.4
UY	Uruguay	24.9	NZ	New Zealand	9.2
CO	Colombia	24.9	AU	Australia	9.0
HR	Croatia	24.0	SG	Singapore	8.6
IN	India	23.3	CH	Switzerland	8.6
VN	Vietnam	22.9	JP	Japan	8.1
RO	Romania	22.9	US	United States	8.0

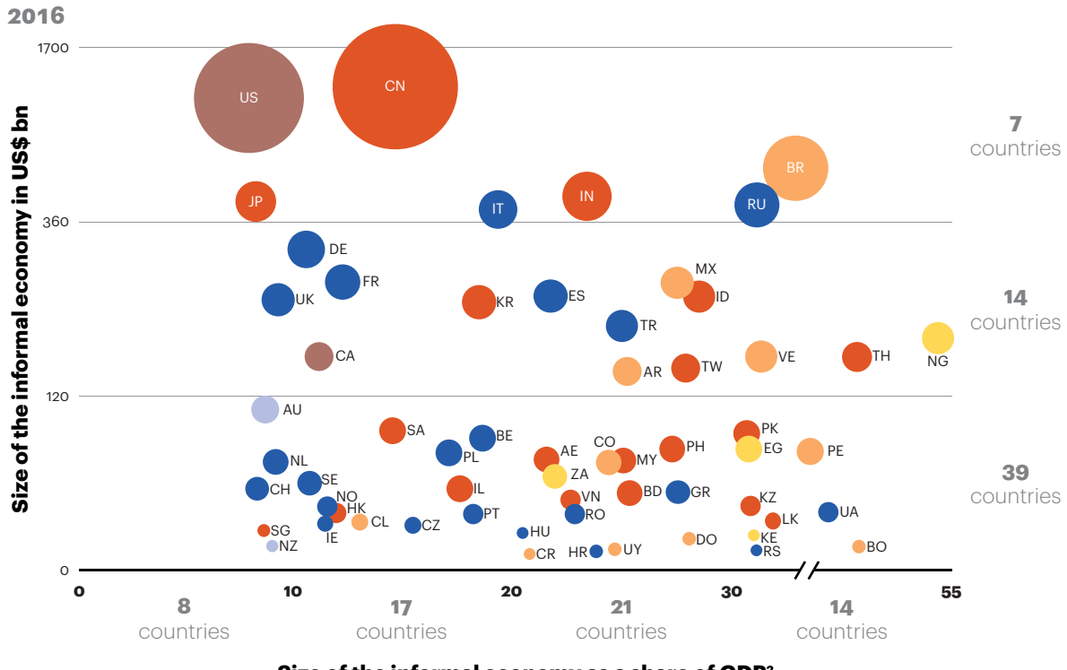
Informal economy as a percentage of GDP

>40 31–40 21–30 11–20 ≤11

Note: The 60 countries above cover 94 percent of the world's GDP.
Sources: EIU, Prof. Dr. F. Schneider; A.T. Kearney analysis

Figure 2

Half of the world's informal economy is in seven countries



Europe Asia North America Latin America Australia and New Zealand Africa

Size of the informal economy in US$ bn

AE – United Arab Emirates
AR – Argentina
AU – Australia
BD – Bangladesh
BE – Belgium
BO – Bolivia
BR – Brazil
CA – Canada
CH – Switzerland
CL – Chile
CN – China
CO – Colombia
CR – Costa Rica
CZ – Czech Republic
DE – Germany
DO – Dominican Republic
EG – Egypt
ES – Spain
FR – France
GR – Greece
HK – Hong Kong
HR – Croatia
HU – Hungary
ID – Indonesia
IE – Ireland
IL – Israel
IN – India
IT – Italy
JP – Japan
KE – Kenya
KR – South Korea
KZ – Kazakhstan
LK – Sri Lanka
MX – Mexico
MY – Malaysia
NG – Nigeria
NL – The Netherlands
NO – Norway
NZ – New Zealand
PE – Peru
PH – Philippines
PK – Pakistan
PL – Poland
PT – Portugal
RO – Romania
RS – Serbia
RU – Russian Federation
SA – Saudi Arabia
SE – Sweden
SG – Singapore
TH – Thailand
TR – Turkey
TW – Taiwan
UA – Ukraine
UK – United Kingdom
US – United States
UY – Uruguay
VE – Venezuela
VN – Vietnam
ZA – South Africa

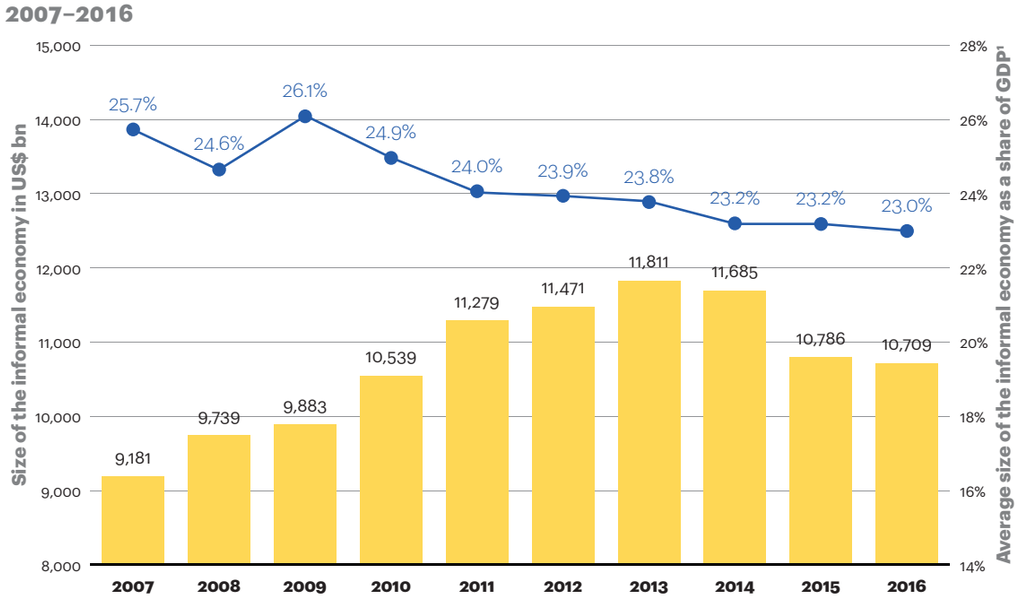
[1] IE is informal economy.
[2] Nominal GDP in US$ at current prices
[3] Calculation based on the 60 focus markets
Sources: EIU, Prof. Dr. F. Schneider; A.T. Kearney analysis

The data used in this study make it possible to consider trends in the informal economy over time. In 2009, as the world's GDP dropped 5 percent, the informal economy reached its peak at 26.1 percent of GDP (see figure 3 on page 10). Aside from this turn in economic events, the global informal economy has seen an overall decline, with the global informal economy's share of global GDP falling from 26.1 percent in 2009 to 23.0 percent in 2016.

Development of the global informal economy in the decade starting in 2007

One thing is clear: the informal economy exists in every country and in every industry—whether hidden or in plain sight. What differs across nations is the amount of regulation, fragmentation, and market development. As a result, creating effective strategies to reduce the size of the informal economy requires first understanding the sector profile in each market. Priorities

Figure 3
Average size of the informal economy as a share of GDP



¹ Nominal GDP in current prices in US$

Sources: EIU, Prof. Dr. F. Schneider; A.T. Kearney analysis

should be established based on the size of the sector and the informal economy within it as well as the market's ability to implement specific measures that will motivate companies and individuals to move their activities into the formal economy.

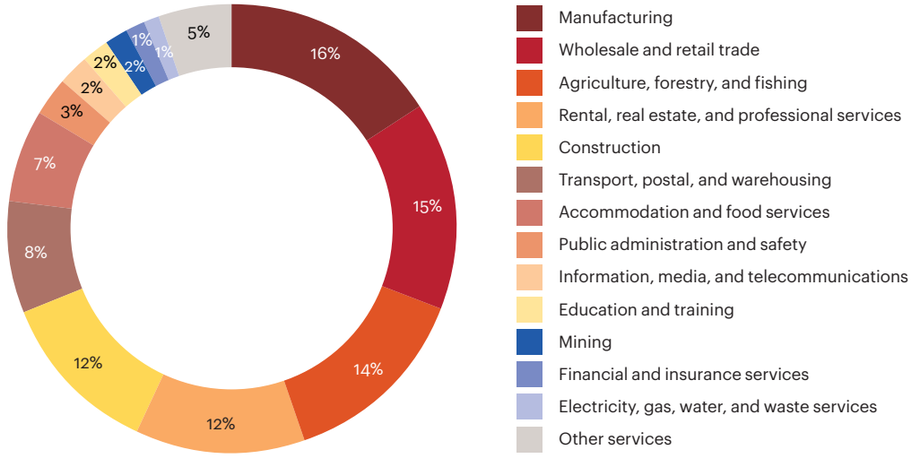
To better understand patterns, our study focuses on a variety of economic sectors in 10 focus countries across the world: Australia, Brazil, China, India, Italy, Kenya, Nigeria, Poland, the Russian Federation, and the United States. This set of 10 focus countries encompasses markets with diverse levels of economic development, from a GDP per capita below US$2,000 in India and Kenya to more than US$50,000 in the United States and Australia. These countries also have a variety of primary industries. For example, Kenya's focus is on agriculture, forestry, and fishing (35 percent of GDP), Poland and China focus on industrial production (around 40 percent of GDP), and in the United States, the service sector contributes almost 80 percent of economic activity.

Our analysis of these 10 focus countries paints a clear picture. Close to 70 percent of the global informal economy is concentrated in five sectors: manufacturing; wholesale and retail trade; agriculture, forestry, and fishing; real estate; and construction. (see figure 4 on page 11).

As expected, a country's share of the informal economy by sector varies widely across the top focus countries (see figure 5 on page 11). In construction, for instance, the average share of the informal economy relative to the gross value added (GVA) among the 10 focus countries is 33 percent, with a range as low as mid-10 percent in Australia to as high as mid-70 percent in the Russian Federation.[6] In our sample, the two sectors with the highest proliferation of informal activities are **accommodation and food services** (average of 51 percent) and **agriculture, forestry, and fishing** (average of 48 percent). **Construction** and **transportation, postal, and**

[6] Gross value added is the value of the goods or services minus intermediate consumption and is typically used to measure the output produced in an area, industry, or sector of the economy [GVA = GDP + subsidies – taxes].

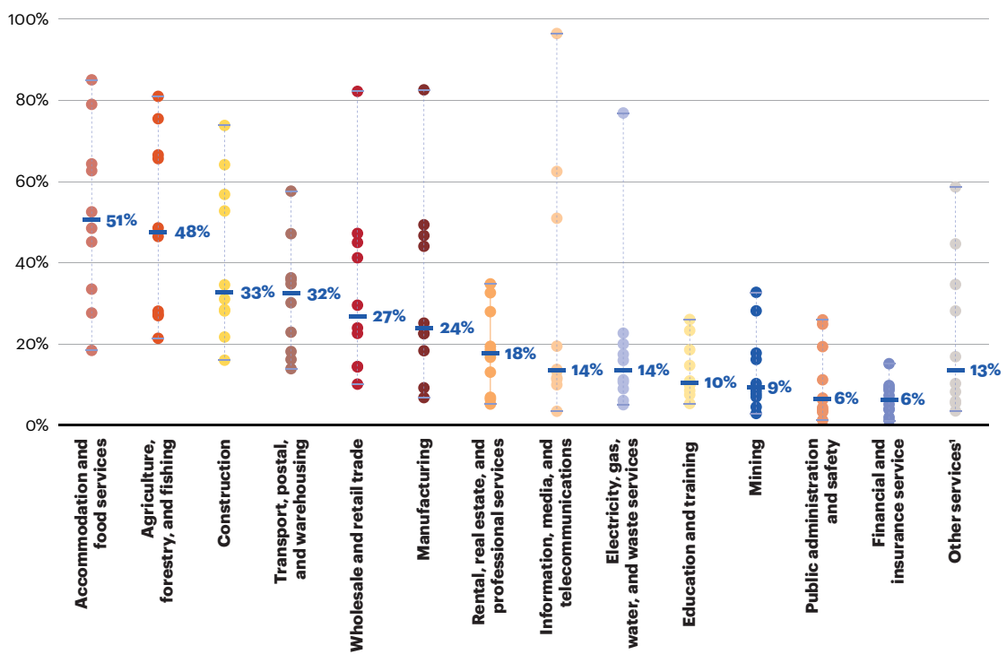
Figure 4
Five sectors contribute two-thirds of the global informal economy



Notes: % weighted share is based on the 10 focus countries. Focus countries include Australia, Brazil, China, India, Italy, Kenya, Nigeria, Poland, Russian Federation, and the United States. Other services include administrative and support services, health and social assistance, and art.

Sources: EIU, Eurostat, OECD, countries' national statistical offices, Prof. Dr. F. Schneider; A.T. Kearney analysis

Figure 5
Country share of the informal economy by sector



Notes: Other services include administrative and support services, health and social assistance, and art. Focus countries include Australia, Brazil, China, India, Italy, Kenya, Nigeria, Poland, Russian Federation, and the United States. GVA is gross value added.

Sources: EIU, Eurostat, OECD, countries' national statistical offices, Prof. Dr. F. Schneider; A.T. Kearney analysis

Figure 6

Heat map of the informal economy in the 10 focus countries[1,2]

Size of the informal economy as percentage of sector GVA

		Accommodation and food services	Agriculture, forestry, and fishing	Construction	Transport, postal, and warehousing	Wholesale and retail trade	Manufacturing	Rental, real estate, and professional services	Electricity, gas, water, and waste services	Information, media, and telecommunications	Other services	Education and training	Mining	Public administration and safety	Financial and insurance services
		51%	48%	33%	32%	27%	24%	18%	14%	14%	13%	10%	9%	6%	6%
High-income	United States (US)	34%	81%	22%	16%	10%	7%	6%	5%	3%	5%	15%	5%	1%	1%
	Australia (AU)	18%	21%	16%	14%	14%	23%	5%	11%	10%	4%	5%	3%	11%	2%
	Italy (IT)	45%	46%	53%	30%	24%	25%	19%	16%	12%	10%	10%	28%	6%	7%
	Poland (PL)	63%	49%	35%	23%	23%	18%	13%	11%	13%	8%	8%	10%	3%	9%
Upper middle-income	Russian Federation (RU)	79%	67%	74%	47%	47%	44%	19%	23%	51%	28%	26%	7%	4%	9%
	Brazil (BR)	53%	66%	64%	58%	41%	47%	35%	17%	19%	6%	11%	18%	26%	5%
	China (CN)	49%	27%	28%	35%	14%	9%	7%	6%	11%	17%	9%	8%	7%	4%
Lower middle-income	Nigeria (NG)	28%	75%	28%	18%	82%	83%	33%	77%	14%	59%	23%	16%	19%	15%
	India (IN)	64%	27%	31%	36%	30%	23%	17%	9%	63%	35%	10%	9%	4%	4%
	Kenya (KE)	85%	28%	57%	36%	45%	49%	28%	20%	96%	45%	19%	33%	25%	10%

XX% Median level of informal economy within the 10 focus countries

Level of informal economy in the industry: High — Low

[1] Based on the United Nations classification of economic development: high-income countries = GNI per capita of more than $12,615, upper middle-income countries = GNI per capita between $4,086 and $12,615, lower middle-income countries = GNI per capita between $1,036 and $4,085, and low-income countries = GNI per capita of less than $1,035. Countries in this study fall into the first three categories.

[2] More details about the informal economy in key sectors for each country are available in the country profiles in Appendix 2.

Notes: Size of the informal economy as % of sector GVA. Other services include administrative and support services, health and social assistance, and art. Focus countries include Australia, Brazil, China, India, Italy, Kenya, Nigeria, Poland, Russian Federation, and the United States. GVA is gross value added.

Sources: EIU, Eurostat, OECD, countries' national statistical offices, Prof. Dr. F. Schneider; A.T. Kearney analysis

warehousing followed closely behind, with a share of undeclared activities adding about one-third of the official sector GVA (see sidebar: Spotlight on Transportation on page 13).

At the other end of the spectrum are five sectors with low levels of informal activity, averaging 15 percent or less of GVA. These are highly regulated sectors or sectors with significant capital expenditure requirements and a high degree of concentration.

Another key takeaway from our analysis of the 10 focus countries is that as income per capita increases, the share of informal activities decreases, both in the overall economy and across sectors (see figure 6). In the United States and Australia, where income per capita is more than US$50,000, only a couple sectors operate with an above-average level of informality, but in

Spotlight on Transportation

Informality is very active in the transportation sector. For example, it represents 58 percent of the sector's activity in Brazil and 36 percent in Kenya and India. In many developing cities, where public transportation plays a central role, transportation provided by private companies—many of which are unregulated and unaccounted for—is often more accessible, faster, cheaper, and more reliable than publicly funded transportation. In Rio de Janeiro, where private buses play a significant role in transporting passengers, tickets and receipts are rare. In Nigeria, private motor-cycle taxis have become the most popular way of travelling when publicly funded transportation is inadequate and inefficient.

The for-hire passenger transportation market has undergone dramatic changes amid the growing presence of ride-hailing companies such as Uber, MyTaxi, Lyft, and Didi Chuxing. Frictionless electronic payments are an important part of the user experience and at the same time increase the transparency of business transactions. For example, in London, the government entity Transport for London has mandated that all of the city's black cabs accept contactless payments. And in Washington, D.C., the Department of For-Hire Vehicles has mandated that taxis swap out their meters for smartphones or tablets.

The informal economy is losing ground thanks to innovative digital solutions that offer a convenient and seamless experience. In China, France, Hong Kong, Japan, Poland, South Korea, Spain, and the United Arab Emirates, passengers can use their mobile phones to buy and store their tickets.

Kenya and Nigeria, where income per capita is under US$3,000, two-thirds of sectors have an above-average amount of informal activities.

In nearly every one of the 10 focus countries, the informal economy is substantial in construction as well as in accommodation and food services. Informality in agriculture, forestry, and fishing—characterized by low pay and substandard working conditions—is also high in high-income markets. According to the US Department of Agriculture, "about half of the hired workers employed in US crop agriculture were unauthorized," contributing to the country's informal economy in agriculture, which stands at 81 percent of the sector's GVA.[7]

Wholesale and retail trade and manufacturing differ significantly across markets. In these sectors, higher market fragmentation goes hand in hand with a higher share of informality. In developed countries, where a few retail chains control a substantial portion of the market, informality is low. On the contrary, in countries where a high proportion of companies operate in retail trade (47 percent in Nigeria and 57 percent in Kenya), the informal economy represents a high proportion of the sector's GVA (more than 80 percent in Nigeria and about 50 percent in Kenya). Kenya's retail sector has historically had high levels of informal activities. In 2016 alone, there were around 3.7 million retailers selling in small local shops, kiosks, and markets.

The informal economy is relatively small in mining, with only 8 percent of sector GVA. As a capital expenditure-heavy industry often dominated by a few large firms, mining provides limited opportunities for informal activities. Yet, the size of the informal economy varies across countries and is high in countries such as Kenya, where informal activities average 33 percent of the sector's GVA, primarily because the country has a big artisanal mining sector, which accounts for up to 60 percent of its annual gemstone production.[8]

[7] US Department of Agriculture Economic Research Service

[8] Kenya has about 100,000 unregistered artisanal or small-scale miners who work independently using their own resources. Most of their production is traded on the black market in neighboring countries.

3. Drivers of the Informal Economy

The factors that drive individuals and businesses into the informal economy differ from country to country, and their impact is not the same. A complex intertwining of factors often shapes the local profile. Understanding these differences is essential to designing effective local policies.

For some, the informal economy is a means to evade taxes, lighten administrative burdens, and avoid red tape. However, not everyone is a willing participant. During a financial crisis, many people must make up for lost income, and those who are unemployed for a long time often have little choice but to work in the informal economy when an equivalent job is not available in the formal economy. Even people who manage to keep their jobs often work second or third jobs in the informal economy to make ends meet. In developing countries, workers with limited skills have fewer formal job opportunities. For instance, for many of the world's hundreds of millions of low-income, smallholding farmers, opportunities to buy and sell their crops are largely based on cash and relationships, exposing them to unstable financial conditions.

When economic growth is slow, the informal economy may be especially attractive if countries are saddling workers and businesses with heavy tax burdens that are otherwise acceptable during better economic times. When economies go through a crisis or economic stagnation, individuals and businesses attempt to make up for loss of income from the official economy by entering the informal economy. For instance, in the years after the global financial and economic crisis, official global unemployment rose from 6.8 percent in 2008 to 8.5 percent in 2013, accompanied by a parallel increase in the informal economy. While this rise in global average unemployment might not sound like a major increase, many countries experienced significant unemployment. Countries such as Greece and Spain experienced a rise in unemployment from a low of 8 percent to over 25 percent at the peak, while youth unemployment exceeded 50 percent. The resulting increase in the informal economy was sizable—from 25.8 percent of GDP in 2008 to 31 percent in 2012 in Greece and from 21.5 percent in 2008 to 24.4 percent in 2013 in Spain.

"The cost and time of dealing with the government and administrative requirements can be too high for small companies and drive them to shadow activities. Predictability and reliability of regulations determine the readiness of companies to operate in the official economy."

—Former staff at a supranational organization and expert on SME finance in developing countries

In addition, many see a lack of fairness in how the tax burden is distributed, especially in developing countries where many people live in poverty. In contrast, high adherence to rule of law, perceived fairness in the distribution of tax burden, public sector effectiveness, and cultural attitudes to tax avoidance play a big role for the actual participation in the informal or the formal economy. Sweden, with a total tax wedge on labor income of 42.8 percent and ranking among the top three countries in the study sample by overall tax burden, has an informal economy of only 10.7 percent of GDP. And we say "only" because this study assumes that no economy has been able to eliminate its informal economy completely, hence, a threshold of 5 percent of GDP is assumed as the minimum informal economy size a country is likely to face.

Sometimes, the public sector has difficulty uncovering informal businesses because of a lack of labor inspectors or inadequate tools to track unreported sales. In addition, some people avoid the formal economy because they see the government as not only lacking in terms of efficiency but also in some cases lacking integrity and burdening individuals and businesses with cumbersome administrative tasks. For example, in the Heritage Foundation Index of Economic Freedom, part of which measures government and civil service transparency and trust in the political elite, the informal economy tends to be larger in countries with low government integrity.[9]

"The size of the informal economy is a signal of the mistrust people harbor for laws and regulations—in short, for the government."

—Small business owner, IT company, Ukraine

Even some well-intentioned businesses operate in the informal economy because of a tangle of bureaucratic and administrative red tape. From registering a new company and filing taxes to obtaining official documents, institutional complexity can be a major obstacle. For example, in Bolivia, registering a new company requires 14 steps that can take about six weeks to complete with paperwork and approval processes encompassing a variety of government agencies—and in our sample, Bolivia had the world's second-largest informal economy at 46 percent of GDP. At the other end of the spectrum is New Zealand, where entrepreneurs can register their business ventures in just one step. With electronically connected government agencies that can seamlessly share information, New Zealand has one of the world's smallest informal economies at only 9 percent of GDP.

In addition, even when the risks of operating in the informal economy outweigh the perceived benefits, there may be no credible deterrent because of prevailing social and other non-economic factors. For instance, the informal economy tends to thrive in societies where it employs a large number of people, resulting in minimal social stigma. In other cases, the institutions and forces that give rise to willingness to play by the rules discourage engagement in informal activities. For example, operating in the informal economy may be considered reprehensible in countries with strict tax morale, strong trust in public institutions, and stigmas against those who do not work in the formal economy.

Although the drivers vary from country to country, when the informal economy is thriving, many facets of society suffer: individuals, businesses, and the government. In the next chapter, we analyze the effects of informality on the economy and society, and we review the public policy responses that governments have implemented to tackle it.

[9] For our study, several indicators from the Heritage Foundation Index of Economic Freedom were used as drivers (factors) for sizing the informal economy, including the index of labor freedom, index of government integrity, index of fiscal freedom, and index of business freedom.

III. Public Policy Responses to the Informal Economy

1. Effects of Informality on the Economy and Society

Because the informal economy has a negative impact on many aspects of a country and its society, dismantling it can improve citizens' lives and create benefits for governments and the businesses that operate under their jurisdiction. However, because it is unregulated, many governments, though aware of the prevalence of the informal economy, are unable to measure the magnitude of its economic contribution, the number of people it employs, or the types of activities undertaken. This creates a distorted view of the actual economic activity occurring within a country's borders and can lead to uninformed decisions about policies.

Despite being largely invisible, the informal economy does damage in a variety of ways (see figure 7):

Figure 7
Negative impacts of the informal economy on society

Individuals	Businesses	Governments
• **Unfavorable working conditions,** including lower wages, exploitation, and unfair treatment with little to no recourse • **Difficulty integrating into the formal economy** with no formal track record of an employment history and no documented job skills • **Difficulty obtaining credit at financial institutions** because of a lack of formal employment, regular pay, and credit history • **No quality guarantees** for services purchased in the informal economy and no legal way to enforce claims about quality or delivery	• **Unfair competition** as a result of the considerable advantages for informal businesses, including no taxes, a lighter administrative burden, and a lower-cost workforce • **Degrading effects on the economy** when formal businesses are forced to turn to the informal economy to stay competitive and survive	• **Lower tax revenue** from businesses (no corporate employee contributions) and from individuals (no personal income tax, sales tax, or duties) • **Distorted view of actual economic activity,** which could lead to uninformed decisions for policymaking • **Less money to invest in programs,** including infrastructure, healthcare, education, and security, which benefit all citizens • **Lower investments in social programs** leading to sustained—or even higher—levels of poverty and inequality

Source: A.T. Kearney analysis

The informal economy creates **unfavorable working conditions**. Off-the-record employees are often paid lower wages, most do not have health insurance or access to other social services, and they are more likely to experience severe financial stress if they lose their jobs, especially older workers or people already living in poverty. They are also not covered by workplace protection and safety plans and rarely have vacation or sick leave.[10] Workers in the informal economy are vulnerable to exploitation and unfair treatment, and they often work long hours with no additional pay.[11]

[10] Evans, M., Syrett, S. and Williams, C.C. (2006) *Informal Economic Activities and Deprived Neighbourhoods*. London: Department of Communities and Local Government; ILO (2002) *Decent Work and the Informal Economy, Geneva*: International Labour Office

[11] Leonard, M. (1998) *Invisible Work, Invisible Workers: the Informal Economy in Europe and the US*. London: Macmillan; Renooy, P., Ivarsson, S., van der Wusten-Gritsai, O. and Meijer, R. (2004) *Undeclared Work in an Enlarged Union*. Brussels: European Commission

Once employed in the informal economy, many individuals find it **difficult to integrate into the formal economy**. There is no track record of their employment history and skills, which reduces their chances of getting a job in the formal economy, especially during an economic downturn.[12] They frequently face difficulties trying to obtain credit at financial institutions because of a lack of formal employment, regular pay, and credit history.[13]

Consumers and individuals who use goods and services from the informal economy are also at greater risk because of the **lack of adherence to quality and safety standards**. Although goods and services in the informal economy are not necessarily flawed, they do not undergo any official controls, which carries inherent risks. For example, for food service businesses, regular health inspections are often required to maintain a valid license, and street food vendors often operate without oversight or control. Unsafe food prepared and sold in the informal economy is a major contributor to gastrointestinal diseases, which are a leading cause of sickness and death in the developing world.[14] In addition, there is no quality guarantee for services purchased in the informal economy and no legal action that individuals can pursue to enforce any claims about quality or delivery.[15]

Businesses also face an array of negative impacts, including **unfair competition**.[16] Businesses in the informal economy enjoy considerable advantages, including no taxes, a lighter administrative burden, and a lower-cost workforce. As a result, they can sell goods and services for less, undercutting prices in the formal economy. Because they do not comply with economic and labor regulations, they can rapidly respond to market shifts (by quickly getting rid of their workforce with no implications) and unfairly steal market share from formal businesses. In effect, companies in the formal economy operate on an unlevel playing field and are penalized for adhering to the rules. In some circumstances, the degrading effects of such practices can cut across the economy in the form of hyper-casualization when formal businesses are forced to turn to the informal economy to stay competitive and survive.[17]

For governments, the most obvious effect is **lower tax revenue**. Off-the-books employment reduces both corporate employee contributions and personal income taxes. Underreporting sales reduces the amount of value-added or sales tax, duties, and excise tax—meaning that governments have less funds to invest in programs, including infrastructure, health, education, and security, which benefit all citizens.

In addition, the informal economy sustains a society's level of **poverty and inequality**.[18] Workers in the informal economy typically have low incomes and a lack of skills, and many come from vulnerable groups that may have no other options, including women, young adults in rural areas, the poor and uneducated, migrants without official documentation, and older workers. According to the latest ILO study, those with completed secondary and tertiary education are less likely to be informally employed compared with workers who have either no education or have not completed primary education. And people living in rural areas are twice as likely to

[12] Grabiner, Lord (2000) *The Informal Economy*. London: HM Treasury

[13] Kempson, E. (1996) *Life on a Low Income*. York: York Publishing Services; Williams, C.C. (2007) "The nature of entrepreneurship in the informal sector: evidence from England," *Journal of Developmental Entrepreneurship*, 12(2), pp. 239–54

[14] "The Top 10 Causes of Death: Leading Causes of Death by Economy Income Group," World Health Organization, 2015

[15] Williams, C.C. (2006) *The Hidden Enterprise Culture: Entrepreneurship in the Underground Economy*. Cheltenham: Edward Elgar; Llanes, M. and Barbour, A. (2007) *Self-Employed and Micro-Entrepreneurs: Informal Trading and the Journey Towards Formalization*. London: Community Links

[16] Renooy, P., Ivarsson, S., van der Wusten-Gritsai, O. and Meijer, R. (2004). *Undeclared Work in an Enlarged Union: an Analysis of Shadow Work*. Brussels: European Commission

[17] Williams, C.C. (2006) *The Hidden Enterprise Culture: entrepreneurship in the underground economy*. Cheltenham: Edward Elgar; Mateman, S. and Renooy, P. (2001) *Undeclared Labour in Europe: Towards an integrated approach of combating undeclared labour*. Amsterdam, Regioplan

[18] Colin C. Williams, *The Informal Economy and Poverty: Evidence and Policy Review*, 2014

have informal employment (80 percent) as those in urban areas (43.7 percent).[19] Because there are few opportunities to improve job skills, their chances of transitioning to the formal economy and getting out of poverty are slim.

Even though the informal economy provides jobs, these jobs are not as good as equivalent ones that would be found in the formal economy and therefore preserve the social status quo, sustaining and deepening inequality and poverty.

A broad body of academic research sheds light on the profound impact of the informal economy on all stakeholders (see Appendix 11 for suggested further reading). Governments around the world are responding in a variety of ways to reduce the size of their informal economies. Next, we focus on public-sector measures to address the size of the informal economy and investigate the global evolution toward digital payments.

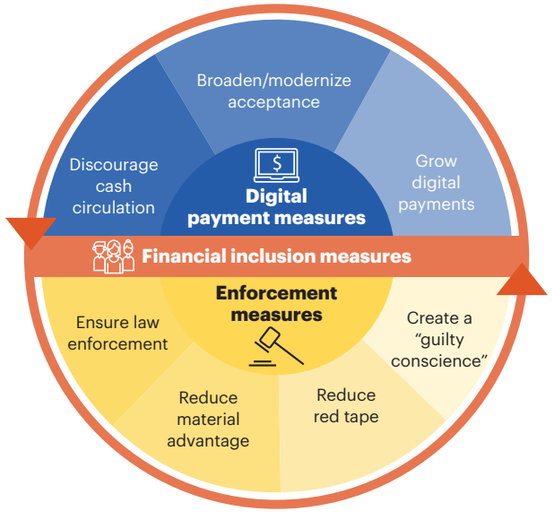
2. An Overview of the Measures to Address the Informal Economy

When we published our first study in 2009, more than two-thirds of all measures aimed at reducing the informal economy revolved around using law enforcement (government actions to punish participation in the informal economy), and the primary focus was on using strict controls and penalties to uncover undeclared work and unofficial employment.[20] In the wake of the global economic crisis, as the informal economy moved into the policy spotlight, many governments shifted from punitive policies to proactive measures that encourage participants to transition to the formal economy.

To gain a comprehensive view of the trends for combatting the informal economy and develop insights about future policies, our study examines a database of more than 700 measures used by governments around the world since the year 2000. These measures fall into three broad categories: **enforcement measures** that seek to punish participation in the informal economy, **digital payment measures** that rely on positive reinforcement to stimulate engagement in the formal economy, and **financial inclusion measures** that foster the literacy, awareness, and means to participate in the financial system and the formal economy (see figure 8).

Figure 8

Governments use three types of measures to combat the informal economy



Source: A.T. Kearney analysis

Enforcement measures first require creating regulations and then ensuring compliance with those regulations. Our analysis of more than 700 measures shows that more than two-thirds of these measures focus on undeclared work, and in most cases, they involve penalties ranging from fines to criminal charges. For example, in 2009, Portugal introduced dynamic data checking between what employers pay and what employees report as income to identify discrepancies. In 2013, Argentina's government introduced a variety of initiatives against undeclared work, including labor inspections and a register of employers with labor sanctions. To deter off-the-books sales in Chile, all businesses are required to have a digital receipt for every transaction.

With incentives-based approaches, some countries opt to simplify procedures and lessen the administrative burden of the informal economy. These types of measures encourage compliance by providing some type of benefit, whether it be financial, such as a lower tax rate, or non-financial, such as online tax filings, simplified interfaces, or streamlined process for registering new businesses or new employees. For example, Rwanda's one-stop shop for business registration significantly reduced the time involved to launch a new business, and the Federation of Egyptian Chambers of Commerce has 26 small and medium enterprise service centers across the country to make registering new businesses easier and provide advice close to where the businesses are set up.

Some countries have made processes less complex and more user-friendly. Germany introduced a "mini-job" regulation with quick and simple registration for low-wage jobs (especially in the household sector), a lower tax burden for employers, and basic accident and pension insurance for employees.[21] In the first year, there was an 18 percent increase in the number of mini-job workers, and over 10 years, there has been a 45 percent increase.

To encourage citizens and companies to comply with new measures, governments can ensure there are more advantages and incentives to participating in the formal economy. One way to do this is with targeted communications about ways the public sector has improved its services and created new benefits for both businesses and individuals.

3. An Evolution Toward Digital Payments

Since 2010, many countries have been riding the wave of consumer digital engagement and the growing adoption of smartphones. Because the informal economy relies on the use of cash and thrives when transactions cannot be detected by authorities, it faces major obstacles in the digital world. More governments have been using this to their advantage. Measures no longer need to mandate compliance because they rely on voluntary adoption of new technologies. Authorities have de-emphasized their oversight function in favor of enabling companies and individuals to conduct their daily business in a more transparent digital manner.

Digital payments strategies are now playing a greater role than in the past when an enforcement-based approach predominated. Since 2007, initiatives have shifted away from enforcement measures (see figure 9 on page 20). Today, such measures constitute no more than one-fifth of all initiatives to reduce the informal economy.

In many countries, private-sector initiatives—in addition to public-sector efforts—have been vital in encouraging the adoption of digital payments. These initiatives often involve in-market innovation and agile use of technology. For example, M-Pesa began in Kenya in 2007 as a mobile phone-based money transfer service launched by Vodafone for Safaricom and Vodacom, the largest mobile network operators in Kenya and Tanzania. Today, more than 60 percent of Kenya's adult population are active users.[22]

[19] International Labour Organization, "Women and men in the informal economy: A statistical picture," 2018

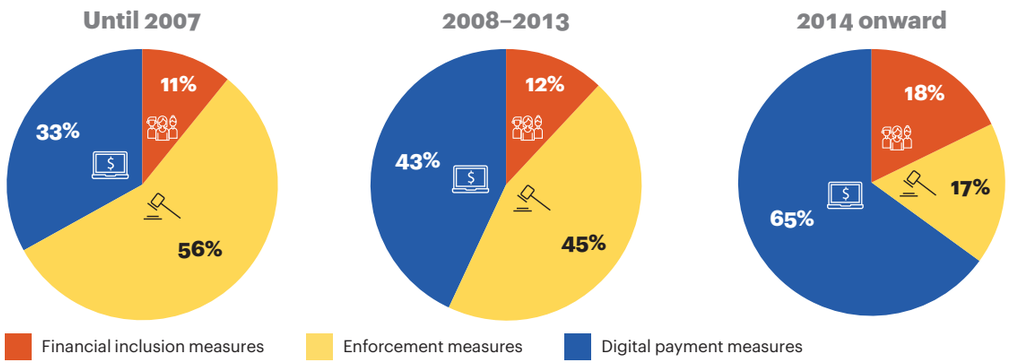
[20] For more, see the latest version of the paper *The Shadow Economy in Europe, 2013* at www.atkearney.com.

[21] "Mini jobs," a term coined in Germany, are a form of marginal employment that are generally characterized as part-time with a low wage. Mini jobs were intended to legalize informal work and become a means of promoting employment.

[22] In March 2017, M-Pesa had 18 million users in Kenya. (Source: Vodafone, Safaricom on the occasion of the 10th anniversary since the launch of M-Pesa.) Kenya's population age 14 and older is 29 million (out of a total population of 49 million).

Figure 9

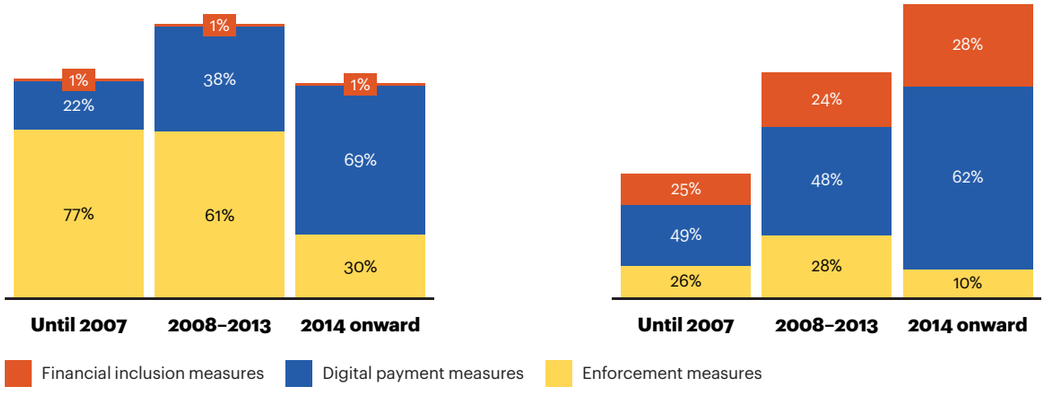
Most efforts today to shrink the informal economy revolve around digital payments



Source: A.T. Kearney analysis

Figure 10

Most markets are moving away from punitive measures toward approaches focused on digital payments



Source: A.T. Kearney analysis

In general, once a market has reached a certain stage of maturity with the required infrastructure and levels of public acceptance, digital payments are faster, more convenient, and cheaper to use than cash.[23] For example, they help stakeholders avoid risks such as fraud and robberies and alleviate the cost of transporting cash.

Although regulatory enforcement was at one time an essential approach to fighting the informal economy in developed nations, there has been a marked change in policy trends. Since 2013, the number of law enforcement measures has dropped significantly—almost by half. Now, for the first time, enforcement measures comprise only 30 percent of all measures used in developed countries (see figure 10).

[23] Bhaskar Chakravorti, "The Hidden Costs of Cash," *Harvard Business Review*, June 26, 2014; Heiko Schmiedel, Gergana Kostova, and Wiebe Ruttenberg, "The Social and Private Costs of Retail Payment Instruments: a Retail Perspective," European Central Bank, September 2012; Bhaskar Chakravorti and Benjamin D. Mazzotta, "The Cost of Cash in the United States," The Institute for Business in the Global Context, Tufts University, September 2014

Developing countries often find enforcement difficult and costly. They may lack effective tracking tools, personnel, or skills in the public sector—barriers that stand in the way of widespread adoption.[24] Instead, many countries have used positive reinforcement—tackling the informal economy with digital payments and financial inclusion.

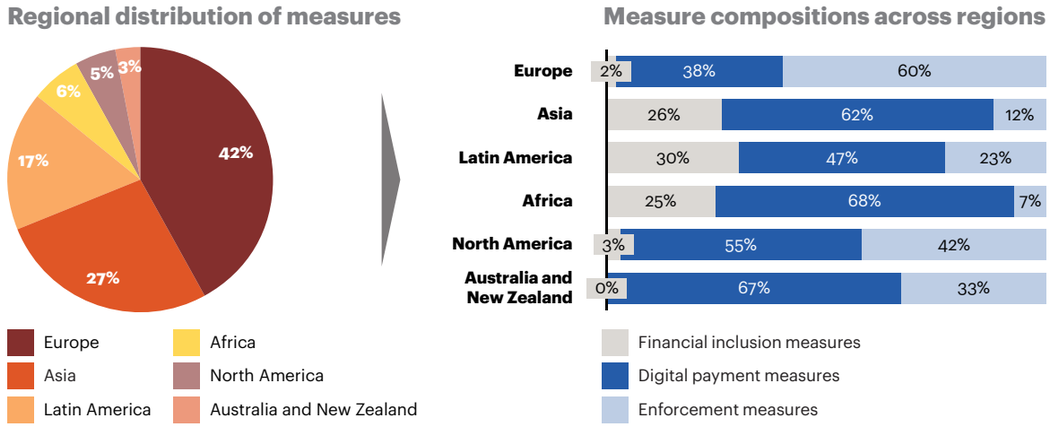
Over the past decade, one of the most frequently used measures in developed countries has been putting a cap on the size of permissible cash transactions. In Europe, for instance, 20 countries have such a limit, with the amount allowed for cash payments for goods and services varying from about US$17,000 in the Czech Republic (CZK350,000) to about US$620 (€500) in Greece. Over the years, countries have been lowering these limits. In early 2017, as part of the effort to reduce the use of cash, the European Commission started a consultation about introducing a limit. Potential legislation is expected in 2018. Following the recommendation of the Black Economy Taskforce in their final report issued in May 2018, the Australian government is planning to follow suit and will introduce an economy-wide cash payment limit of US$7,500 (AU$10,000) applying to payments made to businesses for goods and services from July 1, 2019.

Not all regions follow the same approach for using digital payments to reduce the informal economy. **Europe** has been the most traditional region, with the highest percentage of use of enforcement measures, when it comes to fighting the informal economy (see figure 11). Yet, countries are taking diverse approaches. While Germany has relied on regulatory enforcement, Turkey and Poland have pursued a more balanced approach. Both countries have multiyear programs for strengthening the payment infrastructure and encouraging the use of digital payments.

In **Africa**, more than 90 percent of all measures involve digital payments. The challenges that the public administration and law enforcement have experienced with enforcement measures have led to a strong focus on digital payment initiatives. The highest priority is placed on financial literacy and inclusion. Efforts range from comprehensive multiyear

Figure 11

Europe and Asia have the most initiatives to combat the informal economy



Source: A.T. Kearney analysis

[24] "Addressing Tax Evasion and Tax Avoidance in Developing Countries," German Federal Ministry for Economic Cooperation and Development, December 2010; Henrik Kleven, Adnan Khan, and Upaasna Kaul, "Taxing to Develop: When 'Third-Best' is Best," International Growth Center, April 2016

programs such as the Central Bank of Nigeria's Cash-less Nigeria initiative to private-sector initiatives, sometimes focused on loyalty programs, such as Vodafone and Vodacom's rollout of M-Pesa in Kenya.[25]

Latin America has also taken the path of providing opportunities for digital payments and incentivizing rather than enforcing the move to electronic money. For example, the Dominican Republic uses digital payments to distribute social benefits to more than a million people, who can use their government-issued debit cards at more than 5,000 merchants. The most common methods of encouraging people in Latin American countries to use non-cash payments has been VAT rebates and receipt lotteries for card payments. In the region, more than one-third of all measures focus on financial inclusion.

In **North America**, **Australia**, and **New Zealand**, digital payments are common. E-government initiatives support the use of digital payments, and a wealth of private payment innovation is fueling growth in digital transactions.

According to our analysis, **Asia** has the second-largest share of initiatives to combat the informal economy, nearly 90 percent of which are linked to digital payments and financial inclusion. For example, Bangladesh's financial inclusion policies have focused on digitalization, including interactive websites for government entities and a variety of apps to improve financial access for all citizens. Since 2016, the country planned to increase the share of citizens who have bank accounts from 36 percent to 75 percent by 2019—putting a spotlight on financial education, supportive regulations, and consumer protection.

Asia has also been a leader in terms of payment innovation. Closed-loop contactless smartcard systems such as Octopus in Hong Kong and Upass in South Korea allow consumers to use their mobile phones to pay for a variety of daily transactions. Octopus now has 34.5 million cards in circulation. The share of e-money transactions already exceeds traditional payments, positioning these providers as leaders in the use of digital payments. Additionally, many markets, such as Australia and Singapore, are moving toward open-loop contactless systems. Bringing contactless payments into the transit environment creates opportunities to accelerate the migration from cash to electronic payments by eliminating the nuisance of carrying coins for low-value purchases.

In the next chapter, we focus on the evidence that digital payments supported by effective public policies can reduce the size of the informal economy.

[25] Although M-Pesa's intent was not to reduce the amount of informal activities, it has had a major impact on digital payments and financial inclusion and has provided formal jobs, for example for M-Pesa agents.

IV. Digital Payments Help Reduce the Size of the Informal Economy

Having established the scope of the global informal economy and the developments in policies to tackle it, which currently emphasize the role of digital payments, this chapter explores the benefits of various digital payments-related policies. We begin by demonstrating the strong inverse correlation between digital payments and the informal economy. Then, we review three specific digital payments policy areas for tackling the informal economy—discouraging the use of cash, establishing acceptance development funds, and encouraging the use of digital payments—plus financial inclusion approaches.

Next, and for the first time, we use four of the most-used digital payment measures and the 10 focus countries to analyze the impact of each measure on the size of the informal economy, GDP, and tax revenue. Finally, we perform a forecasting analysis and quantify unreported GDP attributable to the informal economy as well as the potential increase in official GDP and tax revenue that could be generated by increasing the use of digital payments.

1. Correlation Analysis: Cash Enables the Informal Economy

Our analysis reveals a clear inverse relationship between the size of the informal economy (as a share of GDP) and the penetration of digital payments (see figure 12 on page 25). The coefficient of correlation between the size of the informal economy and digital payments penetration is -0.72, with R^2=0.52, reflecting the fact that the variation in digital payments per capita explains a large percentage of the variation in the share of the informal economy.[26] Excluding the outliers in the data (Japan, Brazil, and the Russian Federation) improves the coefficient of correlation to -0.76 and R^2 to 0.58.[27] Given the global nature of our study—60 markets representing 94 percent of global GDP and drawn from every continent and at all levels of economic development—the results are compelling.

Because cash makes it easier to hide informal activities from authorities, the informal economy will weaken as digital payments become more common and displace cash. It is not surprising that countries with a low number of digital payments transactions per capita, such as Nigeria (1.7 transactions) and Bolivia (7.8 transactions), also have the highest and second-highest informal economies, at 53.4 and 46.4 percent of GDP, respectively. At the other end of the spectrum, Singapore and Hong Kong, where digital payments exceed 700 transactions per capita, enjoy some of the world's lowest levels of informal economic activities, at 9 and 12 percent of GDP respectively.

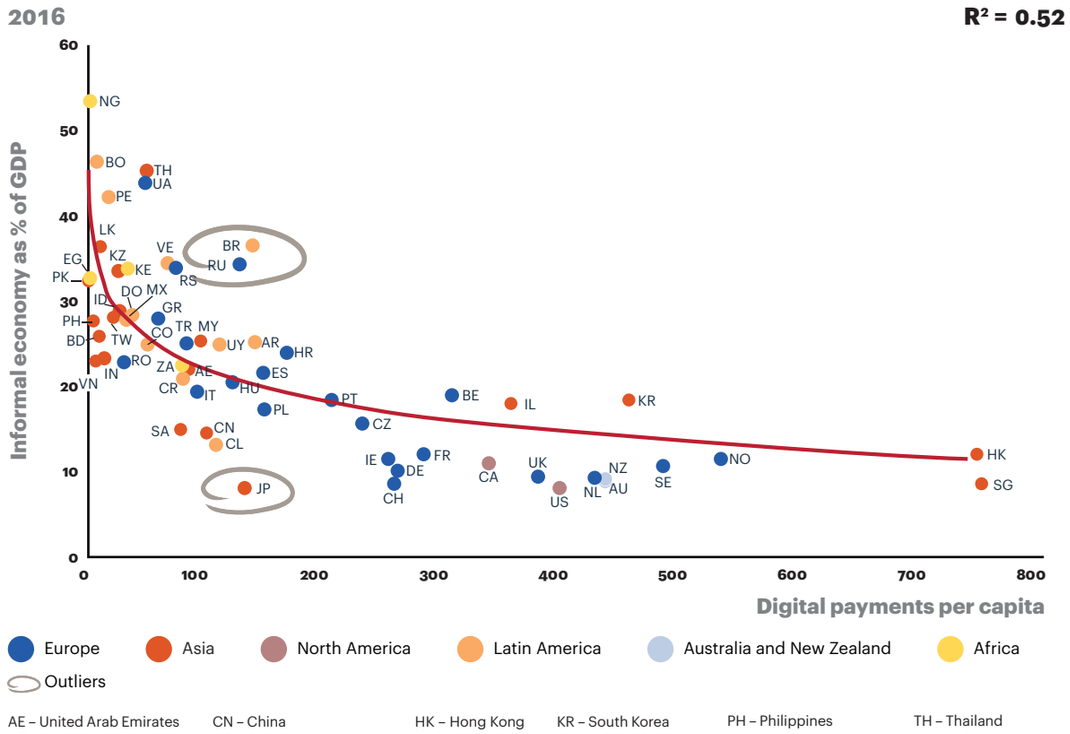
Markets with fewer than 70 digital transactions per capita exhibit a wide range of informal economy levels—from around 23 percent of GDP in Romania and Vietnam to 53 percent in Nigeria. In these markets, the impact of digital payments on the informal economy is somewhat subdued. Differences in the quality of public services, economic situation, or even public attitudes toward

[26] A coefficient correlation with a value of -1.0 indicates perfect negative correlation. The square of the coefficient of correlation (–0.722) is coefficient of determination (R^2), which is a statistical measure of how close the data is to the fitted regression line. R^2 is always between 0 and 1.0. Zero indicates that the model explains none of the variability of the response data around its mean, while 1.0 indicates the model explains all the variability of the response data around its mean. An R^2 of 0.52 indicates that more than half of the variability in the informal sector is explained by digital payments.

[27] In the Russian Federation and Brazil, the economic crisis and slow economic growth appear to have contributed to the rise of the informal economy. Japan has one of the world's smallest informal economies, and yet the country lags many developed nations in the adoption of digital payments. A high government integrity score, which implies that citizens have a high level of trust in public institutions and their ability to effectively carry out their mandate, including ensuring proper tax compliance by individuals and businesses, is likely to be one of the reasons for Japan's small informal economy.

Figure 12

Increased use of digital payments is strongly associated with smaller levels of the informal economy



AE – United Arab Emirates	CN – China	HK – Hong Kong	KR – South Korea	PH – Philippines	TH – Thailand
AR – Argentina	CO – Colombia	HR – Croatia	KZ – Kazakhstan	PK – Pakistan	TR – Turkey
AU – Australia	CR – Costa Rica	HU – Hungary	LK – Sri Lanka	PL – Poland	TW – Taiwan
BD – Bangladesh	CZ – Czech Republic	ID – Indonesia	MX – Mexico	PT – Portugal	UA – Ukraine
BE – Belgium	DE – Germany	IE – Ireland	MY – Malaysia	RO – Romania	UK – United Kingdom
BO – Bolivia	DO – Dominican Republic	IL – Israel	NG – Nigeria	RS – Russian Federation	US – United States
BR – Brazil	EG – Egypt	IN – India	NL – The Netherlands	SA – Saudi Arabia	UY – Uruguay
CA – Canada	ES – Spain	IT – Italy	NO – Norway	SE – Sweden	VE – Venezuela
CH – Switzerland	FR – France	JP – Japan	NZ – New Zealand	SG – Singapore	VN – Vietnam
CL – Chile	GR – Greece	KE – Kenya	PE – Peru		ZA – South Africa

Sources: BIS, ECB, WB, countries' national statistical offices, Prof. Dr. F. Schneider; A.T. Kearney analysis

the informal economy are more pronounced and have a larger contribution than in countries where digital payments already represent a larger share of business and personal transactions.

The growth rate of digital payments tracks the pace of decline of the informal economy, as explained later in this section. Leaps in digital payment adoption of 50 percent or more each year are possible, especially at the beginning of the digitalization journey. The rate of digitalization of payments levels off once a country reaches the threshold of 70 transactions per capita.

2. Available Measures

Policymakers have access to an array of digital payment measures—from discouraging the use of cash to broadening the infrastructure for accepting cards and digital payments. Many measures are motivated by financial inclusion, especially in developing countries. However, some might be more applicable than others, depending on the local context. An effective digital payments agenda must be tailored to each country's specific situation and level of economic development.

A. Digital payment policy measures

Countries try to curtail the informal economy and encourage the use of digital payments in a variety of ways. The measures can be broadly categorized in the following three policy areas:

Discouraging the use of cash involves reducing the perceived advantages of paying with cash as well as changing habits and other traditions that perpetuate its use. For example, before 2016, 95 percent of all transactions in India were settled in cash, 90 percent of vendors did not have the means to accept non-cash payments, 85 percent of workers were paid exclusively in cash, and 47 percent of the population did not have a bank account.[28] As part of the effort to reduce the size of the informal economy and fight corruption, Prime Minister Narendra Modi took all 500 and 1,000 rupee notes—86 percent of the national currency—out of circulation in November 2016. The next month, the number of digital payments jumped by 35 percent.[29] Although this surge was temporary (most likely driven by the shortage of cash), digital payments were 56 percent higher one year after the demonetization.[30] And, as the most recent World Bank Findex data shows, the number of individuals over 15 years of age without a bank account in India dropped to 20 percent as of 2017.[31]

While no other country has gone through such an extensive reduction of the cash in circulation, demonetizing coins and large bills is not uncommon. When Sweden discontinued the 50 öre coin in 2010, the country reduced the number of coins in circulation by 40 percent. With barely 2 percent of the value of all transactions settled in cash in 2016—and projected to drop to 0.5 percent by 2020—cash is rarely used in Sweden.

There are other ways to reduce the amount of cash in circulation, including higher fees for withdrawals from an ATM or a bank branch, daily or weekly cash withdrawal limits, and easy-access to free or low-cost cash deposits. Greece offers another good example. In 2015, in an effort to stem the flight of cash from its banks at the height of a debt crisis that led to the country's third financial bailout, the government put a limit on the amount of cash individuals could withdraw. This has changed consumers' spending habits. In 2015, every Greek accounted for an average of 20 card transactions per year (not including ATM cash withdrawals), up from eight transactions in 2014. The total turnover through cards amounted to €818 per citizen in 2015, compared with €428 per citizen the year before.[32]

Broadening and modernizing the infrastructure for accepting cards and contactless payments is another approach to increasing the use of digital payments. Consumers' choice of whether to use cash or a digital payment is influenced by the payment infrastructure and merchants' willingness to accept digital payments. Several countries have established acceptance development funds to improve the acceptance of digital payments in geographic regions or market sectors with low penetration. In 2017, Poland set up a US$170 million fund to support terminalization in traditionally cash-driven industries. This fund followed a similarly successful effort in 2009, spearheaded by Visa (this study's sponsor), to engage local card-issuing and merchant-acquiring banks. The result was 212,000 new point-of-sale (POS) terminals—a more than 90 percent increase in POS infrastructure, most of them at small and medium-size enterprises in retail, hospitality, and transportation. Malaysia set up a similar fund in 2014 under government supervision. The program, which set an aggressive goal of creating a national acceptance infrastructure with 800,000 POS terminals by 2020, increased the number of POS devices by 60,000 in the first two years.

[28] Data from World Bank's Global Findex on India (2014)

[29] Latest available data from the Reserve Bank of India

[30] Reserve Bank of India electronic payment systems representative data (updated January 16, 2018)

[31] Visa recently published a report on India's experience with demonetization, entitled "Observations from India's Demonetization Journey."

[32] "Value of card transactions, POS terminals double within a year," Ekathimerini, 29 July 2016

Technological advances are also encouraging terminal adoption. Mobile POS solutions such as Square in the United States, iZettle in Europe, Clip in Mexico, and PagSeguro in Brazil are attractive for firms with large field sales staff as well as in sectors where a mobile checkout can save time and reduce costs, including for restaurants, rental cars, transportation, and delivery services. And these solutions are likely to be essential to expanding acceptance at small businesses, changing customers' payment habits at smaller merchants.

Speed and convenience have also boosted the use of near-field communication (NFC) terminals. Whether a card, a mobile device, a key fob, or a wearable device, tap-to-pay methods are growing in popularity. Adoption has been extensive in markets with low-value, high-frequency transactions.

A third approach is to **encourage the use of digital payments**. Most measures fall into this category. As the largest payer and payee in most countries, the government has a significant opportunity to shape the payment behaviors of companies and individuals—for example, by enabling digital transactions for all public matters or providing infrastructure for digital payments at its offices. Germany, Ireland, and Norway provide powerful examples. In 2011, Germany made it mandatory for companies and subcontractors to electronically file corporate income taxes and excise taxes. In Ireland, payers that do not use the online portal are subject to a fine of up to €1500, and tax authorities no longer issue checks but pay all refunds directly into a bank account. And with 250 digital payments per capita, Ireland enjoys one of the world's smallest informal economies at 12 percent of GDP. Another example is Norway's public sector, which has become more digitized in recent years with some impressive results. In fact, all contracts with the public sector are required to send electronic invoices since July 2012.[33] Norway's public sector communicates using the Pan-European Public Procurement Online (PEPPOL) network, and in 2015 alone, about 21 million electronic invoices were exchanged via PEPPOL Norway.

Incentives for using card payments have proven to be an effective way to increase the use of digital payments, especially when linked to lower taxes. South Korea was among the first to launch such a program in the 1990s, and as of 2017, the tax administration allows a deduction of up to 15 percent of the amount consumers spend using their credit cards and 30 percent of their debit card spending as an income tax rebate. A similar measure has been popular in Latin America, where Argentina, Colombia, Mexico, Venezuela, and Uruguay give a VAT refund to citizens who pay with cards. A variation of the VAT refund is the "receipt lottery," such as the Uniform Invoice lottery in Taiwan, introduced in 1951, which encourages locals to obtain receipts for every purchase made at businesses with a monthly turnover of at least NT$200,000 (US$6,200). Consumers with a receipt are eligible to win lottery prizes. As a result, the Taiwanese Finance Ministry experienced a 75 percent increase from the amount collected in 1950.

Smart value cards have revolutionized the transportation sector by sustainably converting low-value cash payments into digital transactions. The pioneers—Seoul's Upass and Hong Kong's Octopus prepaid cards—were launched as early as the 1990s. Their adoption is widespread and goes beyond the public transport system. Ninety-nine percent of Hong Kong's population between the ages of 15 and 64 uses the Octopus card to travel, dine, and shop, executing more than 14 million transactions a day. Recent developments in this space point toward open-loop systems, which allow passengers to pay for a ride with their contactless card or mobile phone. Transport for London has seen success with open-loop contactless, with more than 1 billion journeys made by contactless payment as of July 2017. Other transit operators around the world are adopting open-loop contactless to improve passengers' experiences and increase operational efficiency, including operators in Australia, Poland, France, and the United States.

[33] As a governmental organization, Norwegian Accreditation requires that Norwegian suppliers of goods and services issue invoices and credit notes electronically in a standard electronic commerce format: elektronisk handelsformat (EHF).

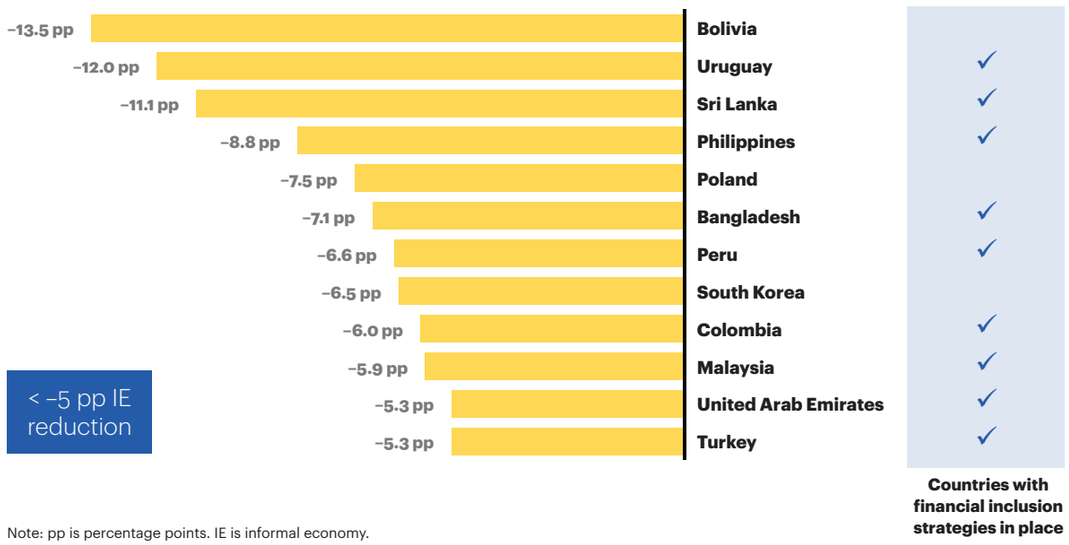
Mobile payment solutions have taken convenience one step further, offering an opportunity to pay without even taking out one's wallet. From SMS messages and apps to Quick Response (QR) codes and contactless terminals, mobile phones are on track to be consumers' central hub for payments. For example, many cities, including Helsinki, Prague, Stockholm, and Vienna, let people pay for public transportation by sending a text message. In South Africa, the Zapper app lets customers pay for taxi rides by scanning a QR code. Mobile payments are by no means limited to developed markets. In developing countries, low-tech mobile money transfer solutions such as M-Pesa or bKash have changed the lives of many unbanked citizens.[34] More than half of Kenya's population uses M-Pesa, which generated US$28 billion worth of transactions in 2015—more than 40 percent of the national GDP. Bangladesh's bKash has more than 24 million active users, or about 15 percent of the population.

B. Financial inclusion measures[35]

Digital payments are an essential part of financial inclusion strategies and the efforts to reduce cash. In the 10 years following 2007, 12 of the 60 markets in our study reduced their informal economy by more than 5 percent of their GDPs (see figure 13). The countries making the most progress are primarily in Asia and Latin America, led by Bolivia, Uruguay, Sri Lanka, and the Philippines. These regions have two things in common: a large unbanked population and national governments that see financial inclusion as a high priority in the national agenda.

Although there is no perfect solution, nations with a significant share of an unbanked population tend to focus on a handful of initiatives (see figure 14 on page 29).

Figure 13
Leading countries with largest improvement in the informal economy and their use of financial inclusion



Note: pp is percentage points. IE is informal economy.
Sources: Prof. Dr. F. Schneider; A.T. Kearney analysis

[34] Bill Gates, "How Mobile Banking Can Change the Lives of the Poor," 9 February 2015

[35] Financial inclusion programs are usually umbrella programs that encompass several national measures to provide access at a reasonable cost for all households to a full range of financial services, including savings or deposit services, payment and transfer services, credit, and insurance as well as competition to ensure choice and affordability for clients.

Figure 14
An array of financial inclusion measures can shrink the informal economy

		Financial inclusion measure	Results
Government as catalyst	**Dominican Republic**	• Government developed an electronic **distribution solution to put the benefits of digital payments** into the hands of eligible families using a Visa Prepaid card	• Over 1 million households, over 75% of the population, received cash benefits of nearly US$1.8 bn via Visa Prepaid cards and spent those benefits at local merchants • Government program savings reached 50%, approximately US$400
Tailored financial products	**Sri Lanka**	• **E-remittance:** introduction of a safe and speedy e-remittance platform by Sri Lanka's leading banks targeting almost US$6 bn (10% of GDP) in remittances yearly	• E-remittance platform facilitates transfers across the whole via connections to more than 90 foreign currency agents
	Uruguay	• **Mandatory payroll through financial system:** accompanied by offering of free-of-charge payroll loans with payments that are subtracted from one's salary, giving individuals access to credit and VAT rebate	• Increase in supply of peso funding and access to credit by consumers—including low-income and rural segments and small businesses • Card usage has quadrupled and POS terminals were used seven times more often in a two-year period
Broader reach	**Malaysia**	• **Agent banking for rural and remote areas:** agents, often rural retail stores, received a free-of-charge POS terminal allowing them to offer basic transaction services	• Malaysia is among the most successful nations in improving financial inclusion; 90% of the adult population had access to financial services in 2016
Financial literacy	**Turkey**	• **Financial Education Action Plan** aimed at accessibility and awareness of financial products and targeting mainly primary and secondary school students and their families	• Sizable improvement of what was previously Europe's highest level of financial exclusion; 21% increase in people having an account at a financial institution, now reaching 69% of the population

Source: A.T. Kearney analysis

Government leadership. Government involvement and support is vital for financial inclusion—protecting the financially disadvantaged; building up crucial electricity, Internet, and mobile infrastructure; educating citizens about the benefits of financial products; and ensuring the success of new measures.[36] Many countries, including Turkey, Indonesia, Uruguay, Colombia, and Nigeria, have established supervisory committees to track the progress of their financial inclusion programs, ensure compliance with the original objectives, and envision the country's next frontier for financial inclusion. Such programs are frequently mandated by the president to ensure visibility and momentum. For example, in 2016, Indonesia's President Joko Widodo said he expects the National Strategy for Financial Inclusion (SNKI) to help Indonesia, which has

[36] The private sector has also contributed to many countries' financial inclusion efforts, such as Visa's program with the Center for Financial Services Innovation in the United States, which provides access to credit for individuals without a credit score, the Financial Inclusion International Demonstration Zone in China, and the simplified account Saldazo, introduced with OXXO, Mexico's largest convenience store.

more than 250 million people, increase the proportion of its citizens who have bank accounts from the current 36 percent to 75 percent by 2019. The strategy focuses on six pillars: financial education, public financing facilities, financial information mapping, supportive regulations, distribution networks and intermediation facilities, and consumer protection.[37]

Tailored financial products. Financial literacy alone cannot eliminate all barriers to financial services. Usability and affordability of products also play a key role. Uruguay, for example, offers free-of-charge payroll loans with payments that are subtracted from one's salary, giving individuals access to credit. In Bangladesh, where formal employment is legal for those age 14 and up, the national bank pioneered a program allowing homeless children to open a savings account and deposit their hard-earned money. The savings program abolished a requirement for a co-signature from a parent or guardian, as this has stood in the way of financial inclusion of orphans or children who have been forced to leave home.

Many governments are using **digital payments** as part of their efforts to improve government efficiency, develop new services, and increase financial inclusion. For example, Brazil has partnered with six banks to cost-effectively disburse social security payments to pensioners and retirees through *Instituto Nacional do Seguro Social* bank accounts. Colombia's coffee federation, *Federación Nacional de Cafeteros de Colombia*, and *Banco de Bogotá* launched a reloadable debit card so farmers can receive harvest payments and government subsidies without making long journeys to town, thus improving transparency in a sector that has one of the largest shares of the global informal economy.[38]

Broader reach. Limited infrastructure often stands in the way of financial services. For example, developed countries have more than 28 bank branches for every 100,000 people, but developing nations have only one-third that amount. When people must walk a great distance to a bank branch, they tend to remain unbanked and instead use cash for their financial transactions. An infrastructure that makes financial services available much closer to home or on a mobile device goes a long way to improving financial inclusion. Colombia opened its financial services market to non-bank competitors to close the distribution gap and foster digital payments, credit, and savings. More than 20 million Colombians, or 40 percent of the population, who were previously unbanked gained access to financial products. As another example, Malaysia introduced agent banking for rural and remote areas as part of its financial sector master plan.

Financial literacy. Consumers' understanding of the benefits of financial products is essential to creating trust in the financial system and ensuring the success of financial inclusion programs. In Nigeria, Women's World Banking launched the BETA savings account program, which has brought financial services to 38,600 low-income shopkeepers in Lagos through community agents called BETA Friends. The agents, typically well-respected members of the community, visit women at their market stalls, which simplifies the banking process and lends a human face to financial services. Turkey—Europe's youngest nation and at the same time the one with the highest rate of financial exclusion—targets primary and secondary school students, their parents, and teachers with basic knowledge about planning and managing their finances.[39]

The promising outcomes from digital payments and financial inclusion measures so far are likely to encourage greater use of such policies to address the informal economy in the future. The speed of this expansion will depend on the ability of the ecosystem of partners—public authorities, payment providers, financial institutions, mobile operators, merchants, and businesses—to foster innovation and adoption.

[37] The Jakart Post, "Indonesia promotes financial inclusion with new strategy," 18 November 2017

[38] Programs supported and executed in cooperation with Visa, Federacion Nacional de Cafeteros de Colombia

[39] In Turkey, 17 percent of the population is between the ages of 18 and 24.

3. Impact Analysis of Four Digital Payment Measures

As is clear from the discussions above, policymakers are increasingly relying on digital payments policies to tackle the informal economy. Amid this wide variety of ways to grow digital payments, four categories of policy measures stand out:

Measure 1: Adoption by the public sector

Measure 2: VAT rebates for card payments

Measure 3: Acceptance development funds

Measure 4: Contactless payments

In this section, we focus on these four measures to analyze the impact of increasing their use on the informal economy, GDP, and tax revenue. The impact calculation is based on the comparative experience of the countries that launched relevant initiatives at least three years ago and have observed tangible, quantifiable results. Our analysis extrapolates the effects of each measure in the 10 focus countries: Australia, Brazil, China, India, Italy, Kenya, Nigeria, Poland, the Russian Federation, and the United States. To isolate the effects of digital payments, all estimates assume that all factors—including GDP, employment, and taxation level—remain unchanged except for the number of digital payments per capita.

Each country's starting point in terms of the acceptance infrastructure, the proliferation of digital payments, and the mix of payments currently used determines the suitability and likely impact of individual measures. Australia, for example, may not benefit as much from financial incentives to use a card because the country is already in the top quintile for highest card usage at around 302 card payments per capita. Nigeria, on the other hand, will need to carefully roll out any initiatives because of the country's limited acceptance infrastructure and the low number of existing card payments. Because of the diversity of digital payment adoption and sophistication of the 10 focus countries, the results are relevant for countries not analyzed in this study as well.[40]

The impact of individual measures is not discretely additive as initiative impacts could overlap. For example, a fund for growing acceptance might aim to roll out contactless terminals and, by doing so, fuel a contactless growth initiative. The costs associated with implementing the four measures are not estimated—for example, the budget required to deploy a VAT rebate program or an acceptance development fund. However, as accurate cost estimates are crucial before rolling out a program, program cost estimates must consider local cost levels and the exact design of the initiative.

Our analysis represents a snapshot in time. In the fast-paced world of digital payments, relevance of an individual measure can change, and impacts can evolve once the measures are in place. These calculations reflect today's information and assessment of the measures.

Measure 1: Adoption by the public sector

As a significant recipient and initiator of payments, governments can serve as a catalyst for business partners and citizens. Making tax filings or payments for state services and customs payments partially or fully digital creates transparency, improves efficiency, and supports the adoption of digital payments. However, full compliance is not easy. In most cases, not paying in cash at public offices is an option, not a requirement.

[40] Within the analysis of each measure, the relevance for different type of countries is explained (for example, developed versus developing countries and high versus low number of digital payments). The calculation outcomes can be used as an *indication* for countries with a similar starting position, but the model used does not allow for direct application to countries beyond the 10 focus countries.

Our study estimates the impact of digital payments in the public sector based on the experience of countries considered global leaders in this field. The impact of growing acceptance through adoption by the public sector was calculated based on the experiences of the United States, which represents a strong example. The country introduced electronic benefit transfers in the 1980s and electronic tax filings in the late 1990s. Significant progress has been made over the past three decades. In 2017, the IRS reported that more than 132 million tax returns—or about 85 percent of all tax files—were submitted electronically.[41]

When public institutions make a targeted effort to convert their operations to digital payments, simplify online payment options, and mandate the use of digital payments for select services, the impact can be substantial. The US Department of the Treasury's Bureau of the Fiscal Service collected US$3.8 trillion in revenue in 2016 through electronic transactions—about 98 percent of total collected revenues—and announced acceptance of contactless payment methods beginning in August 2017. Our study estimates that up to 20 percent of the cash transactions that citizens typically make to state and public institutions each year can be converted to digital payments within five years through supporting measures. Even in developing countries such as India, Kenya, and Nigeria, where there is a large rural population and low use of electronic payments, 5 percent of cash transactions can be converted.

The extent to which the public sector's adoption of digital payments will reduce the size of the informal economy and increase GDP and tax revenues will differ from country to country (see figure 15). Naturally, the impact will be most substantial for countries with a low starting point in terms of digital payments. This measure can generate the highest GDP impact in China and India—up to US$60 billion for each country.

Figure 15

Projected impact from public-sector adoption of digital payments[1]

		Five-year impact from digital payments adoption by public sector (2017-2021)					
		Informal economy (change in percentage points)		GDP (change in US$ billion)		Tax revenue (change in US$ billion)	
Country	Informal economy in 2016 (% of GDP)	Lower confidence limit	Upper confidence limit	Lower confidence limit	Upper confidence limit	Lower confidence limit	Upper confidence limit
Australia	9.0%	–0.1	–0.1	0.8	1.0	0.6	0.7
Brazil	36.5%	–1.2	–1.4	14.8	17.7	8.4	10.1
China	14.5%	–0.6	–0.7	49.7	59.6	28.8	34.6
India	23.3%	–2.8	–3.5	46.4	58.8	18.1	23.1
Italy	19.5%	–0.9	–1.1	12.0	14.4	9.3	11.2
Kenya	33.7%	–2.1	–2.5	1.1	1.3	0.4	0.5
Nigeria	53.4%	–9.3	–13.3	13.2	19.7	4.1	6.3
Poland	17.4%	–0.5	–0.6	1.1	1.3	0.9	1.1
Russian Federation	34.3%	–1.2	–1.4	1.6	1.9	0.9	1.0
United States	8.0%	–0.1	–0.1	11.9	14.2	7.4	8.9

Impact magnitude: High Low

[1] The upper and lower ranges were used to interpret the results. The ranges are based on a 95 percent confidence interval estimated by Dr. Schneider, indicating that the actual impact on the informal economy, GDP, and taxation will lie within the indicated spectrum with a probability of 95 percent.

Notes: Measure assumes up to 20% of cash transactions made to state and public institutions can be converted into digital payments within a five-year period. For developing countries such as India, Kenya, and Nigeria 10% is assumed. pp is percentage points.

Sources: EIU, Prof. Dr. F. Schneider; A.T. Kearney analysis

[41] Latest available Internal Revenue Service report for the 2016–2017 filing season statistics as of December 29, 2017

The adoption of digital payments for public sector services presents different challenges for the 10 focus countries. For digitally advanced countries such as the United States, the challenge is to move from a very high level of adoption to almost full adoption in all public-sector entities—not just government bodies—while at the same time motivating consumers who prefer cash to use digital payments. In comparison, the challenge for Nigeria and Kenya is to gain traction with their new e-tax and e-payment platforms. While the potential for electronic payments is significant, developing countries with large rural populations face basic issues such as poor Internet connectivity, limited literacy, and a lack of access to bank accounts. Nevertheless, the early results are promising. Kenya, for example, had 2 million users in its iTax platform in the first year alone.

Measure 2: VAT rebates for card payments

Some measures are more effective because they become so popular that people share their positive experiences with friends and family, mainly other consumers. Tax deductions for card payments at the point of sale is a good example. The impact of VAT rebates has been calculated based on the experiences of South Korea. South Korea enacted a series of laws to stimulate consumption after the 1997 economic crisis, including tax rebates for purchases made with debit and credit cards. As a result, card transactions grew from 15 to 65 percent of consumer spending during a 10-year period.

This measure was also widely adopted by Latin American countries in the form of a VAT rebate for card payments. In 2014, for example, Uruguay gave a 4 percent discount on debit card purchases and a 2 percent discount on credit card purchases. A year later, the number of electronic payments increased by 42 percent. Debit card transactions grew 65 percent in 2016 and 78 percent in 2017, according to data from the country's central bank.

This type of tax rebate is one of the most powerful measures. Our study assumes that within five years, a VAT rebate could encourage half of the population to use digital payments for all of their point-of-sale transactions (15 percent in India, Kenya, and Nigeria) if there is an adequate acceptance infrastructure to accommodate these transactions.[42]

The potential impact on the informal economy, GDP, and tax revenues is calculated for a five-year period per country (see figure 16 on page 34). The impact could be significant across the board, especially for countries with a low use of card payments. Nigeria and India could see huge benefits from implementing VAT rebates, reducing the size of their informal economies by 11 to 16 percentage points and 4.4 to 6.4 percentage points, respectively. At a minimum, an informal economy reduction of 7.0 percentage points could decrease the informal sector in Brazil to slightly below 30 percent of GDP. China is likely to get the largest GDP boost from this initiative—in the range of US$185 billion to US$261 billion—followed by India.

Tax rebates are most relevant for developing countries that are just beginning their digital payment journey. This type of incentive increases the likelihood that consumers will adopt and use digital payments, and correspondingly gives merchants an incentive to accept them. This incentive discourages the use of cash, a key contributor of the informal economy. At the same time, little tax money is spent on providing rebates to the small group of existing card users. Among the 10 focus countries, Nigeria, Kenya, and India have the largest potential to benefit from this measure. Program costs and the amount of the rebate will need to be carefully calculated.

[42] This assumption is based on the current level of card payment adoption in the study's 10 focus countries along with additional international experiences. Frequency of use is assumed to remain unchanged as payment method shifts from cash to cards. No assumption was made about the level of a VAT rebate, which would likely differ for each country. This study assumes that when introducing such a measure, the government will do due diligence of the required rebate to achieve a certain shift in behavior specific to that country.

Figure 16

Projected impact from a tax rebate for card payments

Country	Informal economy in 2016 (% of GDP)	Five-year impact from tax rebate for card payments (2017–2021): Informal economy (change in percentage points) Lower confidence limit	Informal economy (change in percentage points) Upper confidence limit	GDP (change in US$ billion) Lower confidence limit	GDP (change in US$ billion) Upper confidence limit	Tax revenue (change in US$ billion) Lower confidence limit	Tax revenue (change in US$ billion) Upper confidence limit
Australia	9.0%	n/a	n/a	n/a	n/a	n/a	n/a
Brazil	36.5%	–5.6	–7.7	76.5	108.7	44.4	63.6
China	14.5%	–2.2	–3.0	185.5	261.2	108.2	152.9
India	23.3%	–4.4	–6.4	77.4	117.6	30.5	46.8
Italy	19.5%	–3.3	–4.6	46.1	67.2	35.9	52.6
Kenya	33.7%	–4.2	–5.4	2.2	2.9	0.9	1.1
Nigeria	53.4%	–11.0	–16.1	15.9	24.8	5.0	8.1
Poland	17.4%	–2.7	–3.8	6.3	9.0	5.1	7.2
Russian Federation	34.3%	n/a	n/a	n/a	n/a	n/a	n/a
United States	8.0%	n/a	n/a	n/a	n/a	n/a	n/a

Impact magnitude: High Low

Notes: This measure is not recommended for the United States and Australia due to an already-high existing number of card payments. In case of implementation, costs need to be carefully calculated up front. Measure assumes 50% of population (15% for India, Kenya, and Nigeria) using the VAT rebate for all POS transactions within a five-year period. As an enabler, sufficient infrastructure needs to be in place.

Sources: EIU, Prof. Dr. F. Schneider; A.T. Kearney analysis

As indicated, one crucial prerequisite for the effectiveness of this measure is the acceptance infrastructure. Based on the expected increase in the number of card payments, India and Nigeria can very quickly face significant limitations unless they increase the number of POS terminals five to eight times from the current level.[43] The Russian Federation and Kenya will experience a less dramatic shortage of POS infrastructure but will benefit from a wider footprint prior to a program launch. With this in mind, the Russian Federation mandated the deployment of POS terminals for all merchants with turnover exceeding US$700,000 (RUB 40 million), resulting in 170,000 new terminals in only one quarter (Q4 2017). Sequencing, or at least coordinating, terminalization efforts and incentives for using cards can maximize benefits.

Measure 3: Acceptance development funds

Digital payments require an adequate acceptance infrastructure.[44] While most shops and restaurants in developed countries accept cards, developing countries typically have fewer than 10 terminals per 1,000 inhabitants. Even if a consumer has a card and wants to use it, lack of infrastructure often makes cash the default payment option.

The impact of growing acceptance through development funds has been calculated based on the experiences of Poland and Indonesia. In 2009, in a joint effort between Visa and Polish

[43] Given the low penetration of POS terminals—about 190 per 100,000 inhabitants in India and less than 100 terminals per 100,000 inhabitants in Kenya and Nigeria, accommodating a sizable growth in digital card transactions would require a significant increase in the number of terminals. Our calculation assumes these countries will accommodate the international average number of transactions on each terminal of 6,000 to 7,000 annually.

[44] Acceptance infrastructure refers to POS terminals, for example, devices allowing the use of payment cards at a physical (not a virtual) point of sale. The payment information is captured either manually on paper vouchers or by electronic means. Definition based on the Glossary of Terms Related to Payment Clearing and Settlement Systems by the European Central Bank and Bank of International Settlements. These are definitions of terms as they are used by market participants, not legal definitions.

Figure 17

Projected impact from typical acceptance development fund

Country	Informal economy in 2016 (% of GDP)	Five-year impact of terminalization initiatives (2017–2021): Informal economy (change in percentage points) Lower confidence limit	Informal economy (change in percentage points) Upper confidence limit	GDP (change in US$ billion) Lower confidence limit	GDP (change in US$ billion) Upper confidence limit	Tax revenue (change in US$ billion) Lower confidence limit	Tax revenue (change in US$ billion) Upper confidence limit
Australia	9.0%	n/a	n/a	n/a	n/a	n/a	n/a
Brazil	36.5%	–0.8	–0.9	10.0	12.0	5.7	6.9
China	14.5%	n/a	n/a	n/a	n/a	n/a	n/a
India	23.3%	–3.2	–4.3	55.0	75.0	21.5	29.5
Italy	19.5%	n/a	n/a	n/a	n/a	n/a	n/a
Kenya	33.7%	–0.8	–1.0	0.4	0.5	0.2	0.2
Nigeria	53.4%	–8.0	–10.9	11.1	15.7	3.4	4.9
Poland	17.4%	–2.3	–3.0	5.2	6.9	4.2	5.6
Russian Federation	34.3%	–5.1	–6.9	7.2	10.1	4.0	5.6
United States	8.0%	n/a	n/a	n/a	n/a	n/a	n/a

Impact magnitude: High Low

Note: The measure is not recommended for China and the United States due to already high POS density (in China accounting for Alipay POS). Measure assumes POS device penetration increase to 70% of the average level for the top countries; that is, Australia with 41 POS devices per 1,000 inhabitants and Italy with 37 devices per 1,000 inhabitants. For developing countries such as India, Kenya, and Nigeria a level of 10% is assumed. pp is percentage points. In case implemented, costs need to be carefully calculated upfront.

Sources: EIU, Prof. Dr. F. Schneider; A.T. Kearney analysis

banks, Poland initiated a fund to increase the number of POS terminals. Within three years, the number of terminals grew by 30 percent. Similarly, in Indonesia, the number of terminals tripled with the support of a five-year acceptance fund. However, with only 15.5 POS devices per 1,000 people, both countries rank below average in terms of acceptance infrastructure, according to our study's sample of 60 countries, which have an average of 19.08 devices per 1,000 people.

The underlying assumption for the impact calculation of this measure is that the POS device penetration will increase to 70 percent of the average level for the top countries—that is, Australia with 41 POS devices per 1,000 inhabitants and Italy with 37 devices.[45] The target for the developing countries—India, Kenya, and Nigeria—is significantly lower at 10 percent of the top nations because of a low starting point of fewer than two terminals per 1,000 inhabitants. No impact has been calculated for Australia and Italy as they serve as a benchmark for the calculation.

The resulting impact on the informal economy, GDP, and tax revenue over a five-year period differs per country (see figure 17). Among all markets implementing this measure, Nigeria could experience the largest reduction in the informal economy.

An acceptance development fund could be a valid approach for most focus countries. The benefits are significant for markets with below-average terminalization, such as Kenya and Nigeria. India recognized this opportunity and, following demonetization, invested in strengthening its POS infrastructure. Aiming to increase the number of terminals from 1 million to 3 million, India surpassed this goal in January 2018—reaching 3,061,817 terminals.[46] In March 2018, there was a further increase of over 220,000 terminals.

[45] For this calculation, the target number of POS devices has been set at 70 percent of the average between the two top countries: 27.5 terminals for every 1,000 inhabitants.

[46] Between October 2016 and January 2018, the number of POS terminals increased from 1,511,769 to 3,061,817, according to the Reserve Bank of India.

Half of the 10 focus countries have a POS density below our 60-country sample's average, which is 19.08 POS devices per 1,000 inhabitants. These countries could benefit from an acceptance development fund to widen the footprint and improve the availability of terminals. Although close to the average in our study, Brazil could improve the availability of acceptance infrastructure in remote and rural areas or in selected industries that have a high share of informal activities, and the Russian Federation could strengthen its terminal availability and acceptance of digital payments outside of large metropolitan cities.

However, the benefits of such a fund are limited for the United States and China, which are already scoring slightly above the 60-country average terminal penetration. In China, besides the 24.5 million traditional POS terminals, there are 40 million points of sale for Alipay, all QR code-based.

Australia and Italy are among the terminalization leaders, but improvements in acceptance infrastructure can still create advantages. Italy can benefit from an increased focus on using POS devices, which is low in international comparison with only 1,140 transactions per terminal per year compared with more than 6,000 in Poland. Australia has enabled its POS devices for contactless payments, encouraging the use of cards for low-value transactions and boosting already high terminal use.

Depending on the structure of the acceptance development fund, governments could incur costs, but such costs are temporary incentives for onboarding merchants. However, benefits to governments in the form of higher tax revenue are substantial and long-term.

Measure 4: Contactless payments

With the convenience of tap-to-pay, contactless payments have expanded rapidly in Australia, Canada, Singapore, the United Kingdom, and Eastern Europe. This technology, which is relatively new for most markets in our sample, shortens the time required to pay at the point of sale. As a result, it creates an important opportunity to reduce the use of cash for low-value purchases such as public transportation, fast food services, and many other retail transactions where consumers are in a hurry.

Some markets have achieved impressive results in a very short time. In the United Kingdom, for example, contactless payments are the payment method of choice. In June 2017, 110.8 million contactless cards had been issued—67.5 percent of all cards in circulation—accounting for a third of all card payments with 470 million contactless transactions.[47] Australia is on the frontier of contactless transactions: in 2016, contactless payments accounted for one-third of all point-of-sale transactions and more than 60 percent of all card payments at the point of sale. Poland is also a global leader with more than two-thirds of all card transactions already enabled for contactless transactions.

To estimate the impact of contactless payments, our study examines the effect on the overall growth of card payments in the United Kingdom and Poland. In these two countries, contactless technology has been available for some time, and adoption accelerated only once the infrastructure of cards and terminals reached a critical mass. A five-year period seems to be sufficient to reach a level of contactless adoption of up to 50 percent of all card transactions. While contactless payments partially replace traditional card payments carried out with a PIN or signature, they also generate additional payment volumes. The value per transaction declines because of the disproportionate increase of low-value transactions, but the number of transactions can go up by one-third.

[47] UK Finance, Debit Card Report, October 2017; UK Finance, Quarterly *Market Trends*, third quarter of 2017

Figure 18

Projected impact from increased prevalence of contactless payments[1,2]

Country	Informal economy in 2016 (% of GDP)	Five-year impact from increase in contactless payments (2017–2021): Informal economy (change in percentage points) Lower confidence limit	Informal economy (change in percentage points) Upper confidence limit	GDP (change in US$ billion) Lower confidence limit	GDP (change in US$ billion) Upper confidence limit	Tax revenue (change in US$ billion) Lower confidence limit	Tax revenue (change in US$ billion) Upper confidence limit
Australia	9.0%	n/a	n/a	n/a	n/a	n/a	n/a
Brazil	36.5%	–2.5	–3.0	32.3	38.8	18.5	22.3
China	14.5%	–0.9	–1.1	74.0	88.8	42.9	51.6
India	23.3%	–2.7	–3.3	44.3	55.0	17.3	21.6
Italy	19.5%	–0.7	–0.8	9.0	10.8	7.0	8.4
Kenya	33.7%	–0.7	–0.8	0.3	0.4	0.1	0.2
Nigeria	53.4%	–7.7	–10.4	10.6	14.8	3.3	4.6
Poland	17.4%	n/a	n/a	n/a	n/a	n/a	n/a
Russian Federation	34.3%	–5.0	–6.8	7.2	10.0	4.0	5.6
United States	8.0%	–0.3	–0.4	43.4	52.1	27.1	32.5

Impact magnitude: High Low

[1] According to a Reserve Bank of Australia consumer payments survey, contactless payments accounted for more than 60 percent of all card transactions in the country. Therefore, Australia was not included in the calculation. Mary-Alice Doyle, Chay Fisher, Ed Tellez, and Anirudh Yadav, Reserve Bank of Australia 2016 Consumer Payments Survey, "How Australians Pay: New Survey Evidence," March 2017

[2] Poland is also a global leader with more than two-thirds of all card transactions already enabled for contactless transactions. Therefore, Poland was not included in the calculation. Source: National Bank of Poland

Note: The measure is not recommended for Australia and Poland due to already high adoption of contactless cards and POS terminals. Measure assumes contactless adoption of up to 50% of all card transactions within a five-year period. pp is percentage points. In case of implementation, costs need to be carefully calculated upfront.

Sources: EIU, Prof. Dr. F. Schneider; A.T. Kearney analysis

The resulting impact on the informal economy, GDP, and tax revenue calculated for a five-year period differs per country (see figure 18). This measure is most suitable for countries with a medium-to-high level of card usage and a solid POS infrastructure already partially enabled for contactless transactions. For example, in the Russian Federation, more than 7 million Moscow Metro passengers a day use contactless payments for their rides.

While contactless technology infrastructure can be a catalyst for digital payments in markets such as Italy, India, and Nigeria, the required infrastructure investment could stand in the way of fast adoption. Italy will face the issue of investing in and upgrading its extensive but largely underutilized POS network, while India and Nigeria will need to build the infrastructure from scratch.

The United States and Australia are among the world's top 10 markets with the highest number of digital payments per capita at 453 and 439 respectively, but they are very different when it comes to contactless payments. While Australia is one of the leading contactless markets, the United States still lags in consumers' use of this payment method. Roughly 36 percent of the terminals in the United States have contactless capabilities, but only 28 percent of POS terminals are activated to accept contactless cards.[48] However, only 5 percent of card users have cards that are enabled for contactless transactions. If 50 percent of US card payments were contactless, the country could add US$52 billion of economic activity to its GDP in five years.

[48] Strawhecker Group, 2017

In China and Kenya, people are quickly adopting mobile payments with relatively simple technology such as SMS and QR codes. Although the potential to reduce cash transactions in both countries is still significant, time will tell if people will choose to use contactless over other payment methods.

While most contactless payments are now card-based, contactless payments using a mobile device are on the rise. There are a number of local applications, and the global brands—Apple Pay, Samsung Pay, and Android Pay—have won more than 150 million subscribers around the world since 2015. However, adoption differs significantly across markets. For example, China has become by far the largest mobile payments market because of the ubiquitous use of mobile devices. As a result, mobile payments quickly took off once the country had the supporting infrastructure—with no drag on adoption because of old habits of using a card. Even though mobile payments in the United States and Australia are growing by double digits, this growth is coming from a low base, and adoption is still lagging. Because US and Australian consumers are accustomed to using plastic credit cards, it will take time for them to favor their smart devices. In these countries, most mobile payment transactions entail migrations from traditional card payments, which has little impact on increasing the overall volume of digital transactions.

Mobile wallets can be beneficial for countries with moderate to high smartphone penetration but relatively low levels of digital payments, such as Brazil, Italy, Greece, and Taiwan. In these markets, contactless card payments have not yet gained traction. The convenience of mobile wallets could make a difference to consumers, but because these markets were slow to adopt other types of digital payments, the uptake of mobile technology is difficult to forecast. As mobile wallets evolve and add benefits such as peer-to-peer payments and loyalty programs, the impact on changing the payment habits can be tremendous in many countries.

4. Forecasting Impact Analysis

For the first time, this study quantifies unreported GDP attributable to the informal economy as well as the potential official GDP and tax revenue increase that could be generated by higher use of digital payments.

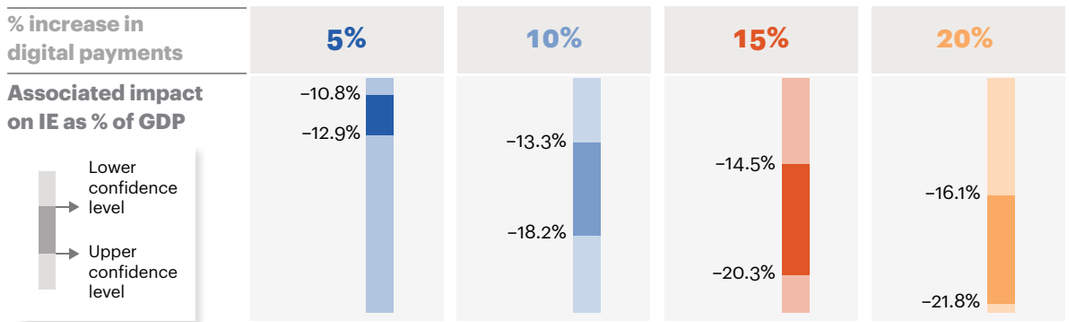
To gain a clearer picture of how digital payments can shrink the size of the informal economy, we assessed the efficacy of various initiatives to address the informal economy by observing the actual impact in 13 countries that introduced such initiatives: Costa Rica, Indonesia, Italy, Kenya, Mexico, Netherlands, Poland, the Russian Federation, Singapore, South Africa, South Korea, the United Kingdom, and Uruguay. However, since these 13 countries did not fully capture the diverse stage of economic development for countries around the globe, we identified another set of 10 countries that in our view could serve as an archetype for all countries around the world. We then extrapolated the impact of informal economy initiatives from the 13 countries to these 10 countries. This allows a country to estimate the likely impact of an initiative based on the experience of one or more of the 10 countries that most closely resemble its economic profile.

To generate robust and scalable results, these 10 selected countries represent different continents and diverse levels of economic development. However, what they have in common is experience with a variety of measures to reduce the use of cash and improve the acceptance and adoption of digital payments. Because these countries have seen a variety of results, our analysis paints a realistic picture of the range of potential impacts for other countries.

Impact on the informal economy

The inverse relationship between digital payments and the informal economy means that even a 5 percent increase in digital payments per year for five consecutive years can reduce the informal economy by 10.8 to 12.9 percent (see figure 19). A faster pace of digital payment adoption—for example, increasing digital payments 20 percent per year—is likely to decrease the informal economy by 16.1 to 21.8 percent. Because measures focusing on digital payments have a long tail in terms of their impact after implementation, all impact calculations are based on a five-year period with the cumulative effects presented in the fifth year.[49]

Figure 19
Impact from increasing digital payments on the size of the informal economy per year for five consecutive years



Notes: % increase in number of digital payments per capita. IE is informal economy.
Sources: Prof. Dr. F. Schneider; A.T. Kearney analysis

While the global growth rate in digital payments averaged 14 percent for the past 10 years, countries grew at very different paces. The number of digital transactions in Nigeria rose 57 percent per year, while Germany grew at only 3.4 percent per year. To gauge a realistic range of impacts from increasing digital payments, the 10 focus countries are grouped by their expected transaction growth in the coming five years. China, India, Kenya, Nigeria, and the Russian Federation can each expect growth of 20 percent. Brazil and Poland are likely to grow by 10 percent per year and Australia, Italy, and the United States by only 5 percent per year.

The spectrum of impacts on the informal economy is wide (see figure 20 on page 40). Nigeria, with an informal economy of 53 percent and expected growth in digital payments of 20 percent, is likely to reduce its informal economy by around 10 percentage points, reaching a value between 41.8 and 44.8 percent of GDP in 2021. At the other end of the spectrum is the United States. With the US informal economy already at a low 8 percent and the expected growth in payments only 5 percent per year for the next five years, the gains in the informal economy will likely not exceed 1 percentage point. The most likely size of the informal economy in 2021 will fall between 7 and 7.1 percent.

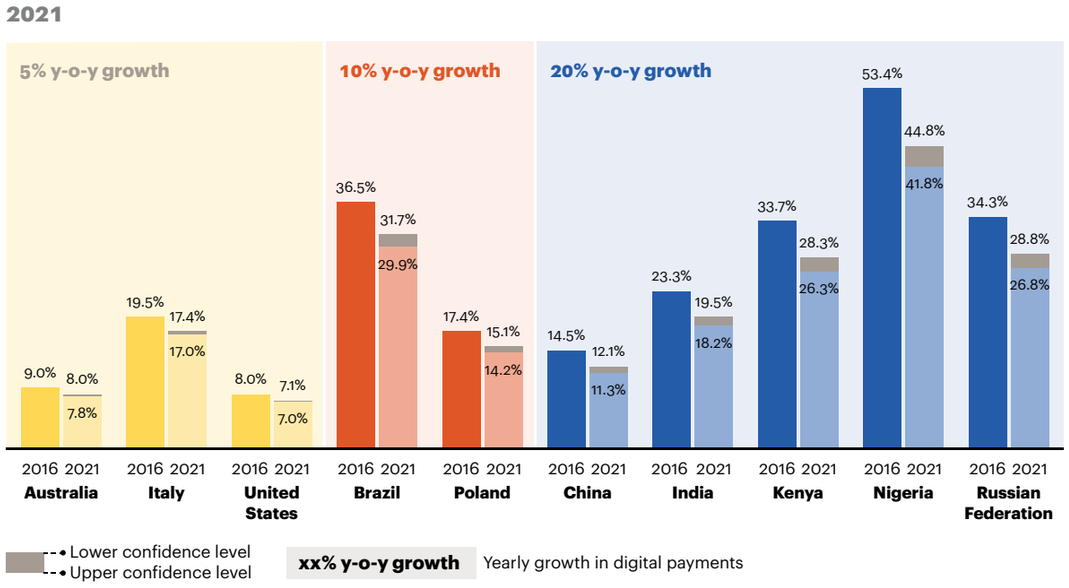
Impact on official GDP

Product prices differ in the formal and informal economy, and not all individuals who use a product or service in the informal economy would be willing to pay a higher price in the formal

[49] All estimates are *ceteris paribus*, that is, assuming all factors remain unchanged except the number of digital payments per capita. Ranges are used to interpret the results. The latter are based on a 95 percent confidence interval estimated by Dr. Schneider, indicating that the actual impact on the informal economy, GDP, and taxation will lie within the indicated spectrum with a probability of 95 percent.

Figure 20

Nigeria could see significant gains in reducing its informal economy

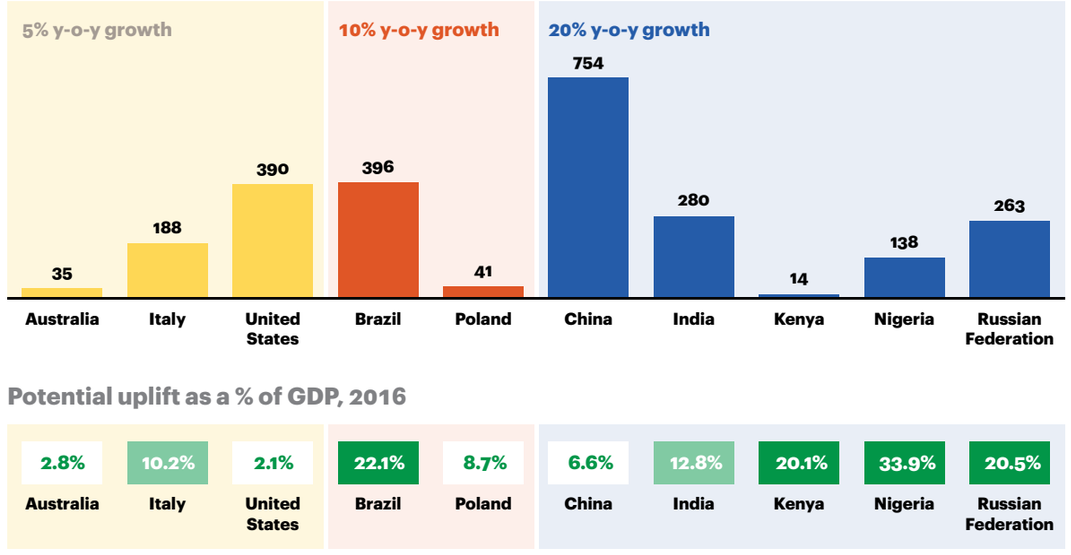


Note: Calculated on the basis of all else being equal; informal economy as % of GDP

Sources: Prof. Dr. F. Schneider; A.T. Kearney analysis

Figure 21

Unreported GDP and potential GDP uplift



Note: In US$ billion and %; 70% of the informal sector is considered to be transferrable into the official economy.

Sources: EIU, Prof. Dr. F. Schneider; A.T. Kearney analysis

economy.[50] Price differentials and price sensitivity vary across countries. To ensure a comparable approach, our analysis assumes that around 70 percent of the economic output produced by the informal economy is transferable into the formal economy.[51]

Part of each country's official GDP vanishes in the informal economy, meaning that there is no country in the world without a certain level of informal economy (see figure 21 on page 41). This unreported GDP is a combination of the share that is transferable into the formal economy and the lowest possible theoretical level of informal economy that will continue to persist. As no country has been able to eliminate its informal economy in its entirety, a threshold of 5 percent of GDP is assumed as the minimum informal economy size that any given country is likely to face.

The unreported GDP differs significantly in absolute size and as the share contributed to the formal economy. For Kenya, this increase is small, adding only up to US$14 billion. In Australia, the relative expected contribution to the national economy is 2.8 percent (US$35 billion), and Nigeria's unreported GDP can account for almost one-third of the formal economic output (US$138 billion). China leads the rankings in terms of largest absolute gain: the potential increase in official GDP from transitioning informal activities amounts to US$754 billion.

Based on our model, these values represent the maximum potential gain a country can expect from addressing issues in its informal economy. If the reasons people engage in the informal economy are targeted and removed, a growing portion of unreported GDP can be transferred into official GDP. While recovering this unreported GDP might be manageable for many economies, the implementation challenges and timing for unlocking the potential GDP increase will vary significantly across countries.

The estimated five-year impact on GDP from increasing digital payments is based on country-specific growth rates of digital payments. The highest impact in absolute terms can be achieved by China and the United States, which together could bring more than US$1 trillion in GDP. However, the largest increase of GDP in relative terms is possible in Nigeria, the Russian Federation, and Brazil. Nigeria, for example, with a GDP of US$406 billion in 2016, could see an uplift of between 6.6 and 9.3 percent by the end of 2021 if it continues to grow digital payments by at least 20 percent per year. Likewise, the increase for the Russian Federation could range between 4.2 and 5.9 percent of GDP—an increase in GDP up to US$76 billion (see figure 22 on page 42).

Impact on tax revenue

In addition to the impact on GDP growth, moving individuals and businesses out of the informal economy increases tax revenues. A 1 percent increase in GDP could lead to a proportional increase in tax revenue. The estimated tax revenue increase varies depending on the country's tax rate, social security contribution levels, and incidence of tax evasion. Under the assumption that only digital payments change and all other factors stay the same, the current tax levels—effective tax rate and staggering—remain constant. Therefore, the effect is proportionally distributed across all main tax types.[52] Similar to the results from the GDP calculation, Nigeria is estimated to have the largest growth in tax revenue, while Australia and the United States are likely to experience more modest gains (see figure 23 on page 42).

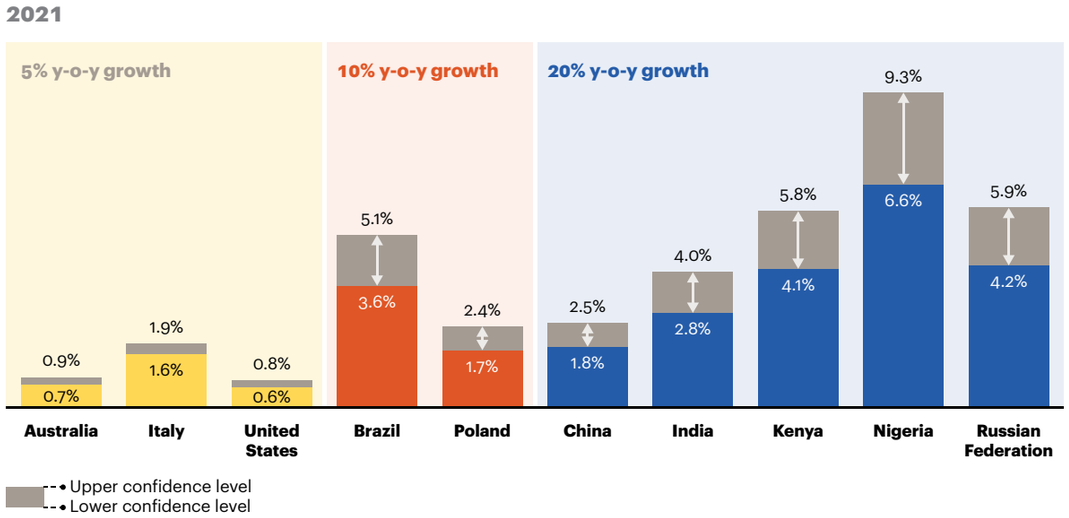
[50] "The informal economy provides low-cost labor, inputs, goods, and services to both formal and informal enterprises and low-cost goods and services to the general public, especially poorer households," according to Women in Informal Employment: Globalizing and Organizing. "The informal economy also helps to meet the needs of poor consumers by providing accessible and low-priced goods and services," according to the International Labour Conference Office.

[51] The assumption of 70 percent is derived from Mogensen, G. V. (1985) Sort Arbejde i Danmark, Copenhagen: Institut for Nationalokonomi. The Danish study found that the purchasers of shadow work would prefer to resort to do-it-yourself activities (34 percent) or not consume the services (30 percent) rather than pay the official formal price. Friedrich Schneider & Colin C. Williams, The Shadow Economy, The Institute of Economic Affairs, 2013

[52] The assumption is that tax rates are not changed when this calculation was undertaken. This is a very strong assumption as the size of the informal sector can very much be affected by the overall tax level and the perceived fairness in the distribution of taxation.

Figure 22

Nigeria, The Russian Federation, and Brazil could see the largest increases in GDP

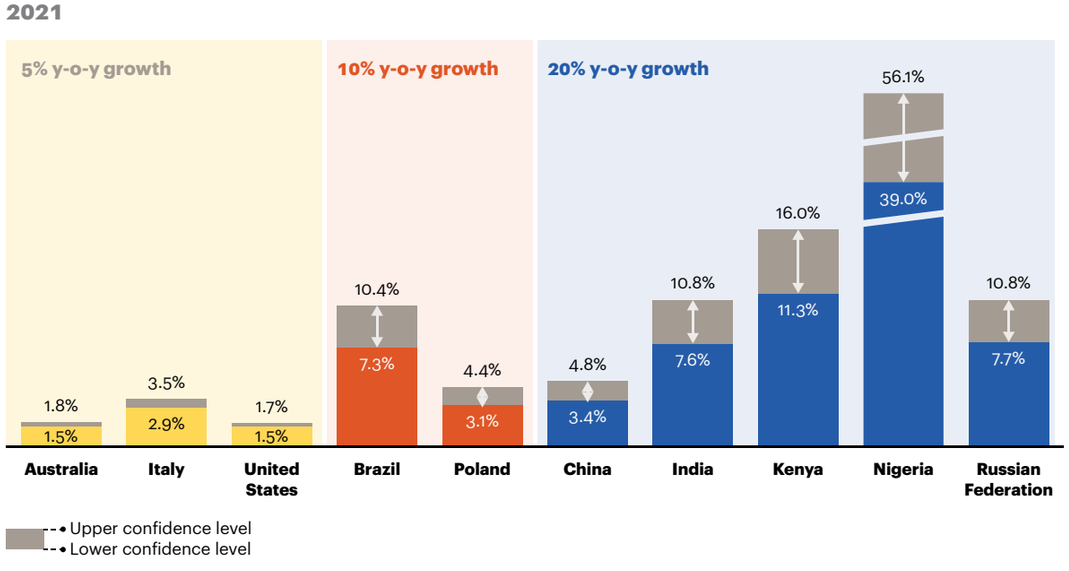


Note: Calculated on the basis of all else being equal; 95% confidence interval

Sources: EIU, Prof. Dr. F. Schneider; A.T. Kearney analysis

Figure 23

Nigeria could see the largest influx of tax revenue



Note: Calculated on the basis of all else being equal; 95% confidence interval

Sources: EIU, Eurostat, OECD, countries' national statistical offices, Prof. Dr. F. Schneider; A.T. Kearney analysis

V. The Way Forward

Despite being largely invisible, the informal economy impairs society in a variety of ways that go far beyond the financial implications of GDP and tax revenues—from unfavorable working conditions and a lack of safety standards to unfair competition and sustained levels of poverty and inequality. Because it has a negative impact on many aspects of society, reducing the size of the informal economy can improve the lives of people around the world and bring a variety of benefits to workers, businesses, and governments.

Looking ahead, the role of digital payments is bound to grow—making a positive impact not from coercion but from convenience. However, no generic set of policies can reduce the size of an informal economy, and no universal recipe exists that can create an effective digital payments policy. The ideal approach varies from country to country.

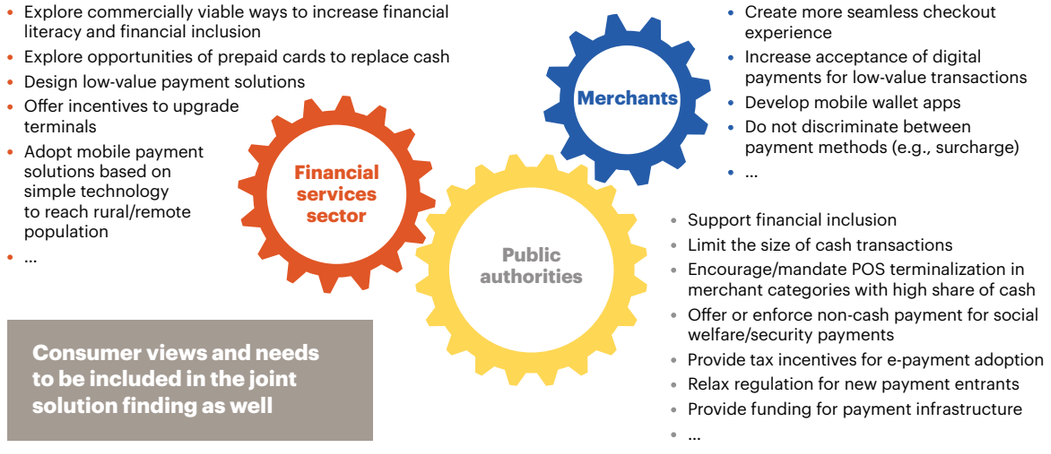
All stakeholders—public authorities, payment service providers, financial institutions, mobile operators, merchants, and businesses—have different roles to play in their market and in advancing digital payments (see figure 24). For example, the financial services sector's branch and agent network can be used to reach the unbanked, and merchants can ensure wider acceptance with faster, more seamless, and more secure transactions.

Public authorities have an essential and multifaceted role. In addition to providing a regulatory and legal framework, they can act as the glue between stakeholders—moderating a dialogue about the national road map, setting priorities, spearheading collective actions, and ensuring transparency and accountability for results.

Taking a unique historical and global perspective, our study provides a wide range of ideas, inspiration, and experience from the challenging task of tackling the informal economy in countries around the world. While this comprehensive research paves the way for success, it is ultimately in every stakeholder's hands to discuss, define, and drive forward a national road map to tackle the informal economy. Digital payments are an essential part of government solutions, and we expect their role to gain prominence as their effectiveness continues to be proven.

Figure 24

Collaboration between stakeholders in combating the informal economy



Note: POS is point-of-sale.

Source: A.T. Kearney analysis

Appendix 1: Performed Analyses

This study analyzes the informal economy from three perspectives:

Drivers. The study describes common drivers of the informal economy, including GDP growth, taxation level, public-sector reputation, and integrity. Because of the inverse relationship between digital payments and the informal economy, special attention is dedicated to the use of cash as the fuel of the informal economy. The correlation between the informal economy and the number of digital payments per capita builds the core of our analysis. In addition, we discuss the importance of financial inclusion.

Industry sectors. Ten countries—Australia, Brazil, China, India, Italy, Kenya, Nigeria, Poland, the Russian Federation, and the United States—were selected to explore and analyze the patterns of the informal economy in different economic sectors. The countries were selected to represent diverse sector profiles.

The United Nations International Standard Industrial Classification was used to ensure comparability of sectors across geographies.[54] Because of different levels of data granularity across countries, the following sectors were identified and reviewed: agriculture, forestry, and fishing; mining; manufacturing; electricity, gas, water, and waste services; construction; wholesale and retail trade; accommodation and food services; transport, postal, and warehousing; information, media, and telecommunications; financial and insurance services; rental, hiring, real estate, professional, scientific, and technical services; public administration and safety; education and training; and other services.

Since no consistent and comparable breakdown of GDP per sector is available across countries, sector gross value added (GVA)—the value of the goods or services minus intermediate consumption—was used instead.

Impact. We examine three areas:

- **The impact of the informal economy on society.** We outline the impact of the informal economy on national competitiveness, ease of doing or starting business, inequality, job creation, and worker protection.
- **The impact of selected digital payment measures on the informal economy, GDP, and tax revenue.** The impact of four measures—adoption by the public sector, VAT rebates for card payments, acceptance development funds, and contactless payments—on the informal economy is assessed and quantified. For each measure, the quantification is based on two or three markets with a proven record of fighting the informal economy. The expected gains in GDP and tax revenue, for the deployment of these measures, *ceteris paribus*, are analyzed as well.
- **The impact of digital payments on the informal economy, GDP, and tax revenue.** The question of whether digital payments are reducing the size of the informal economy is considered based on 13 countries selected for their successful deployment of coherent measures against the informal economy in the past decade. The study derives the size of the informal economy (Appendix 5), the effects of digital payments on the informal economy (Appendix 7) and the gain in GDP (Appendix 8), and tax revenue (Appendix 9) for all 60 markets. In addition, the study derives the five-year cumulative effect on tax revenue by type from increasing digital payments in 10 focus countries (Appendix 10).

All estimates are *ceteris paribus*, that is, assuming all factors remain unchanged except the number of digital payments per capita. Ranges are used to interpret the results. The latter are

[54] International Standard Industrial Classification of All Economic Activities, Rev. 4., United Nations, 2008

based on a 95 percent confidence interval estimated by Professor Schneider, indicating that the actual impact on the informal economy, GDP, and taxation will lie within the indicated spectrum with a probability of 95 percent.

Scope. The study covers 60 markets around the globe, which jointly account for 94 percent of the global GDP.[55] These 60 markets reflect a wide degree of diversity across several dimensions, including the following:

- **Wide geographic coverage.** Our study encompasses 22 European countries (37 percent of the total), 19 Asian economies (32 percent), 11 markets in Latin America (18 percent), along with four African countries, North America (Canada and the United States), and Australia and New Zealand.
- **Balanced level of economic development.** Based on the United Nations classification of economic development, 52 percent of the markets fall in the high-income category, 28 percent are upper middle-income, and 20 percent are lower middle-income.[56]
- **Experience in tackling the informal economy.** Over the past decade, Bolivia, Uruguay, Sri Lanka, the Philippines, Poland, Bangladesh, Peru, and South Korea have reduced the informal economy's share of their GDP by more than 5 percentage points, while Turkey, Poland, the Russian Federation, Australia, and India have implemented the most measures against the informal economy (20 or more since 2000).

Methodology and data. Sizing the informal economy is no small task. As the informal sector is not visible or directly measurable, we applied the MIMIC approach, which uses causal variables to approximate its size.

The MIMIC model is a well-established and respected method that makes it possible to examine the relationship between outcomes that are not directly observable—the informal economy, in this case—and observable input factors. More than 30 variables were used to calculate the size of the informal economy, including economic indicators such as nominal and real GDP, unemployment, and taxation levels, along with socioeconomic indicators and indicators related to payment behavior, such as the level of cash use.

The size of the informal economy in each market is based on two estimates derived from the MIMIC model. The **upper bound** represents the size of the informal economy as estimated with the traditional MIMIC approach and is consistent with the model used in our past studies that focused on Europe. However, in this study, we also consider a lower bound that aims to address one shortfall of the MIMIC and other currency demand approaches: the fact that variables such as tax burden, unemployment, and regulation are responsible not only for individuals and companies engaging in the informal economy, but also for do-it-yourself (DIY) activities, using friends and neighbors for help, or purchasing legal materials for use in the informal economy and DIY activities. The **lower bound** excludes DIY activities, using friends and neighbors for help, and purchasing legal materials for use in the informal economy from the definition of the informal economy. The upper bound is used for comparison and continuity with results from past studies. Both values for each country are available in the appendix.

[55] International Standard Industrial Classification of All Economic Activities, Rev. 4., United Nations, 2008

[56] High-income countries: gross national income (GNI) per capita of more than $12,615; upper middle-income countries: GNI per capita between $4,086 and $12,615; lower middle-income countries: GNI per capita between $1,036 and $4,085; low-income countries: GNI per capita of less than $1,035. Countries considered in this study fall into the first three categories. GNI is defined as gross domestic product plus net receipts from abroad of wages and salaries and of property income, plus net taxes and subsidies receivable from abroad (OECD).

Measures library. A library with more than 700 global measures used by governments to combat the informal economy since the year 2000 was collected, structured, and analyzed. The measures are classified into enforcement measures and digital payment measures, with more granular categorization available as well. Additionally, because of their impact and relevance for developing countries, measures around financial inclusion and financial literacy were explored in more detail.

Selective interviews. To provide faces and voices to the issues of the informal economy, selective interviews were conducted with small and medium-size enterprises, public officials, and managers in supranational organizations. The interviews, which covered Africa, Asia, Australia, Europe, and North America, addressed the perceptions and impacts of the informal economy from the perspective of the interviewee.

Appendix 2: 10 Focus Country Profiles

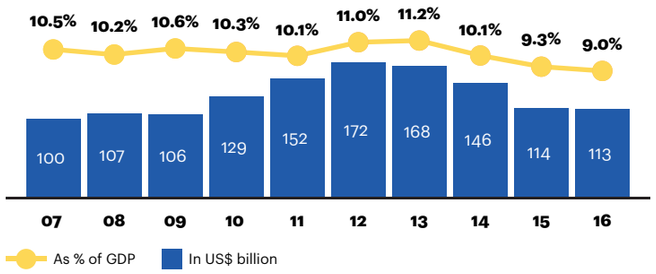
Sector legend

- Accommodation and food services
- Agriculture, forestry, and fishing
- Construction
- Transport, postal, and warehousing
- Wholesale and retail trade
- Manufacturing
- Rental, real estate, and professional services
- Information, media, and telecommunications
- Electricity, gas, water, and waste services
- Education and training
- Mining
- Public administration and safety
- Financial and insurance services
- Other services

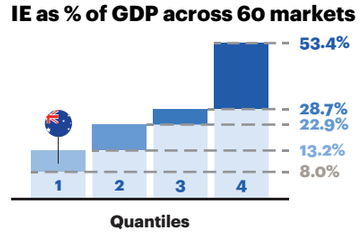
Australia

Focus country profile

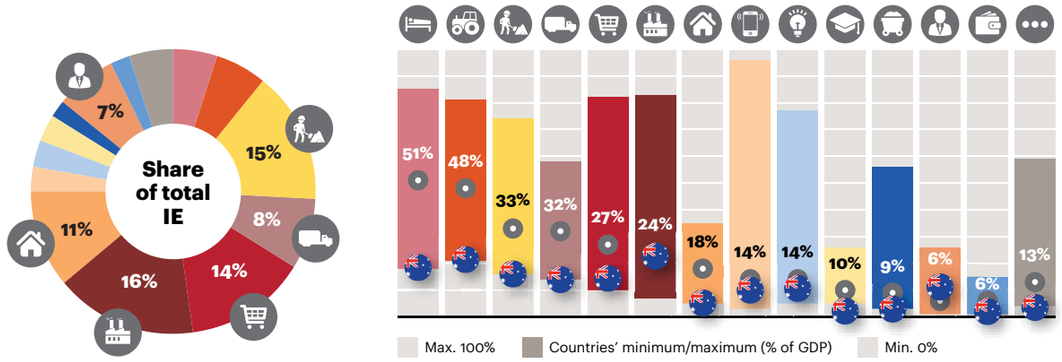
Size of the informal sector



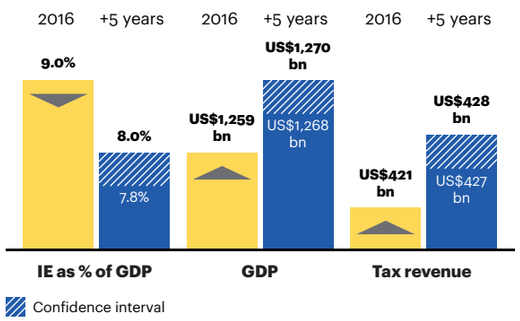
IE as % of GDP across 60 markets



Sector split of the informal economy*



5-year impact of 5% increase in digital payments

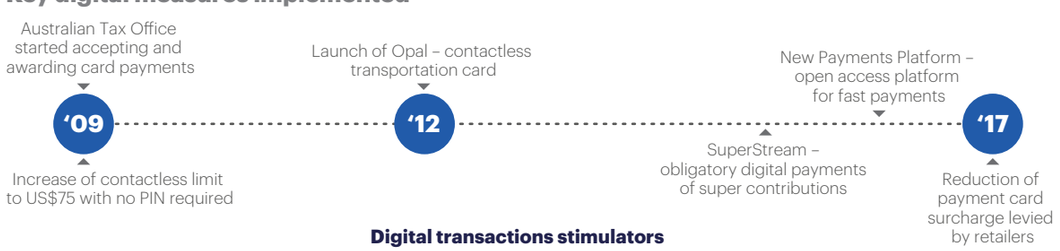


5-year impact on GDP per selected measure

+US$0.8-1.0 bn

Digital payment adoption by the government

Key digital measures implemented



Digital transactions stimulators

*See the legend on page 49 for a description of each icon.

Sources: Bank for International Settlements; European Central Bank; Economist Intelligence Unit; Eurostat; Organisation for Economic Co-operation and Development; World Bank; countries' national statistical offices; the authors

Australia

Size of the informal economy. The informal economy in Australia is 9 percent of GDP—a drop from 10.5 percent in 2007—and accounts for US$113 billion. In our sample, Australia is among the five countries with the smallest informal economies.

Sector profile of the informal economy. Similar to the averages in our 10 focus countries, the three sectors with the largest contribution to the informal economy are manufacturing, construction, and wholesale and retail trade—accounting for 45 percent combined. Informal activity is highest in manufacturing as a result of unreported labor and underreported wages (including employment of migrant workers), and agriculture, forestry, and fishing as a result of unreported employment and unreported fishing. Use of contractors in industries such as construction, cleaning, and courier services has been identified as high risk for tax compliance and is to be addressed by extending the taxable payment reporting system.[57] Construction is already part of that system. Informal activities are lowest in the mining and financial and insurance services sectors.

Drivers of the informal economy. Because the informal economy is already somewhat small, there are no large crucial drivers. Still, as in many developed countries, tax and social security burdens make the informal economy appealing.

Impact of digital payments. By continuing its growth trajectory and increasing digital payments by 5 percent annually for five consecutive years, Australia has an opportunity to reduce its informal economy by up to 1.2 percentage points of GDP (to 7.8 percent in 2021), grow GDP by up to US$11 billion, and generate additional tax revenue of up to US$7 billion. More intensive growth in digital payments of 10 percent per year could reduce the informal economy by up to 1.6 percentage points (to 7.4 percent of GDP in 2021) and increase GDP by up to US$16 billion.

Measures against the informal economy. Australia has a robust regulatory enforcement system and has implemented a number of measures focused on control, detection, and penalization of informal employment and sales underreporting. The government established an independent entity, the Black Economy Taskforce, to bring together 19 commonwealth agencies and an array of private-sector participants to provide policy recommendations for tackling the informal economy. In addition, Australia is a forerunner in digital and card payment usage, which has helped increase transparency of individual and business transactions. Many efforts have been channeled in this direction, including the Opal contactless smartcard ticketing system for public transportation in the greater Sydney area, e-government and e-tax payment initiatives, and more recently, the ban on card surcharging.[58] In 2014, the country mandated that merchants offer a contactless payment option. Today, more than one-third of card payments are contactless, and more than half of the population uses contactless payment methods. The country is also making advances in the adoption of mobile payments with Apple Pay, Android Pay, Samsung Pay, and the local Optus Pay.

Impact of selected measures. Digital payments are widespread with more than 430 digital payments per capita each year. Designing and implementing new measures to reduce the size of the informal economy is no trivial task. Supporting the adoption of digital payments by both individuals and businesses—through legislation, innovation, targeted incentives in high-risk sectors or regions, and targeted incentives for population groups with low use of digital payments—is an important approach to reducing the size of the informal economy.

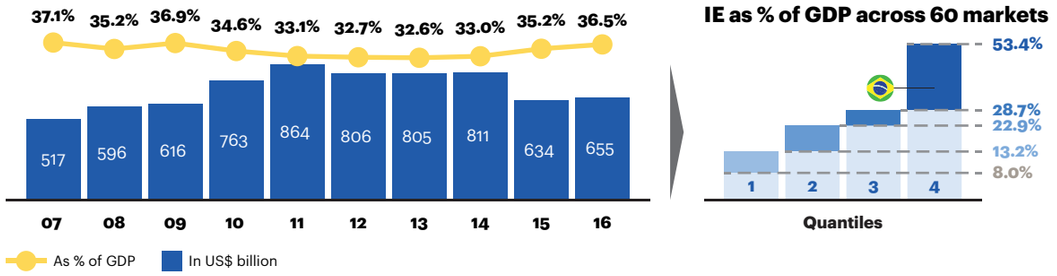
[57] Black Economy Taskforce interim report into the black economy from May 9, 2017

[58] The Australian Competition and Consumer Commission (ACCC) banned all Australian businesses from slugging customers with excessive surcharges for using electronic funds transfer at point of sale (EFTPOS) and credit cards to pay for purchases starting September 1, 2017. The excessive surcharging ban has applied to large businesses since September 2016 and was extended to all businesses that are either based in Australia or use an Australian bank.

Brazil

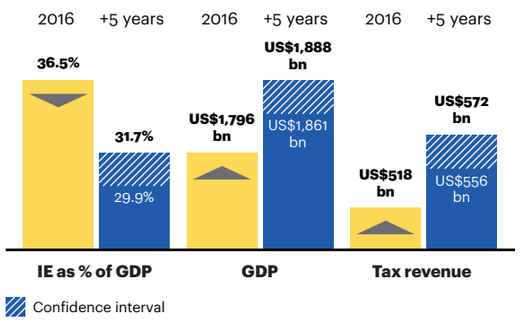
Focus country profile

Size of the informal sector

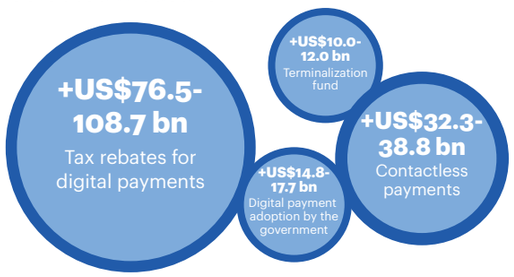


Sector split of the informal economy*

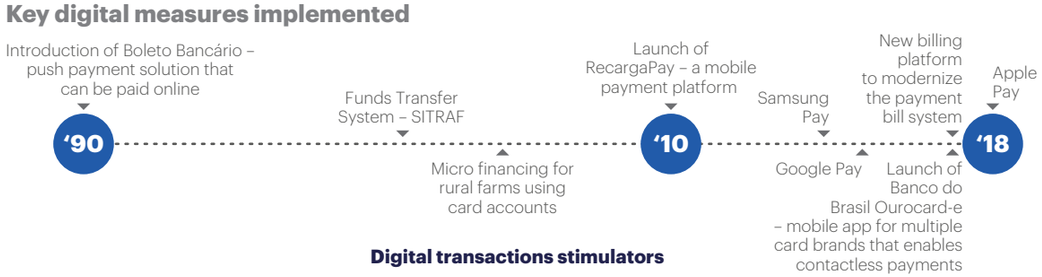
5-year impact of 10% increase in digital payments



5-year impact on GDP per selected measure



Key digital measures implemented



*See the legend on page 49 for a description of each icon.

Sources: Bank for International Settlements; European Central Bank; Economist Intelligence Unit; Eurostat; Organisation for Economic Co-operation and Development; World Bank; countries' national statistical offices; the authors

Brazil

Size of the informal economy. The informal economy in Brazil is 36.5 percent of GDP and accounts for US$655 billion. In our sample of 60 markets, Brazil is among the top 10 countries with the largest informal economies as a percentage of GDP. Informal activities decreased between 2006 and 2013, but since then, the informal sector has been growing, driven by less favorable economic conditions and changes in the political environment. As a result, the net decline was only 0.5 percentage points for the full 10-year period.

Sector profile of the informal economy. Manufacturing; wholesale and retail trade; and rental, hiring, and real estate services are the three sectors with the largest contribution to the informal economy with a combined share of 48 percent. While an informal real estate market is common in developing countries, the size is extensive in Brazil with 17 percent of all informal activities. The deficit of affordable housing options in urban centers for the country's poorest has resulted in growth of favelas, which are rented mostly without formal contracts.

The penetration of informal activities is highest in agriculture, forestry, and fishing and in construction because of the high share of unreported labor, especially in civil construction, which tends to use small subcontracted firms. Small and medium-size businesses frequently remain unregistered, contributing to the highest level of informal economy in transport, postal, and warehousing in our sample (and one of the highest levels of informal activities in hospitality).

Drivers of the informal economy. The decline in raw material prices and the slowdown in GDP growth in recent years laid the groundwork for a rebound of Brazil's informal economy. For a large portion of the rural and poor population, the informal economy is a refuge to earn a living during an economic downtown. Several other factors contribute to the high level of informal activities in Brazil: a relatively high tax burden measured as share of GDP (34 percent), labor regulations involving a significant administrative burden, and perceived below-average effectiveness of the judicial and public institutions.[59] It is worth mentioning that in November 2017, a new law aimed at modernizing Brazilian labor law became enforceable.

Impact of digital payments. By continuing its growth trajectory and increasing digital payments by 10 percent annually for five consecutive years, Brazil could reduce the informal economy as a share of its GDP by up to 6.6 percentage points (to 29.9 percent in 2021), increase GDP by up to US$92 billion, and generate additional tax revenue of up to US$54 billion. More intensive growth in digital payments of 15 percent per year could reduce the informal economy by up to 7.5 percentage points (or 29 percent of GDP in the year 2021) and increase GDP by up to US$104 billion.

Measures against the informal economy. Efforts to reduce the informal economy have relied on two main levers. Removing red tape is a key government initiative. In 2015, the federal government launched a program (*Programa Bem Mais Simples Brasil*) to reduce the paperwork involved in opening or closing small and medium-size companies and expects to reduce the overall time from 83 days to only five days. More recently, the Single Foreign Trade Portal was established to reduce bureaucracy in Brazilian exports and imports, increase legal certainty, and facilitate the creation of official jobs.

To support financial inclusion, the country initiated and launched the National Partnership for Financial Inclusion, aiming to create an institutional environment and regulations that promote adequate financial inclusion for Brazilians. To increase the coverage with financial services, Brazil enabled retailers, lottery outlets, and post offices to operate as bank correspondents, resulting in 12 million new accounts opening in less than three years. In 2010, RecargaPay—a mobile payment platform and wallet without a bank account in the background—took off and has since reached more than 5 million subscribers. Loyalty and convenience through in-app payments are starting to emerge but are mostly stand-alone efforts.

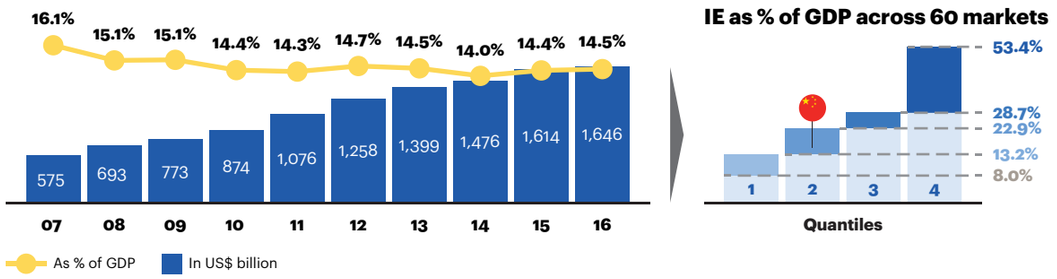
Impact of selected measures. While digital payments are not the payment method of choice, they are also not a novelty. With about 140 electronic transactions per capita per year, Brazil is around the international average but still has substantial potential to grow. Targeted deployment of acceptance infrastructure, especially contactless POS devices, could present opportunities to boost digital payments in segments with low penetration, such as public transportation, rent, utilities, or health insurance. This measure could boost GDP by US$32 billion to US$39 billion in a five-year period. On VAT, or as it is called in Brazil, *Imposto sobre Circulação de Mercadorias e Serviços* (ICMS), similar to other Latin American countries, Brazil could benefit from ICMS rebates for card payments, resulting in a potential GDP uplift of US$77 billion to US$109 billion over the same period.

[59] Based on the indexes and methodology provided by the Heritage Foundation as part of the Index of Economic Freedom

China

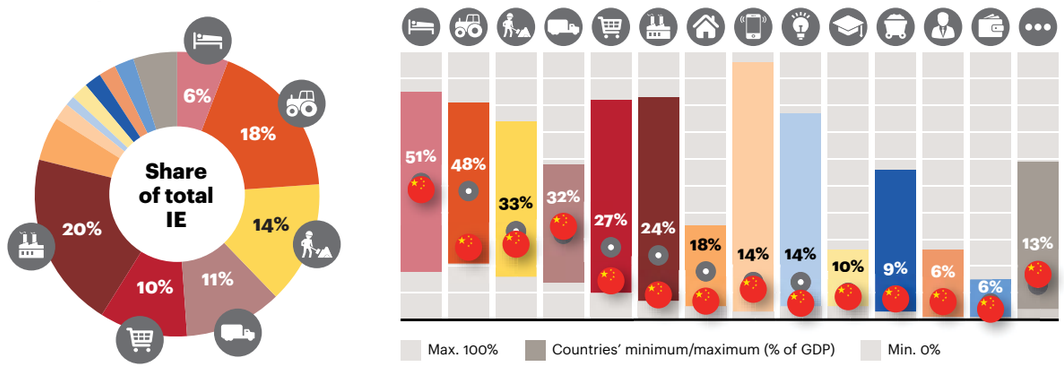
Focus country profile

Size of the informal sector

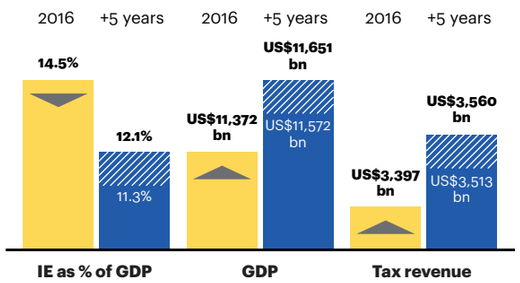


IE as % of GDP across 60 markets

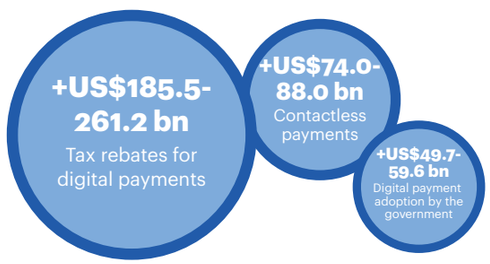
Sector split of the informal economy*



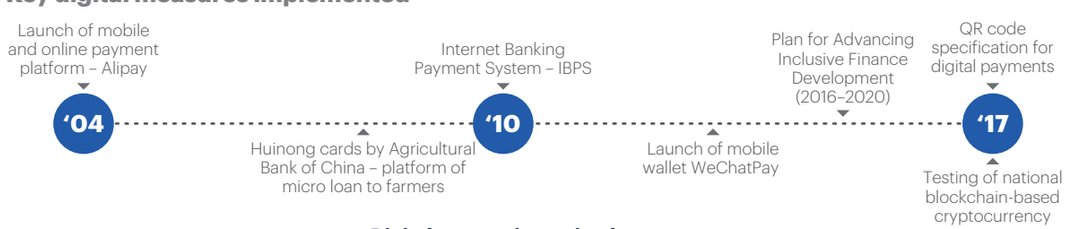
5-year impact of 20% increase in digital payments



5-year impact on GDP per selected measure



Key digital measures implemented



*See the legend on page 49 for a description of each icon.

Sources: Bank for International Settlements; European Central Bank; Economist Intelligence Unit; Eurostat; Organisation for Economic Co-operation and Development; World Bank; countries' national statistical offices; the authors

China

Size of the informal economy. With 14.5 percent of GDP, China's informal economy is well below the international average and puts the country in the second quartile of nations with the smallest informal economies. Still, because of the magnitude of China's economy in the global context, the informal economy is the world's largest in absolute terms—amounting to US$1,646 billion. In the past decade, China made solid progress—decreasing the informal economy as a percentage of GDP by 1.6 percentage points from 16.1 percent in 2007 to 14.5 percent in 2016.

Sector profile of the informal economy. Manufacturing; agriculture, forestry, and fishing; and construction are the three largest contributors to the informal economy (52 percent combined). The penetration of informal activities is largest in accommodation and food services; transportation; construction; and agriculture, forestry, and fishing (all sectors with a significant share of small and medium-size companies) and lowest in the financial and insurance sector.

Informal economy drivers. Given an already fairly small informal economy, there are no large crucial drivers. Tax and social contributions burdens are likely contributors to the informal economy, as for several other nations in our sample. A large rural population and growing disparity in income are also drivers. Further, improving regulatory and infrastructure environment for business could facilitate a reduction of the informal economy.

Impact of digital payments. By continuing its growth trajectory and increasing digital payments by 20 percent annually for five consecutive years, China could reduce the informal economy as a share of GDP by up to 3.2 percentage points (to 11.3 percent in 2021), increase GDP by up to US$279 billion, and generate additional tax revenue of up to US$163 billion.

Measures against the informal economy. Efforts to decrease the informal economy have been twofold. First, China has focused on reducing financial exclusion with a number of initiatives. Recent policies have enabled new financial services firms to enter and serve the unbanked. The government has started to deliver benefit payments through bank accounts, and these government-to-person electronic transfers have had a major impact on the number of people with a bank account. The second area of efforts is in the adoption of new technologies. Companies such as F-Road have provided infrastructure to financial institutions to deliver mobile banking to rural consumers. The platform is compatible with different mobile phones and has reached more than 4.3 million rural inhabitants. For the more urban population, mobile wallets have seen a rapid adoption and are becoming a standard. Alipay, launched in 2004, has more than 520 million users, and WeChat Pay managed to reach more than 800 million monthly active users. China is also on the frontier of innovation: its Central Bank is actively pursuing the research and development of Central Bank Digital Currency as a means to reduce cash usage, which will lead to a further decrease of the informal economy in China.

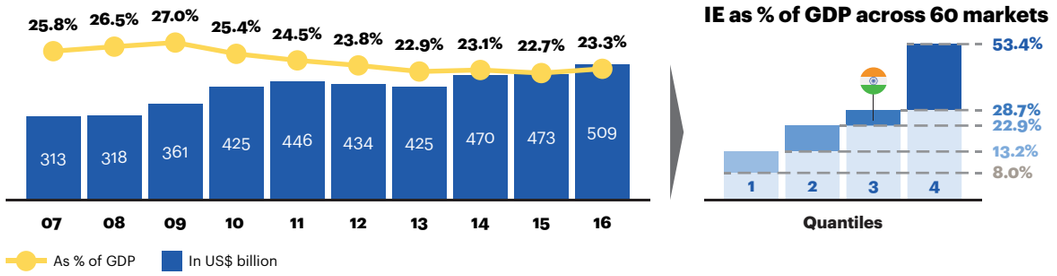
Impact of selected measures. While digital payments per capita are still at a moderate level of 100 per capita per year, mobile payments are becoming a standard and have witnessed impressive adoption.

Public institutions could accelerate adoption of digital payments outside metropolitan centers and in industries with low penetration through regulation and by serving as a role model in the adoption of non-cash payments. In addition, incentives or tax rebates for card payments could generate US$186 billion to US$261 billion over a five-year period through adoption by segments that are currently outside of the mainstream. All measures require investments, which should be considered and calculated up front, especially given the dimensions that an implementation might require.

India

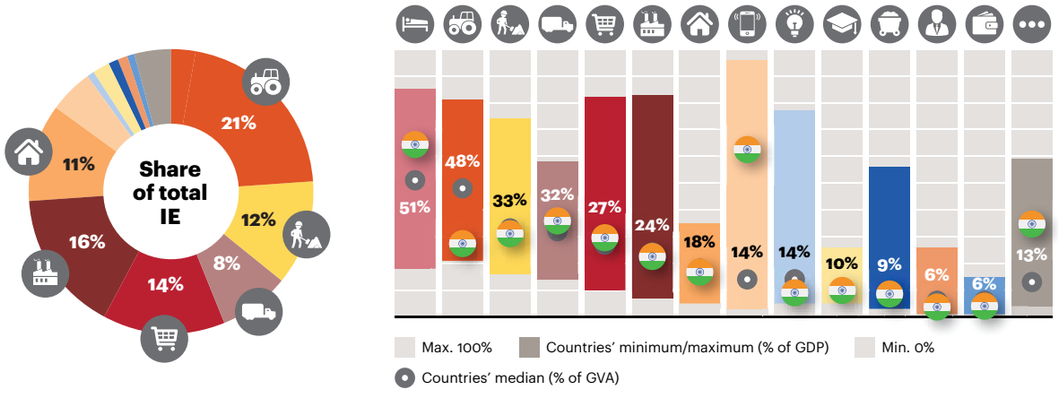
Focus country profile

Size of the informal sector

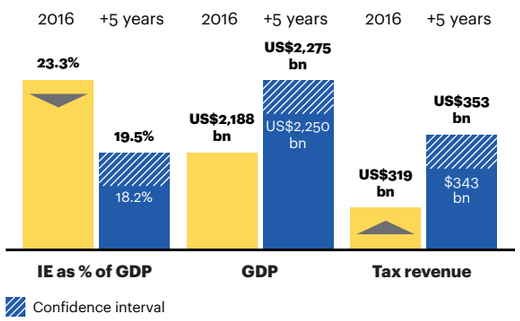


IE as % of GDP across 60 markets

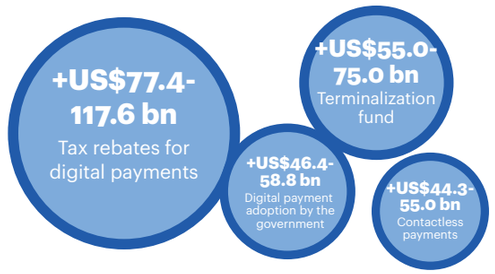
Sector split of the informal economy*



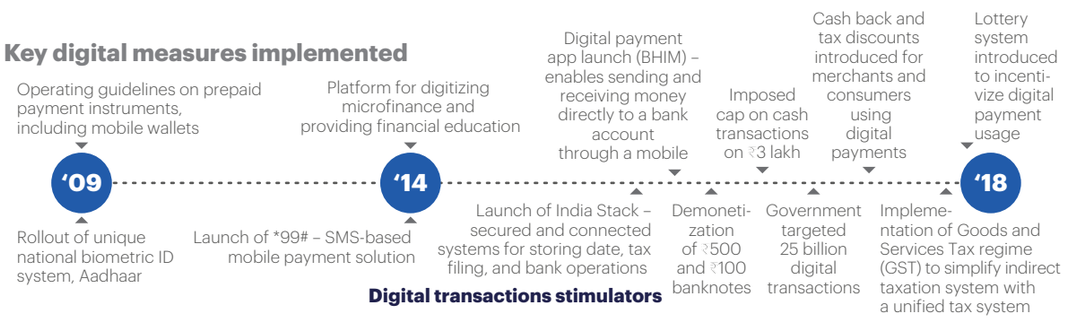
5-year impact of 20% increase in digital payments



5-year impact on GDP per selected measure



Key digital measures implemented



*See the legend on page 49 for a description of each icon.

Sources: Bank for International Settlements; European Central Bank; Economist Intelligence Unit; Eurostat; Organisation for Economic Co-operation and Development; World Bank; countries' national statistical offices; the authors

India

Size of the informal economy. India's informal economy is at the international average. The country has a moderate level of informal activity at 23.3 percent of GDP and an absolute size of US$509 billion. In the past decade, India's informal economy has decreased from 25.8 percent in 2007 to 23.3 percent in 2016.

Sector profile of the informal economy. As in several developing countries in our sample, agriculture, forestry, and fishing, along with manufacturing and wholesale and retail trade are the three largest contributors—accounting for more than half of the informal economy. A combination of factors drives the above-average penetration of informal activities in these sectors, including small family enterprises, which are the most frequent form of ownership, and the informal employment of women, especially in home-based work. For example, India's dominance in textile and garment manufacturing is often attributed to extensive use of subcontracting to family enterprises, and there is a high proportion of female workers. The penetration of informal activities is highest in accommodation and food services and in information, media, and telecommunications and lowest in the public administration and safety and financial and insurance sectors.

Informal economy drivers. A large rural population and disparities in wealth and social status are considerable drivers of the informal economy in India. Complex labor regulations and lack of adequate supporting infrastructure for businesses contribute to the informal economy.[60] In addition, heavy reliance on cash allows anonymity in business and private transactions.

Impact of digital payments. By continuing its growth trajectory and increasing digital payments by 20 percent annually for five consecutive years, India could reduce the informal economy as a share of its GDP by up to 5 percentage points (to 18.2 percent in 2021), increasing GDP by up to US$87 billion and generating additional tax revenue of up to US$34 billion.

Measures against the informal economy. Over the years, the government has taken various initiatives to promote financial inclusion and to expand the reach of financial services to consumers at the bottom of the pyramid. To this end, many measures have been taken, including opening of Jan Dhan bank accounts, expansion of bank branches to unbanked areas, and differentiated banking licenses in the form of payments banks and small finance banks, allowing innovative business models in the form of a business correspondent channel to extend basic banking services to the rural unbanked and simplified know-your-customer (KYC) norms for account opening, including e-KYC.

The fight against the informal economy also included bold moves. On November 8, 2016, Prime Minister Narendra Modi announced invalidation of all 500 rupee (US$8) and 1,000 rupee banknotes (US$15) at midnight (though citizens were permitted to exchange their old notes for new ones over the next 50 days). While it is too soon to judge the effects of the program, it was an effort by the government to fight the informal economy.[61] Meanwhile, to encourage digital payments transactions, India has been rapidly growing its digital payments ecosystem, including a rapid POS terminal rollout from 1 million to 3 million in a few months, an increased base of cards reaching 800 million, and new digital payment initiatives such as the Unified Payments Interface (UPI) and Bharat QR.

Post-demonetization, mobile wallet transactions have gained traction. With only about 16 million transactions in 2012, usage grew to nearly 3 billion transactions in 2017. However, the new prepaid payment instrument guidelines released in 2017 mandated full KYC for mobile wallet users, which has proven to be a dampener and impacted adoption.

Impact of selected measures. India has embarked on a journey to increase electronic payments and decrease cash with the understanding that the country has much to gain from transparency and financial inclusion. Our impact analysis of the four digital payment measures indicates that, in the case of India, the largest impact on GDP would come from expanding the acceptance infrastructure and encouraging digital payment adoption, such as G2P and P2G payments (see figure 16 on page 32). Goods and services tax (GST) rebates for card payments could increase GDP by US$77 billion to US$118 billion, while broadening the POS device footprint and density from the current low level of 190 terminals per 100,000 inhabitants could contribute an additional US$55 billion to US$75 billion in only five years (2017–2021) (see figure 17 on page 34 and figure 18 on page 35). Improving the acceptance infrastructure, a measure with which India has already experimented, will require a larger dimension to unfold its full effect.

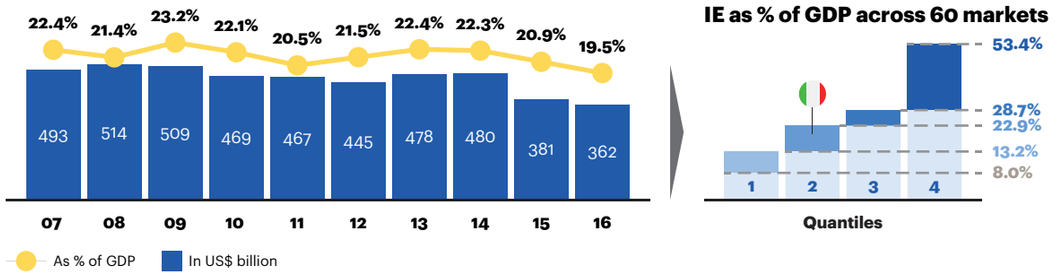
[60] Based on the indexes and methodology provided by the Heritage Foundation as part of the Index of Economic Freedom

[61] For more about the program's rationale, see the full text of Modi's speech announcing demonetization.

Italy

Focus country profile

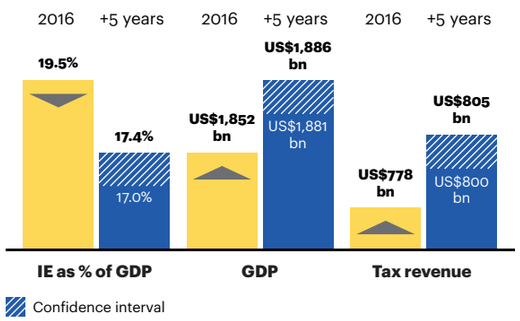
Size of the informal sector



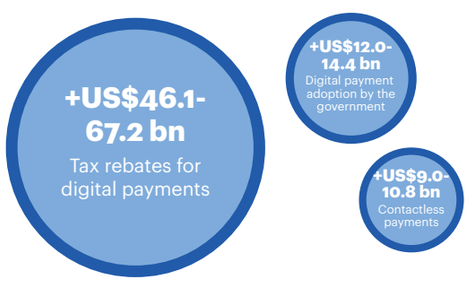
IE as % of GDP across 60 markets

Sector split of the informal economy*

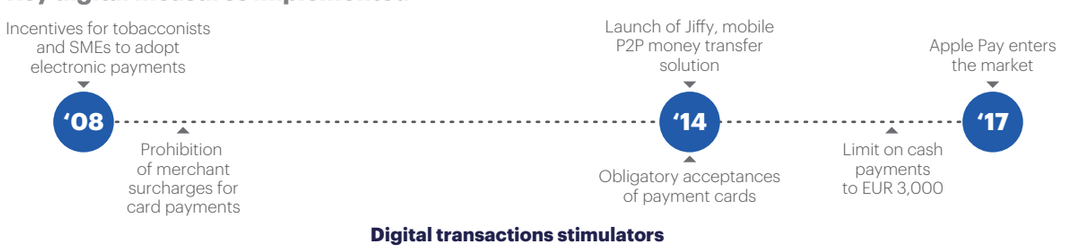
5-year impact of 5% increase in digital payments



5-year impact on GDP per selected measure



Key digital measures implemented



*See the legend on page 49 for a description of each icon.

Sources: Bank for International Settlements; European Central Bank; Economist Intelligence Unit; Eurostat; Organisation for Economic Co-operation and Development; World Bank; countries' national statistical offices; the authors

Italy

Size of the informal economy. Italy has a moderate informal economy as a share of its GDP at 19.5 percent. The country has decreased its informal economy by 3 percentage points as a share of GDP over the past decade. However, it is still on the high side compared with other developed countries, including in Western Europe.

Sector profile of the informal economy. Manufacturing; rental, hiring, and real estate services; and wholesale and retail trade are the three largest contributors, accounting for half of the country's informal economy. The sectors with the highest penetration of informal activities are construction; agriculture, forestry, and fishing; and accommodation and food services. Informal activities are lowest in the public sector. Low-cost foreign informal workers play an important role as seasonal support in agriculture (for example, in southern Italy), in local small manufacturing firms (for example, in textiles and furniture), and as household support.

Informal economy drivers. A heavy tax and social security burden is a key driver of the informal economy. With an overall tax burden at close to 44 percent of GDP, Italy is well above the international average. Informal activities are also fueled by regulations, which bring an administrative burden, and, for a developed nation, relatively low confidence in the efficiency and impartiality of the public and judicial sectors.[62]

Impact of digital payments. A 5 percent annual growth of digital payments for five consecutive years could decrease the size of its informal economy as a share of GDP by up to 2.5 percentage points (to 17 percent in 2021), which would increase GDP by up to US$34 billion and tax revenues by up to US$27 billion.

Measures against the informal economy. Italy has one of the longest and richest histories of fighting the informal economy. Many measures have focused on regulatory enforcement by attempting to control undeclared work and curb underreporting of sales. The country has enacted the largest number of decrees, including the 2006 Bersani–Visco Decree and the 2009 Anti-Crisis Decree. These regulations provided tax incentives for tobacco stores to adopt digital payments at the point of sale and even threatened to close retailers that repeatedly failed to issue receipts. Italy also introduced—and later lowered—the threshold for cash payments. After a 2011 lowering of the threshold to EUR 1,000 (US$1,175) and another planned reduction to EUR 500 (US$590), the government faced pushback from businesses and individuals and thus raised the limit to EUR 3,000 (US$3,525) in 2016. Although a mandate for retailers and professionals such as lawyers to have a digital POS for transactions exceeding €30 has been in existence since June 2014, it was never enforced. Measures to make it enforceable, including sanctions or controls, are under consideration.

Despite being slow to adopt digital payments, Italy has begun to gain traction in mobile payments. The person-to-person real-time mobile money transfer Jiffy now has more than 4.2 million users, making Italy the leading country in the region for real-time digital payments via smartphone. As of 2017, Jiffy is being used as a payment method in retail stores across the country. The growing mobile market is attracting other entrants, including Apple Pay.

Impact of selected measures. Despite a dense POS infrastructure, the penetration of digital payments is relatively low at slightly less than 100 digital transactions per capita annually. A broader acceptance infrastructure—and transition from the current multi-POS environment at the same location—can encourage growth in digital payments, especially where there is below-average POS deployment, including small shops, public transportation, public administration, and low-value transactions.

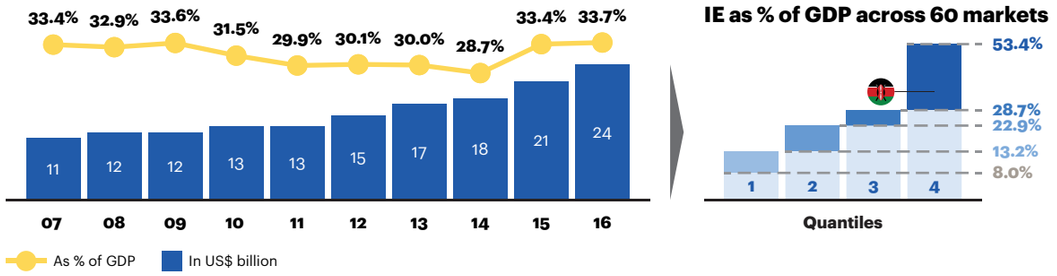
Incentivizing card payments in the form of tax rebates could increase Italy's GDP by US$46 billion to US$68 billion in five years, while increased adoption of non-cash payments by public authorities could generate a GDP effect of US$12 billion to US$14 billion over the same period. The public sector can grow the acceptance of various digital payment methods and serve as a role model for individuals and businesses.

[62] Based on the indexes and methodology provided by the Heritage Foundation as part of the Index of Economic Freedom

Kenya

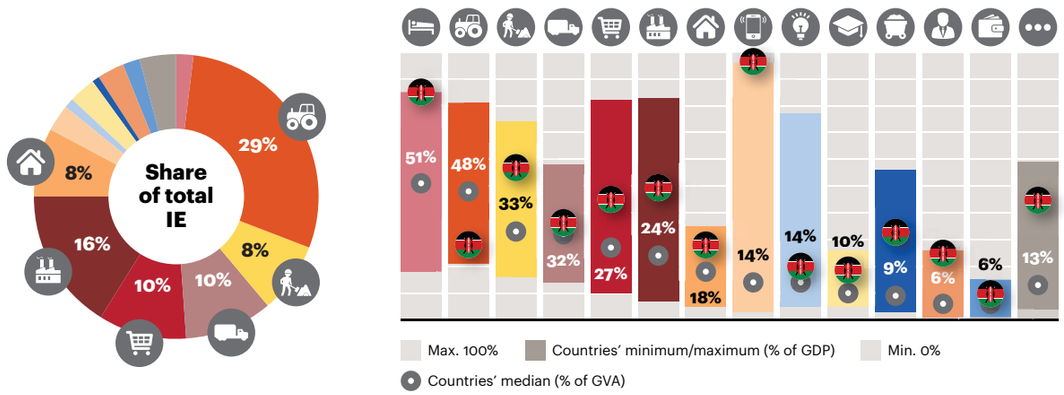
Focus country profile

Size of the informal sector

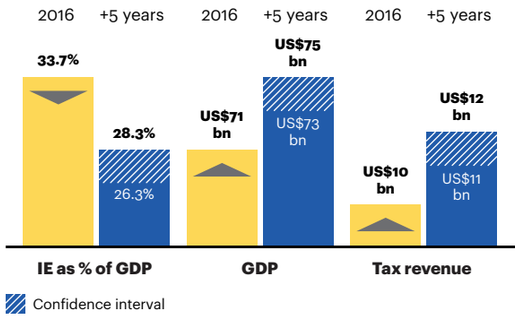


IE as % of GDP across 60 markets

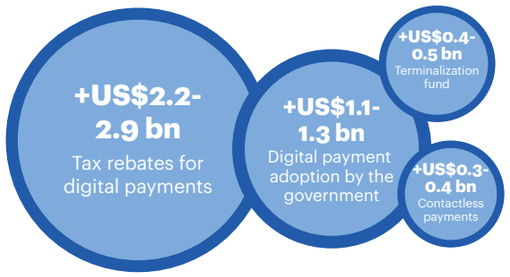
Sector split of the informal economy*



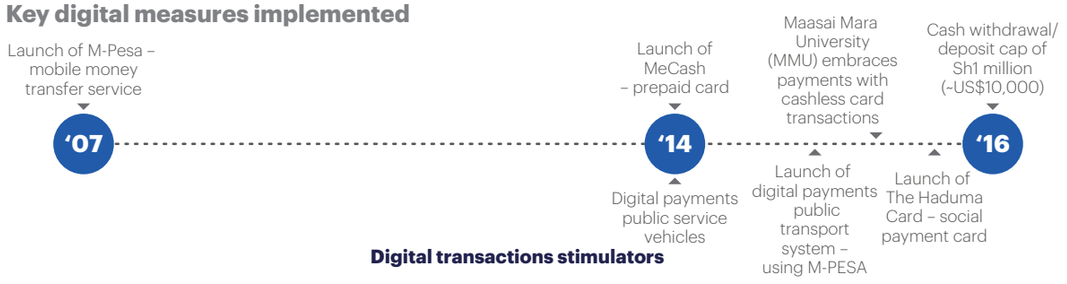
5-year impact of 20% increase in digital payments



5-year impact on GDP per selected measure



Key digital measures implemented



*See the legend on page 49 for a description of each icon.

Sources: Bank for International Settlements; European Central Bank; Economist Intelligence Unit; Eurostat; Organisation for Economic Co-operation and Development; World Bank; countries' national statistical offices; the authors

Kenya

Size of the informal economy. The informal economy in Kenya is 33.7 percent of GDP and accounts for US$24 billion—the eleventh-largest among our 60-market sample as share of GDP. Over the past decade, the country did not make significant progress in reducing the informal economy. In fact, the informal economy was roughly the same in 2016 as it was in 2007 (only 0.3 percentage points higher). In 2014, the informal economy declined briefly, but then bounced back to 2007 levels as the political and economic environment changed.

Sector profile of the informal economy. Agriculture, forestry, and fishing; manufacturing; wholesale and retail trade; and transportation are the country's largest contributors to the informal economy (65 percent of country's total informal economy combined), but only because of their relative sizes to the overall country GDP. The informal economy is largest in information, media, and telecommunications; accommodation and food services; and construction. Although a high share of informal activities in information, media, and telecommunications is not common in many countries, Kenya has an issue with unregistered SIM cards distributed by unlicensed street vendors—a problem the country is addressing with legislation. Although the informal economy is smallest in the financial and insurance sector, an almost 10 percent share of informal activities is attributable to official business that banks conduct with enterprises that operate partially in the informal economy or to local financial alternatives, such as pawn shops or street foreign exchange traders operating outside of the reach of regulators.

Informal economy drivers. A combination of factors drives the informal economy in Kenya. The country has a large poor rural population, which has limited options to earn a living. To an extent, the informal economy is accepted and tolerated because it employs 13.3 million people—83 percent of total employment (excluding small-scale farming and pastoralist activities).[63] Since law enforcement is less effective than in developed countries, the informal economy is difficult to tackle with rules, regulations, and controls, leaving positive reinforcement as the main tool for public authorities.

Impact of digital payments. With 33 annual digital transactions per capita, Kenya is in the middle among developing nations. By continuing its growth trajectory and increasing digital payments by 20 percent annually for five consecutive years, Kenya could reduce its informal economy as share of GDP by up to 7.3 percentage points (to 26.3 percent in the year 2021), increase GDP by up to US$4.1 billion, and generate additional tax revenue of up to more than US$2 billion.

Measures against the informal economy. Kenya's work against the informal economy has been digital and targeted. Various solutions have been tested for different sectors, including transportation, wholesale and retail trade, and education and training. E-government and e-payment initiatives such as the online tax registration, collection, and refund portal iTax have enjoyed solid adoption and popularity.

Kenya is a good case study for how a simple mobile transfer solution can improve financial inclusion, digitize payments, and transform a country's financial services sector. Kenya's M-Pesa already serves half the population, and individuals use it to make transactions that amount to 40 percent of the country's GDP. M-Pesa's success has triggered growth of innovative and complementary solutions such as Kopo Kopo, a robust platform that enables SMEs and start-ups to accept mobile payments.

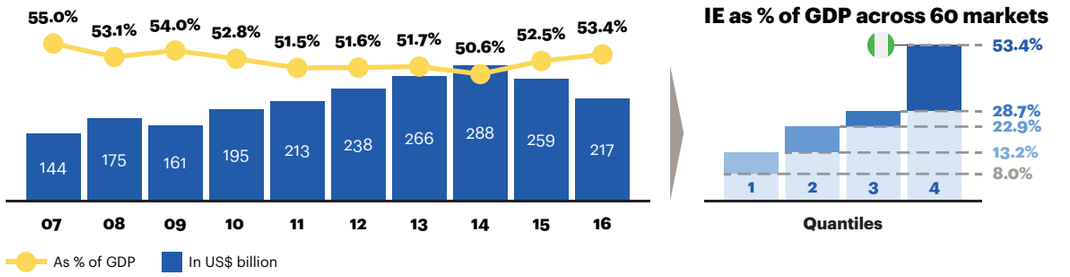
Impact of selected measures. Although ahead of other developing nations in the adoption of digital payments, Kenya still has room to grow. One of the biggest ways is to deploy digital transactions across the public sector. Through this measure, the country could realize between US$1.1 billion and US$1.3 billion over a five-year period. This would involve increasing the availability of payment infrastructure and promoting additional payment methods in parallel (or even as an alternative) to the successful M-Pesa mobile payments.

[63] Economic Survey 2017, Kenya National Bureau of Statistics

Nigeria

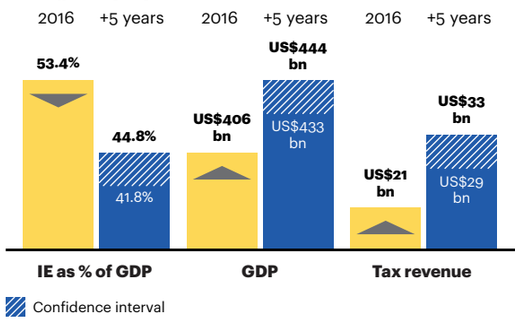
Focus country profile

Size of the informal sector

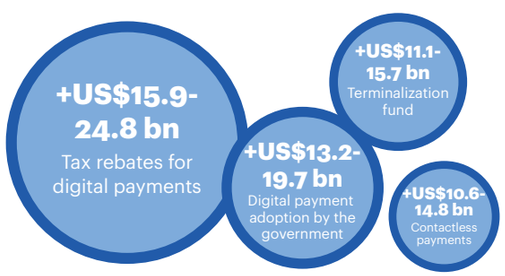


Sector split of the informal economy*

5-year impact of 20% increase in digital payments



5-year impact on GDP per selected measure



Key digital measures implemented

*See the legend on page 49 for a description of each icon.

Sources: Bank for International Settlements; European Central Bank; Economist Intelligence Unit; Eurostat; Organisation for Economic Co-operation and Development; World Bank; countries' national statistical offices; the authors

Nigeria

Size of the informal economy. In our 60-market sample, Nigeria has the largest informal economy with 53.4 percent of GDP—accounting for US$217 billion. Over the past decade, the country made some progress in reducing the size of the informal economy. A decline of 1.5 percentage points as a share of its GDP is visible between 2007 and 2016, yet more could be accomplished given the high starting point, } as the example of several nations in Southeastern Asia and Latin America shows.

Sector profile of the informal economy. Agriculture, forestry, and fishing as well as wholesale and retail trade and manufacturing are the country's largest contributors to the informal economy (75 percent combined). The latter, together with electricity, gas, water, and waste services, have the highest level of informal activities—each above 75 percent of its economic output. A high share of informal activities in electricity, gas, water, and waste services also exists in other developing nations. In Nigeria, this is attributable to waste pickers who make a living from disposed materials and to individuals who connect to the national grid without the distribution companies' knowledge or by bypassing electricity metering—a common act in Nigeria, which many might be unaware is illegal.

The lowest level of informal activities exists in the financial and insurance sector—more than 15 percent of the sector's GDP. Like Kenya, Nigeria's informal activities in financial services are the result of official business that banks conduct with companies operating partially in the informal economy or local financial alternatives such as pawn shops or street foreign exchange traders that operate outside of the reach of regulators.

Informal economy drivers. The drop in oil prices and the economic slowdown played a significant role in the upward trend of informal activities. A combination of several other factors drives the country's informal economy. Nigeria has a large poor rural population, which has limited options to earn a living, and the country ranks low in international comparison in terms of government integrity (fourth-worst) and ease of starting and running a business (169 out of 190 countries for doing business).[64] With less than two digital transactions per capita in a year, the informal economy can remain largely anonymous and undetected.

Impact of digital payments. Digital payments are in a nascent stage. Because of the high level of informal activities and low levels of non-cash payments, even a small increase in digital payments could generate a big impact. By continuing its growth trajectory and increasing digital payments by 20 percent annually for five years, Nigeria could reduce the informal economy as a share of its GDP by up to 12 percentage points (to 41.8 percent by 2021). This would result in up to US$38 billion of additional GDP and up to US$12 billion of additional tax collection.

Measures against the informal economy. Measures to address the informal economy are centered around the country's cashless policy and financial inclusion. The Cashless Lagos project brings together various stakeholders to increase an alternative channel penetration, functionality, and ease of use. It includes POS systems with better connectivity, licensing of new mobile payment solutions, multifunctional ATMs, and support for instant electronic fund transfers and automated direct debits. In addition to better tax collection, the government strives for economic growth, more convenience for consumers, and better access to capital for corporations. The financial inclusion strategy aims to reduce financial exclusion from 46 percent to 20 percent between 2010 and 2020. Most of the efforts have been directed toward discouraging cash circulation and introducing fees and limits for withdrawals. Mobile solutions have received support and are already seeing growing adoption and relevance. Launched in 2012, the mobile solution Paga has reached 5 million users and has processed 9.5 million transactions since 2016.

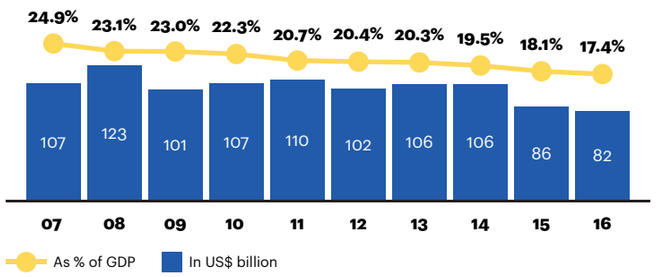
Impact of selected measures. Because the country is at the start of its digital payment journey, much can be done to shrink the informal economy. Despite successful ventures and government-supported programs, the potential to increase the number of digital payments is vast. The starting point is an expansion of the acceptance infrastructure, which would create an opportunity for consumers to choose a payment method other than cash. This measure could contribute US$11 billion to US$16 billion to GDP in five years. Coupled with incentives for adopting digital payments, methods such as tax rebates and the public sector's widespread adoption of digital payments could significantly augment this effect and put Nigeria on the path of digital payment growth.

[64] Based on the indexes and methodology provided by the Heritage Foundation as part of the Index of Economic Freedom

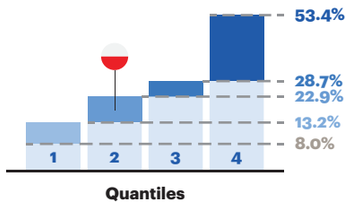
Poland

Focus country profile

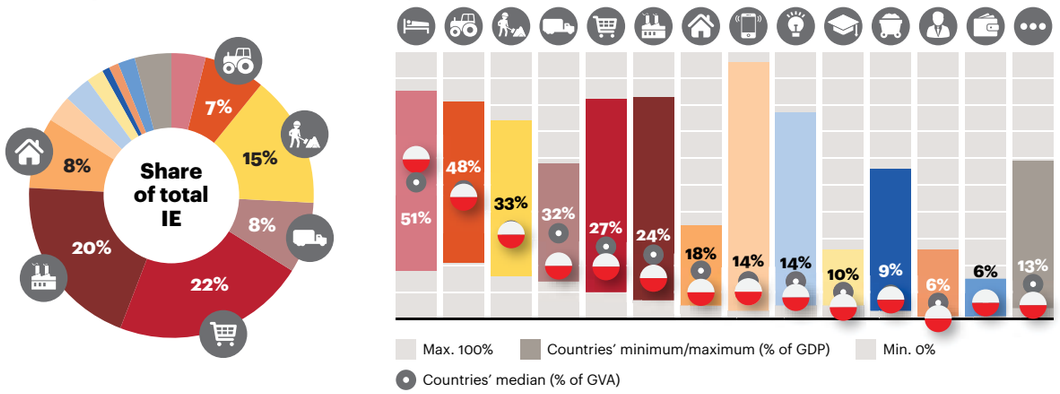
Size of the informal sector



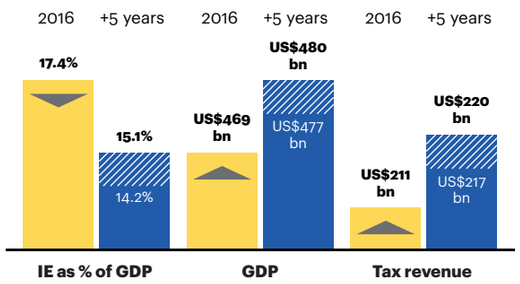
IE as % of GDP across 60 markets



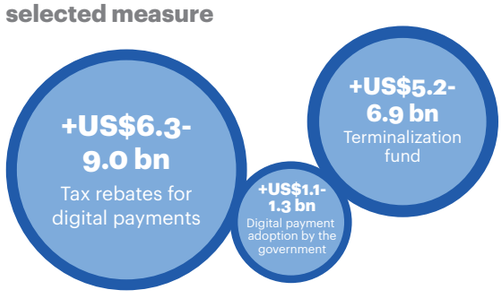
Sector split of the informal economy*



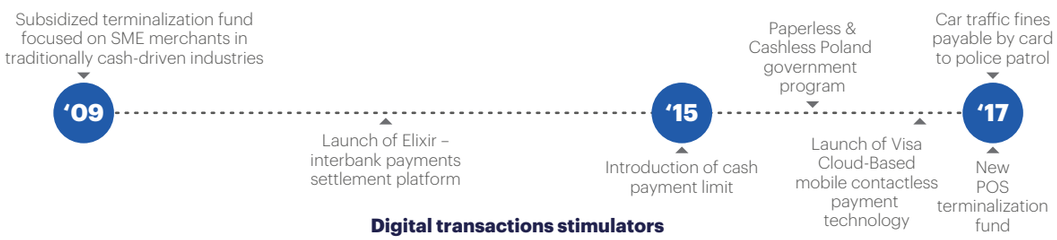
5-year impact of 10% increase in digital payments



5-year impact on GDP per selected measure



Key digital measures implemented



*See the legend on page 49 for a description of each icon.

Sources: Bank for International Settlements; European Central Bank; Economist Intelligence Unit; Eurostat; Organisation for Economic Co-operation and Development; World Bank; countries' national statistical offices; the authors

Poland

Size of the informal economy. The informal economy in Poland is 17.4 percent of GDP and accounts for US$82 billion. Poland is among countries with a moderate informal economy and has gone through a substantial improvement over the past 10 years—reducing the level of the informal economy as a percentage of GDP by 7.5 percentage points, down from 24.9 percent in 2007.

Sector profile of the informal economy. Wholesale and retail trade, manufacturing, and construction are the three sectors with the largest contribution to the informal economy, accounting for 57 percent of the country's informal economy. However, the informal economy is largest in accommodation and food services as a result of undeclared work and revenue underreporting by small family-owned hotels and restaurants and in agriculture, forestry, and fishing as a result of undeclared labor. The informal economy is smallest in public administration and safety.

Drivers of the informal economy. As in other developed nations, a relatively high tax and social security burden is an important driver of informal activities in Poland. Regulations with a significant administrative burden, particularly in terms of starting and doing business, are likely another contributing factor.

Impact of digital payments. By continuing its growth trajectory and increasing digital payments by 10 percent annually for five consecutive years, Poland could reduce the informal economy as a share of its GDP by up to 3.2 percentage points (to 14.2 percent in 2021), increase GDP by up to US$11 billion, and generate additional tax revenue of up to US$9 billion. A more intensive growth in digital payments of 15 percent per year could reduce the informal economy by up to 3.5 percentage points and increase GDP by up to US$13 billion.

Measures against the informal economy. Poland has achieved a good balance between enforcement and encouraging digital payments. One good example is Paperless & Cashless Poland, a comprehensive government program aimed at digitizing services, processes, and transactions.

Since 2012, Poland has been focusing more on supporting the growth of digital payments. Two terminalization funds have increased the POS infrastructure from less than 500 per capita in 2007 to 1,275 in 2016. Contactless payments have been widely adopted and have become a national priority. More than 98 percent of the POS infrastructure is enabled for contactless payments, and more than 68 percent of all card payments are already contactless. The government is equipping cities and municipalities with POS terminals and enabling its police force to accept card payments on the spot for automotive fines.

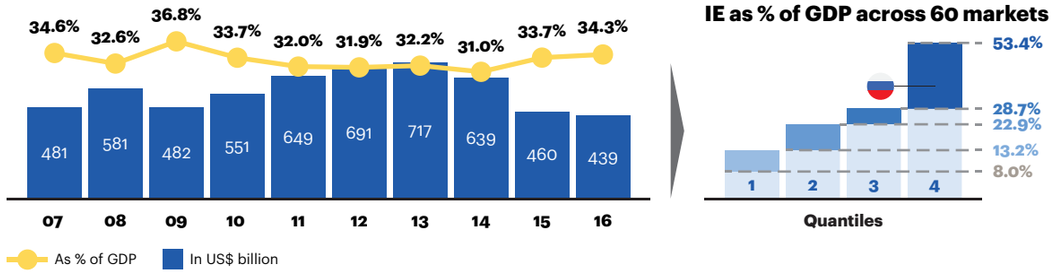
Poland was one of the first European countries to introduce an instant payment system that enables businesses and individuals to make bank transfers 24 hours a day. The systems, called Express Elixir, can also be used to make person-to-person payments using a mobile number. To complete the efforts, the government has established a new, lower threshold (PLN 15.000) on cash payments, mandating that large transactions be paid electronically.

Impact of selected measures. Over the past decade, Poland has significantly increased the number of digital payments and has not stopped in its quest to reduce cash. The country had a successful POS terminalization project, and a second terminal network development program called the Cashless Poland Foundation was launched at the beginning of 2018. The acceptance network is solid but still far from dense, and an infrastructure expansion could generate an additional US$5.2 billion to US$6.9 billion in five years. Coupled with incentives for digital payment adoption, such as VAT rebates for card payments, Poland could generate a US$6.3 billion to US$9 billion increase in GDP over the same period.

Russian Federation

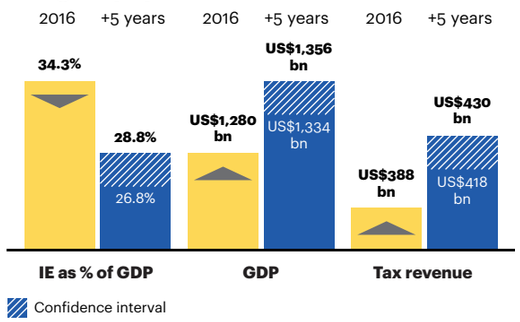
Focus country profile

Size of the informal sector

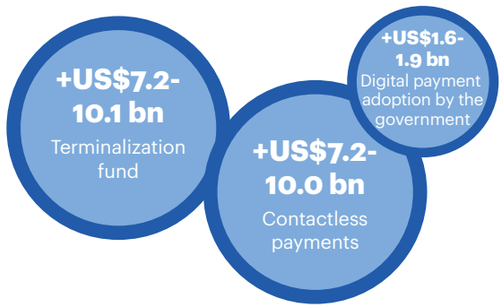


Sector split of the informal economy*

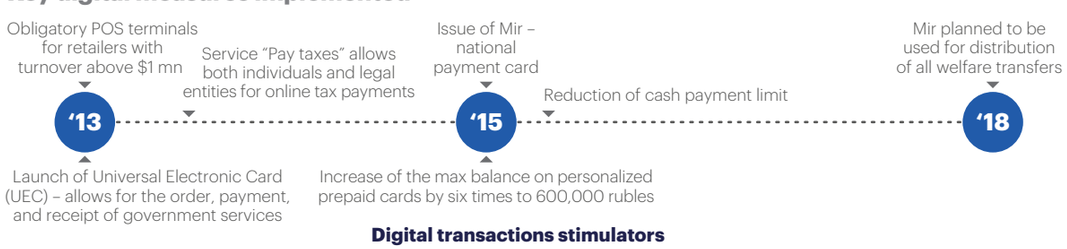
5-year impact of 20% increase in digital payments



5-year impact on GDP per selected measure



Key digital measures implemented



*See the legend on page 49 for a description of each icon.

Sources: Bank for International Settlements; European Central Bank; Economist Intelligence Unit; Eurostat; Organisation for Economic Co-operation and Development; World Bank; countries' national statistical offices; the authors

Russian Federation

Size of the informal economy. The informal economy in the Russian Federation amounts to US$439 billion. With 34.3 percent of GDP, the Russian Federation is among the 10 countries with the largest informal economy. Looking back, the size of the informal economy as a share of GDP did not change significantly. While some reduction of informal activities took place prior to 2013, the changing economic and political environment and low oil prices generated increases in the past three years.

Sector profile of the informal economy. The sectors with the largest contribution to the informal economy are wholesale and retail trade, manufacturing, and construction (combined accounting for 55 percent of the informal economy). Informal activities are lowest in public administration and safety and highest in accommodation and food services; construction; and agriculture, forestry, and fishing. The Russian Federation has the highest level of informal activities in construction among our 10-country sample, accounting for 74 percent of the official activity in the sector. Informal employment of migrants and locals is widespread, especially in Moscow, where new construction is extensive and workers are often engaged with nothing more than a handshake rather than a formal contract.[65]

Informal economy drivers. Slowing economic growth as a result of the drop in oil prices and international sanctions is an important contributor to the recent increases in the informal economy. Regulations with a significant administrative burden also contribute to the informal economy.[66]

Impact of digital payments. By continuing its growth trajectory and increasing digital payments by 20 percent annually for five years, The Russian Federation could reduce the informal economy as a share of its GDP by up to 7.5 percentage points (to 26.8 percent in 2021), increase GDP by up to US$76 billion, and generate additional tax revenue of up to US$42 billion.

Measures against the informal economy. Many measures against the informal economy in The Russian Federation involve digital payments. The government has been expanding acceptance infrastructure and ensuring its usage. The Russian Federation's Central Bank established a national payment system called Mir in 2015. By May 2018, about 35 million cards were in use. The The Russian Federation government is promoting Mir and plans to use the system to distribute all welfare payments by 2019.

Since 2017, the Russian government has gradually implemented a requirement mandating merchants to use online checkout equipment. Additionally, beginning in October 2017, merchants with sales volumes exceeding RUB 40 million (approximately US$643,00) have been mandated to accept Mir cards, which in practice means those merchants will have POS terminals.

Impact of selected measures. Russia has experienced significant growth in digital payments recently. Deployment of contactless cards and infrastructure has been extensive in the big cities and is catching up in the countryside. As Russian Federation consumers respond positively to cash back and bonuses for the use of digital payments, contactless initiatives and other measures to increase the use of digital payments could gain momentum and increase GDP by an additional US$7.2 billion in a five-year period.

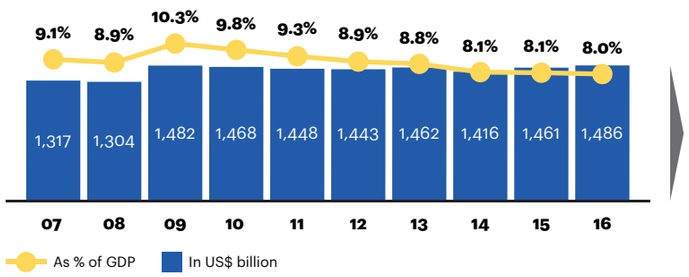
[65] *Migrant Workers in Russia: Global Challenges of the Shadow Economy in Societal Transformation*, edited by Anna-Liisa Heusala, Kaarina Aitamurto, 2017

[66] Based on the indexes and methodology provided by the Heritage Foundation as part of the Index of Economic Freedom

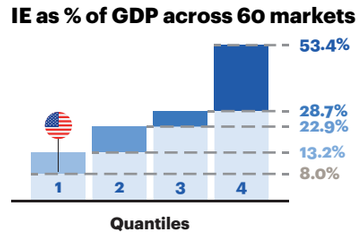
USA

Focus country profile

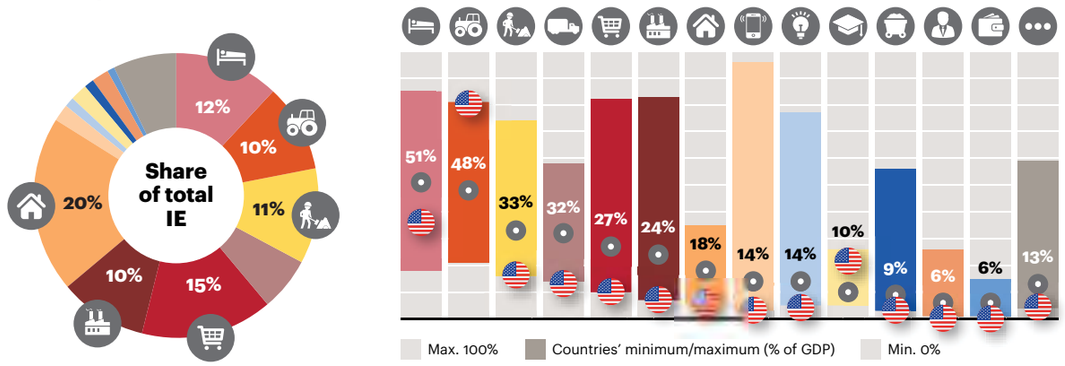
Size of the informal sector



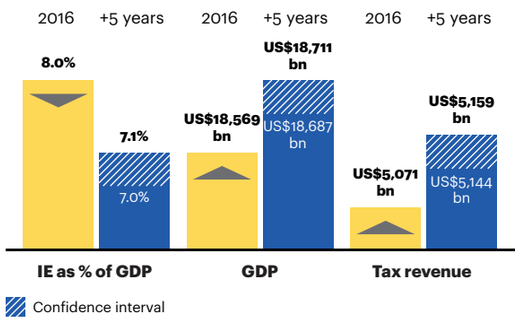
IE as % of GDP across 60 markets



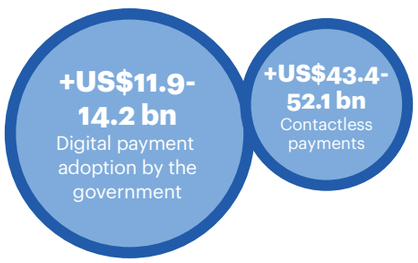
Sector split of the informal economy*



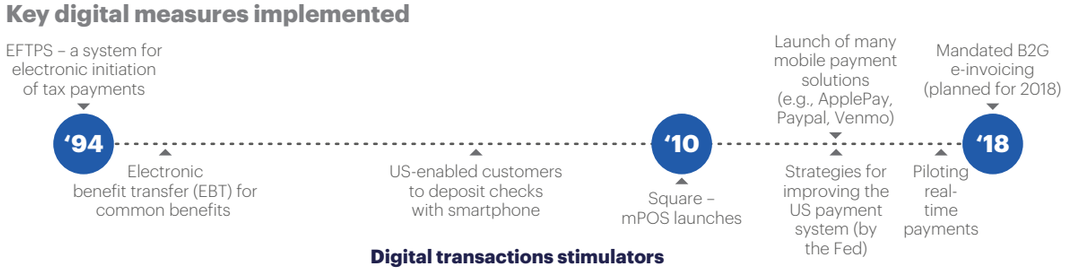
5-year impact of 5% increase in digital payments



5-year impact on GDP per selected measure



Key digital measures implemented



*See the legend on page 49 for a description of each icon.

Sources: Bank for International Settlements; European Central Bank; Economist Intelligence Unit; Eurostat; Organisation for Economic Co-operation and Development; World Bank; countries' national statistical offices; the authors

United States

Size of the informal economy. The informal economy in the United States is 8 percent of GDP and accounts for US$1,486 billion. The United States has the smallest informal economy (as a percentage of GDP) in our sample of 60 markets. Over the past decade, the country decreased the informal economy by 1.1 percentage points as a share of GDP, down from 9.1 percent in 2007.

Sector profile of the informal economy. Rental, hiring, and real estate services; wholesale and retail trade; and accommodation and food services are the three sectors with the largest contribution to the country's informal economy (47 percent combined). The sector with the highest proliferation of informal activities is agriculture, forestry, and fishing, where half of the workforce is made up of informal workers, according to the US Department of Agriculture.[67] Although informal activities are high in agriculture, the impact on the informal economy in total is marginal since agriculture made up only 1 percent of GDP in 2016. The lowest levels of informal activities are in financial and insurance services and in public administration and safety.

Drivers of the informal economy. Given an already small informal economy, there are no large crucial drivers. As in other developed countries, tax and social security burdens are the largest enticement to the informal economy.

Impact of digital payments. By continuing its growth trajectory and increasing digital payments by 5 percent annually for five consecutive years, the United States could reduce the informal economy as a share of its GDP by up to 1 percentage point (to 7 percent in 2021), increase GDP by up to US$142 billion, and generate additional tax revenue of up to US$88 billion. More intensive growth in digital payments of 10 percent annually could reduce the informal economy by 1.5 percentage points (to 6.5 percent of GDP by 2021) and increase GDP by US$206 billion in five years.

Measures against the informal economy. The government and the private sector are both pursuing many measures to increase digital transactions. In the 1980s and 1990s, the government launched initiatives around electronic transfer of social benefits and online tax payments, with great adoption in the past two decades. Government offices have aimed to stay current with consumer payment preferences, for example by accepting mobile and contactless payments.

The private sector is the bedrock of many payment solutions. Square was among the first to offer an alternative to a traditional POS—a mobile POS—and now processes more than US$50 billion per year. Mobile person-to-person payments are already used by more than 46 million people, with companies such as Square Cash, Venmo, and PayPal leading the way. Mobile wallets such as Apple Pay have also gained traction.

Impact of selected measures. The United States has the world's smallest informal economy. Digital payments are widespread with close to 400 digital payments per capita each year, and the public sector's adoption of non-cash payments is extensive. In this context, designing and implementing new measures to grow digital payments and reduce the informal economy might be a challenging task. Instead, the US market might consider focusing on contactless payments, making the checkout experience more convenient and seamless for users, which would increase the use of digital payments. Although the country is at the forefront of digital payments, some segments of the population remain outside the financial system. Individuals without a credit score who do not have access to affordable credit represent about 20 percent of the adult population. They could not only benefit from increased efforts around financial inclusion but could also find better opportunities to operate in the formal sector.

[67] Farm labor statistics from the US Department of Agriculture Economic Research Service

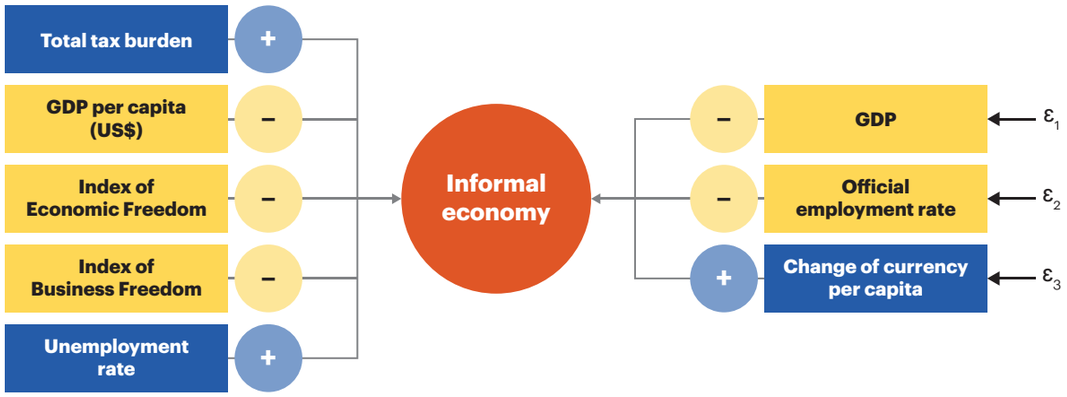
Appendix 3: The MIMIC Methodology Explained

Estimating the size of the informal economy is a complicated undertaking given its hidden nature. This appendix presents the details of the methodology used to estimate the size of the informal economy.[68]

Because the size of the informal economy is an unknown (latent) figure, an estimation technique that directly accounts for this feature must be used. The multiple indicators, multiple causes (MIMIC) estimation model is a viable estimator. The model has an advantage over other methods because multiple observable and measurable causes and indicators are considered. Application of the MIMIC approach can be found in many previous studies measuring the size and time development of the informal economy.

The first part of using the MIMIC model involves establishing a hypothesized relationship between the exogenous variables and the latent variable. The hypothesized path of the relationships between the observed variables and the latent informal economy is based on theoretical considerations (see figure 26).

Figure 26
MIMIC estimation procedure



Note: This is a selection of indicators for MIMIC; for the full list see the second figure in this appendix.
Source: Schneider, Buehn, and Montenegro (2010)

The second part of the process involves estimating the parameters of the MIMIC model to test whether this theoretical relationship between the latent variable (informal economy) and its causes and indicators is supported. As the first part is determined *a priori* by the investigator, the MIMIC model is considered to be a confirmatory rather than an explanatory method.

Formally, the MIMIC model consists of two components:

$$(1)\ y_t = \lambda \eta_t + \varepsilon_t$$

$$(2)\ \eta_t = \gamma' x_t + \varsigma_t$$

[68] Methodology reference publications: Schneider, F., & Buehn, A. (2013), "Estimating the Size of the Shadow Economy: Methods, Problems and Open Questions," Institute for the Study of Labor; Hassan, M., & Schneider, F. (2016), "Size and Development of the Shadow Economies of 157 Countries Worldwide: Updated and New Measures from 1999 to 2013," Institute for the Study of Labor

where (1) is the measurement model and (2) is the structural model. The structural model examines the relationships between the latent variable (η_t) and the causes (x_t') and the measurement model links indicators (y_t') and hidden variable (η_t). The MIMIC model explains the relationship between observable variables and an unobservable variable by minimizing the distance between the sample covariance matrix and the covariance matrix predicted by the model.

In the measurement model (1), the unobservable variable η_t determines a p vector $y_t'=(y_{1t}, y_{2t}, \ldots, y_{pt})'$ of indicators, that is, observable variables that reflect the informal economy activities, subject to a p vector of random error terms $\varepsilon_t'=(\varepsilon_{1t}, \varepsilon_{2t}, \ldots, \varepsilon_{pt})'$. The unobservable variable ηt is a scalar and λ is a p column vector of parameters that relates y_t to η_t.

The structural model (2) determines the unobservable variable η_t by a set of exogenous causes $x_t'=(x_{1t}, x_{2t}, \ldots, x_{pt})'$ that may be useful in predicting its movement and size, subject to a structural disturbance error term ς_t. γ_t is a q row vector of structural parameters.[69] In equations (1) and (2), it is assumed that ς_t and the elements of ε_t are normally, independently, and identically distributed, the variance of the structural disturbance term ς_t is denoted by ψ, and $\Theta_\varepsilon = E(\varepsilon_t \varepsilon_t')$ is the (p × p) covariance matrix of the measurement errors.[70]

In general, estimation of a MIMIC model uses covariance information of sample data to derive estimates of population parameters. Instead of minimizing the distance between observed and predicted individual values, as in standard econometrics, the MIMIC model minimizes the distance between an observed (sample) covariance matrix and the covariance matrix predicted by the model the researcher imposes on the data. The idea behind this approach is that the covariance matrix of the observed variables is a function of a set of model parameters:

$$\Sigma = \Sigma(\theta)$$

where Σ is the population covariance matrix of the observed variables, θ is a vector that contains the parameters of the model, and $\Sigma(\theta)$ is the covariance matrix as a function of θ, implying that each element of the covariance matrix is a function of one or more model parameters. If the hypothesized model is correct and the parameters are known, the population covariance matrix would be exactly reproduced—that is, Σ will equal $\Sigma(\theta)$. In practice, however, one does not know either the population variances and covariances or the parameters, but instead uses the sample covariance matrix and sample estimates of the unknown parameters for estimation.[71]

Estimation is thus performed by finding values for $\hat{\theta}=f(\hat{\lambda}, \hat{\gamma}, \hat{\psi}, \hat{\Phi}, \hat{\Theta}_\varepsilon)$ producing an estimate of the model's covariance matrix $\hat{\Sigma}$ that most closely corresponds to the sample covariance matrix S. During this estimation procedure, all possible matrices that meet the imposed restrictions are considered. If an estimate Σ^* of $\hat{\Sigma}$ is close to S, one might conclude that θ^* is a reasonable estimate of the model's parameters. Hence, estimation of a MIMIC model is reduced to the problem of measuring how close Σ^* is to S and if this estimate is the most accurate, that is, if it is the best estimate given the set of all possible estimates that meet the imposed restrictions.[72] The covariance equation of the MIMIC model can be derived and has the following functional form:

$$\hat{\Sigma} = \left[\frac{\hat{\lambda}(\hat{\gamma}\hat{\Phi}\hat{\gamma} + \hat{\psi})\hat{\lambda}' + \hat{\Theta}_\varepsilon}{\hat{\Phi}\hat{\gamma}\hat{\lambda}'} \middle| \frac{\hat{\lambda}\hat{\gamma}')\hat{\Phi}}{\hat{\Phi}} \right]$$

[69] Without loss of generality, all variables are taken as standardized deviations from their means.

[70] In the standard MIMIC model, the measurement errors are assumed to be independent of each other, but this restriction could be relaxed. (Stapleton, D. C., "Analyzing Political Participation Data with a MIMIC Model," *Sociological Methodology*, 9, 1978)

[71] Bollen, K. A., *Structural Equations with Latent Variables*, 1989

[72] Long, J. S., *Covariance Structure Models: an Introduction to LISREL*, 1983

The function measuring how close a given $\sum^*$ is to the sample covariance matrix S is called the fitting function $F(S; \sum^*)$. The θ^* of all possible θ^* that meets the imposed constraints on $\lambda, \gamma, \Phi, \psi$, and Θ_ε and minimizes the fitting function, given the sample covariance matrix S, is the sample estimate $\hat{\theta}$ of the population parameters. This means that if one set of estimates $\theta_{1)}^*$ produces the matrix $\sum_1^*$ and a second set θ_2^* produces the matrix $\sum_1^*$ and if $F(S; \sum_1)^* < F(S; \sum_2^*)$, $\sum_1^*$ is then considered to be closer to S than $\sum_2^*$.

The most widely used fitting function is the maximum likelihood (ML) function.[73] Under the assumption that $\sum(\theta)$ and S are positive definite, that is, nonsingular, and S has a Wishart distribution, the following fitting function is minimized:

$$F_{ML} = log\left|\sum(\theta)\right| + tr\left[S\sum^{-1}(\theta)\right] - log|S| - (p+q)$$

where $log|\,|$ is the log of the determinant of the respective matrix and (p + q) is the number of observed variables. In general, no closed form or explicit solution for the structural parameters that minimize F_{ML} exists. Hence, the values of $\lambda, \gamma, \Phi, \psi$,and Θ_ε that minimize the fitting function are estimated applying iterative numerical procedures. The ML estimator is widely used because of several desirable properties:

- It is asymptotically unbiased.
- It is consistent—that is, plim $\hat{\theta} = \theta$ ($\hat{\theta}$ is the ML estimator and θ is the population parameter).
- It is asymptotically efficient—that is, among all consistent estimators no other has a smaller asymptotic variance.
- It is asymptotically normally distributed, meaning that the ratio of the estimated parameter and its standard error approximate a z-distribution in large samples.
- It is scale invariance.[74] The scale invariance property implies that changes in the measurement unit of one or more of the observed variables do not change the value of the fitting function. This means that $\hat{\lambda}, \hat{\gamma}, \hat{\psi}, \hat{\Phi}, \Theta_\varepsilon$ are the same for any change of scale.

The MIMIC model takes into account simultaneously different causes and indicators that directly influence the development of the size of the informal economy over time. Tax burden, regulatory burden, unemployment rate, or limited usage of digital payments are among the most important causes leading to proliferation of the informal economy. After considering the different causes that affect the size of the informal economy, the MIMIC model requires the specification of indicators that reflect the existence of the informal economy, for example, GDP growth used as a proxy of formal economy, currency in circulation, and labor force participation rate. Figure 27 on page 73 summarizes all types of variables used for the estimation of the informal economy size, including the original data sources.

The MIMIC model is widely accepted by most scholars who estimate the size and development of informal economic activities using the MIMIC model or more general structural equation

[73] Other estimation procedures such as unweighted least squares (ULS) and generalized least squares (GLS) are also available. ULS has the advantage that it is easier to compute and leads to a consistent estimator without the assumption that the observed variables have a particular distribution. Important disadvantages of ULS are, however, that ULS does not lead to the asymptotically most efficient estimator of θ and that ULS F is not scale invariant. The GLS estimator has similar statistical properties like the ML estimator but the significance tests are no longer accurate if the distribution of the observed variables has very "fat" or "thin" tails. Moreover, GLS F accepts the wrong model more often than ML and parameter estimates tend to suffer when using GLS F. Thus, ML seems to be superior. (For example, see: Bollen, K.A., *Structural Equations with Latent Variables*, New York, 1989, pp. 111–15; Olsson, U. H., Foss, T., Troye, S. V., & Howell, R. D. (2000). "The Performance of ML, GLS, and WLS Estimation in Structural Equation Modeling under Conditions of Misspecification and Nonnormality." Structural Equation Modeling, 7(4), pp. 557–595; Jöreskog, K. G., Sörbom, D., & Du Toit, S. H. C. (2001). *LISREL 8: New Statistical Features*, Scientific Software International, pp. 20–4).

[74] Swaminathan, H., & Algina, J., "Scale Freeness in Factor Analysis," *Psychometrika*, 43(4), pp. 581–583

Figure 27

Variables used in the MIMIC estimation of the informal economy

Type	MIMIC model usage	Indicators	Sources
Digital payments	• Cause	• Causal negative relationship between use of digital payments and size of the informal economy is assumed. Indicators such as number of digital payments per capita, card payments volume per capita, POS penetration per 100,000 inhabitants, or number of ATM transactions per capita are used. • Variables: Number of digital payments, number of card payments, number of payment cards in usage, number of ATMs, number of POSs, card spending, number of ATM transactions	• Bank for International Settlements • European Central Bank • World Bank • Countries' national statistical offices
Macroeconomic and demographic	• Cause/ indicator	• As the informal economy absorbs resources from the formal economy it creates a contraction in the formal economy. The reference variable for this indicator is GDP growth. • We assume that in general unemployment creates incentives to work in the informal economy, measured by the total unemployment as percentage of labor force. • Variables: GDP, population	• Economist Intelligence Unit • International Labor Organization
Monetary	• Indicator	• The informal economy is expected to be reflected in an economy by the increase in the currency in circulation because individuals who participate in informal activities prefer to pay in cash. M1 metric for money supply is used as an indicator variable. • Variables: Currency M1 and M2 in circulation	• Economist Intelligence Unit
Labor	• Indicator	• Labor force participation rate serves as one of the indicators that mirror the existence of the informal economy. In our model, labor force participation rate is measured by the total of workforce as percentage of total population. • Variables: Unemployment rate, labor force, labor force participation rate, public employment	• Economist Intelligence Unit • International Labor Organization • Countries' national statistical offices
Tax and regulatory burden	• Cause	• Tax burden is one of the most important causal variables, proxied by total, direct, and indirect tax revenues as % of GDP. • Intensive regulation leads to bureaucracy and limits business freedom, thus leads to higher motivation to participate in the informal economy. It is proxied by total government spending as % of GDP. • Variables: Direct taxes, indirect taxes, total tax burden, social security payments, Index of Business Freedom, real government spending	• OECD • International Monetary Fund • World Bank • Heritage Foundation
Economic environment	• Cause	• It is crucial to examine the effect of the economic environment and the quality of institutions in the country. Indicators such as Index of Economic Freedom, Corruption Index, or Rule of Law Index are used. • Variables: Index of Economic Freedom, Index of Fiscal Freedom, Corruption Index, Rule of Law Index, Index of Labor Freedom, Index of Government Integrity	• Heritage Foundation • Transparency International • World Justice Project

Notes: Digital payments include card payments (debit and credit card payments, excluding ATM withdrawals), direct debits, credit transfers, and e-money (for example, various payments not requiring a bank account, such as online payment schemes, e-purses, and smartcards for public transport).POS is point of sale.

Sources: Prof. Dr. F. Schneider; A.T. Kearney analysis

models (SEMs) with more than one unobservable variable, that such an empirical exercise is a minefield, regardless of which method is used. Its advantage is that the model explicitly considers multiple causes of the existence and growth of the informal economy via simultaneous specification of a factor and a structural model. The shortfall is that some of the drivers considered in the MIMIC model are also responsible for do-it-yourself activities or help from neighbors, thus making the segregation of the "purely informal" activities challenging. To overcome this drawback in this study, a range has been calculated to size the informal economy in each market, including an upper and lower bound.

In practice, a variety of methods is used to estimate the informal economy. Their description and comparison with the MIMIC approach are shown in figure 28 on page 74.

Figure 28

Comparison of methods used to size the informal economy

Variable	Description	Source
MIMIC method	Based on rationale that informal economy is not directly observable, but it is possible to approximate it using quantitatively measurable causes (for example, tax burden or amount of regulation) and indicators (for example, cash or labor force participation rate).	+ Multiple causes of the existence and growth of the informal economy as well as multiple effects of the informal economy over time are considered + Confirmatory, rather than exploratory technique + Calibration procedure in place to deal with starting values having a great influence on the results – Double counting problem including do-it-yourself activities, legally bought material, and neighbors' help
Discrepancy method	Multistaged method mostly used by statistical offices, working on the premise that non-observed economy estimates take place at various stages of the production process of national accounts. Method is based on discrepancies between income and expenditure national statistics or discrepancies between official and actual labor force.	+ Comprehensive categorization of various types of informal/underground activities + Highly complex procedure which takes into account all possible situations – Differently applied combination of estimation procedures by national statistical offices from country to country without proper documentation
Public surveys	Representative surveys designed to investigate public perception of informal economy, actual participation in informal economy activities, and opinions about informal practices.	+ Direct method of informal economy estimation – Likely to underestimate the informal economy because people under-declare in surveys what they are trying to hide from authorities – Usually only households are included (not companies) – Financially and procedurally demanding method
Company managers surveys	Representative surveys of company managers in given country. Method is based on premise that company managers are most likely to know how much business, income, and wages go unreported due to their unique position in dealing with both types of income.	+ Direct method of informal economy estimation with detailed information on the structure of the informal economy, especially in the service and manufacturing sectors – Likely to underestimate the informal economy because people under-declare in surveys what they are trying to hide from authorities – Financially and procedurally demanding method
Households consumption income gap estimation	Focused on the discrepancy between income and expenditure of households. For households, probability of underreporting is estimated and further likely amount of underreporting is calculated. As a result, method provides single number depicting size of informal economy in given country.	+ Can be easily applied to multiple countries – Breakdown per industries is not possible as only macro estimates are available – Inconsistently high values of informal economy (compared to other methods)

Sources: Prof. Dr. F. Schneider; A.T. Kearney analysis

Appendix 4: Overview of Digital Payment Measures per Market

Digital measures type	Abolishment and reduction of fees for digital payments	Contactless smartcard system	Demonetization	Digital payment adoption	Digital payment infrastructure	Fees and limits for cash deposits and withdrawals	Financial inclusion strategy	Incentive for digital payments	Mandatory digital payments	Mobile payment solutions	National payment road map	Products and features encouraging digital payment adoption	Acceptance development funds	Threshold for cash payments
Argentina				■				■	■	■		■		
Australia	■	■		■	■				■					
Bangladesh					■		■			■				
Belgium	■		■							■				■
Brazil					■		■			■		■		
Canada		■	■											
Chile					■		■		■					
China				■	■		■			■				
Colombia				■			■	■		■				
Costa Rica				■				■				■	■	
Croatia	■							■						■
Czech Republic	■		■						■					■
Dominican Republic									■					
Egypt							■			■		■		
France	■		■	■						■				■
Germany	■		■	■										
Greece	■		■	■		■		■	■				■	■
Hong Kong, SAR		■												
Hungary	■												■	■
India	■		■	■	■	■	■	■		■				■
Indonesia				■	■		■		■	■				
Ireland	■		■	■							■			■
Israel														■
Italy	■		■	■				■						■
Japan		■		■	■					■	■	■		
Kazakhstan					■									
Kenya				■		■	■		■	■		■		
Malaysia	■			■	■					■		■	■	
Mexico	■				■	■	■	■	■	■			■	■
Nigeria					■	■	■			■			■	
Norway	■			■										■
Pakistan										■				
Peru									■	■				
Philippines							■							
Poland	■	■		■	■					■	■		■	■
Portugal	■		■	■					■					■
Romania	■							■					■	■
Russian Federation		■		■	■	■	■		■		■	■	■	■
Saudi Arabia		■			■							■		
Serbia				■				■						
Singapore		■	■		■						■			
South Africa			■	■	■				■					
South Korea		■	■	■	■		■	■	■	■		■	■	■
Spain	■		■	■										■
Sri Lanka										■				
Sweden	■		■		■					■				
Switzerland					■									■
Taiwan		■		■	■		■			■				
Thailand						■	■	■	■	■				
The Netherlands	■		■		■		■			■	■			■
Turkey		■		■	■		■				■		■	■
Ukraine				■										■
United Arab Emirates							■			■				
United Kingdom	■	■		■	■		■							
United States				■	■			■	■	■	■			
Uruguay				■			■	■	■					■
Venezuela			■			■		■						
Vietnam										■	■	■	■	

Source: A.T. Kearney analysis

Appendix 5: Size of the Informal Economy in 60 Markets, Decade of 2007

Market	Size of the informal economy as % of GDP (upper bound)									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Argentina	21.9	21.9	23.0	21.6	20.8	21.6	21.6	22.0	25.0	25.2
Australia	10.5	10.2	10.6	10.3	10.1	11.0	11.2	10.1	9.3	9.0
Bangladesh	32.9	31.3	31.5	30.8	28.8	29.0	28.2	27.4	27.6	25.8
Belgium	20.6	20.6	21.0	21.1	20.0	20.6	21.1	20.4	20.1	19.0
Bolivia	60.0	54.6	58.4	55.1	51.8	49.6	48.2	46.9	46.0	46.4
Brazil	37.1	35.2	36.9	34.6	33.1	32.7	32.6	33.0	35.2	36.5
Canada	15.5	14.6	14.9	13.3	13.1	13.9	13.8	12.7	12.0	11.0
Chile	16.0	15.0	15.4	15.0	13.9	13.5	13.7	13.6	14.1	13.2
China	16.1	15.1	15.1	14.4	14.3	14.7	14.5	14.0	14.4	14.5
Colombia	30.9	29.8	31.2	30.7	27.6	27.3	26.8	26.0	25.3	24.9
Costa Rica	24.5	23.6	26.6	26.9	27.0	26.1	26.1	25.7	21.5	21.0
Croatia	23.9	23.0	26.7	27.0	26.0	26.7	26.7	25.9	24.4	24.0
Czech Republic	19.9	18.6	19.9	20.4	18.1	17.9	18.2	17.1	16.2	15.7
Dominican Republic	32.2	31.3	33.1	30.7	30.5	30.6	29.0	27.6	28.0	28.4
Egypt	30.8	28.9	30.3	30.5	32.9	33.6	34.4	35.0	33.3	32.6
France	14.3	13.0	15.3	14.5	13.2	13.5	13.8	13.5	13.1	12.1
Germany	13.7	12.7	14.8	14.0	12.2	12.0	12.3	11.3	10.9	10.2
Greece	26.8	25.8	27.9	28.8	29.7	31.0	30.4	29.7	29.1	28.0
Hong Kong, SAR	13.1	13.0	13.8	12.8	12.2	12.3	12.2	11.9	12.4	12.0
Hungary	21.4	20.6	23.2	22.8	21.9	22.3	21.6	20.8	20.5	20.6
India	25.8	26.5	27.0	25.4	24.5	23.8	22.9	23.1	22.7	23.3
Indonesia	31.1	29.4	30.3	29.4	28.6	28.2	27.9	27.0	27.7	28.7
Ireland	15.1	15.0	15.9	14.3	15.0	13.9	13.6	12.4	12.1	11.5
Israel	21.8	20.4	21.5	20.5	19.4	19.9	19.9	19.4	19.2	18.0
Italy	22.4	21.4	23.2	22.1	20.5	21.5	22.4	22.3	20.9	19.5
Japan	10.1	9.2	10.4	9.9	9.9	9.7	9.3	8.7	8.2	8.1
Kazakhstan	34.2	32.7	34.7	33.0	31.6	31.9	30.8	30.1	32.8	33.5
Kenya	33.4	32.9	33.6	31.5	29.9	30.1	30.0	28.7	33.4	33.7
Malaysia	31.2	30.0	31.7	30.2	29.8	29.8	29.8	26.4	26.1	25.3
Mexico	30.7	29.8	32.7	31.2	30.3	29.5	30.1	29.1	28.1	27.9
New Zealand	11.7	11.9	12.8	12.7	11.3	11.4	11.2	10.4	10.1	9.2
Nigeria	55.0	53.1	54.0	52.8	51.5	51.6	51.7	50.6	52.5	53.4
Norway	12.4	12.9	12.8	13.4	13.0	12.7	13.0	12.7	12.5	11.5
Pakistan	30.8	30.5	31.3	30.3	30.9	31.1	30.6	30.3	31.6	32.4
Peru	48.8	46.1	47.7	43.0	40.4	39.7	39.5	40.2	41.5	42.2
Philippines	36.4	35.1	37.0	34.6	33.9	33.6	31.7	29.3	28.0	27.6
Poland	24.9	23.1	23.0	22.3	20.7	20.4	20.3	19.5	18.1	17.4
Portugal	23.4	22.0	23.0	22.1	21.7	21.5	21.7	20.6	19.1	18.5
Romania	27.0	25.4	28.2	26.8	25.4	25.1	24.0	22.7	22.9	22.9
Russian Federation	34.6	32.6	36.8	33.7	32.0	31.9	32.2	31.0	33.7	34.3
Saudi Arabia	15.0	13.8	15.1	14.4	14.0	13.3	13.6	13.9	14.7	14.9
Serbia	30.7	30.1	30.6	30.3	31.4	31.9	32.6	33.2	33.5	34.0
Singapore	11.5	10.7	11.9	10.7	10.1	9.9	10.2	9.9	9.2	8.6
South Africa	21.8	20.4	23.4	23.2	22.1	22.2	21.5	21.3	22.0	22.4
South Korea	24.9	23.9	23.1	23.0	20.8	21.0	21.3	20.4	19.8	18.4
Spain	22.7	21.5	24.2	23.9	23.7	24.1	24.4	24.0	22.0	21.7
Sri Lanka	47.6	46.4	48.9	41.9	39.3	37.5	38.1	37.0	35.5	36.4
Sweden	13.9	13.1	13.5	11.2	11.8	11.7	12.1	11.6	11.2	10.7
Switzerland	8.1	8.0	8.9	8.6	8.4	8.5	8.4	8.2	8.7	8.6
Taiwan	31.3	30.1	28.9	28.2	28.0	28.0	28.0	26.9	29.0	28.0
Thailand	48.1	47.8	51.2	48.7	47.9	46.7	46.7	47.3	43.1	45.2
The Netherlands	13.2	12.2	11.5	11.2	10.7	10.7	11.0	11.4	10.4	9.4
Turkey	30.4	29.1	32.3	30.2	27.7	28.0	27.3	27.5	27.4	25.1
Ukraine	38.7	36.7	43.5	42.2	39.2	39.7	40.0	40.0	42.9	43.9
United Arab Emirates	27.4	26.8	25.5	25.1	23.9	23.1	22.4	22.0	24.3	22.0
United Kingdom	12.7	11.7	12.9	12.2	12.0	11.8	11.5	10.7	10.2	9.5
United States	9.1	8.9	10.3	9.8	9.3	8.9	8.8	8.1	8.1	8.0
Uruguay	36.9	35.2	35.7	32.3	30.7	28.3	27.5	25.6	25.4	24.9
Venezuela	29.2	28.7	32.8	31.1	30.3	29.7	29.3	30.2	31.2	34.5
Vietnam	25.0	23.9	24.3	24.1	23.0	22.7	22.7	22.0	21.7	22.9

Sources: Prof. Dr. F. Schneider; A.T. Kearney analysis

Market	Size of the informal economy as % of GDP (lower bound)									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Argentina	14.3	14.2	14.9	14.1	13.5	14.1	14.0	14.3	16.2	16.4
Australia	6.8	6.6	6.9	6.7	6.5	7.2	7.2	6.6	6.0	5.9
Bangladesh	21.4	20.4	20.5	20.0	18.7	18.8	18.3	17.8	17.9	16.8
Belgium	13.4	13.4	13.7	13.7	13.0	13.4	13.7	13.2	13.1	12.4
Bolivia	39.0	35.5	38.0	35.8	33.7	32.3	31.3	30.5	29.9	30.2
Brazil	24.1	22.9	24.0	22.5	21.5	21.3	21.2	21.5	22.9	23.7
Canada	10.1	9.5	9.7	8.7	8.5	9.0	9.0	8.2	7.8	7.2
Chile	10.4	9.7	10.0	9.7	9.0	8.8	8.9	8.9	9.1	8.6
China	10.5	9.8	9.8	9.4	9.3	9.5	9.4	9.1	9.3	9.4
Colombia	20.1	19.4	20.3	20.0	17.9	17.8	17.4	16.9	16.4	16.2
Costa Rica	15.9	15.3	17.3	17.5	17.6	16.9	17.0	16.7	14.0	13.6
Croatia	15.5	14.9	17.3	17.6	16.9	17.3	17.3	16.8	15.8	15.6
Czech Republic	12.9	12.1	12.9	13.2	11.7	11.6	11.8	11.1	10.5	10.2
Dominican Republic	21.0	20.3	21.5	20.0	19.8	19.9	18.9	17.9	18.2	18.5
Egypt	20.0	18.8	19.7	19.8	21.4	21.9	22.3	22.7	21.7	21.2
France	9.3	8.5	9.9	9.4	8.6	8.8	9.0	8.8	8.5	7.9
Germany	8.9	8.2	9.6	9.1	7.9	7.8	8.0	7.3	7.1	6.6
Greece	17.4	16.8	18.1	18.7	19.3	20.1	19.7	19.3	18.9	18.2
Hong Kong, SAR	8.5	8.5	9.0	8.3	7.9	8.0	7.9	7.7	8.1	7.8
Hungary	13.9	13.4	15.1	14.8	14.2	14.5	14.1	13.5	13.3	13.4
India	16.8	17.2	17.6	16.5	15.9	15.4	14.9	15.0	14.7	15.1
Indonesia	20.2	19.1	19.7	19.1	18.6	18.3	18.1	17.6	18.0	18.6
Ireland	9.8	9.7	10.3	9.3	9.7	9.0	8.9	8.1	7.9	7.5
Israel	14.2	13.2	14.0	13.3	12.6	12.9	12.9	12.6	12.5	11.7
Italy	14.5	13.9	15.1	14.3	13.3	13.9	14.6	14.5	13.6	12.7
Japan	6.6	6.0	6.8	6.5	6.4	6.3	6.0	5.6	5.3	5.2
Kazakhstan	22.2	21.2	22.5	21.5	20.5	20.7	20.0	19.5	21.3	21.8
Kenya	21.7	21.4	21.9	20.5	19.4	19.6	19.5	18.6	21.7	21.9
Malaysia	20.3	19.5	20.6	19.6	19.4	19.4	19.4	17.2	16.9	16.5
Mexico	19.9	19.4	21.2	20.2	19.7	19.2	19.5	18.9	18.2	18.1
New Zealand	7.6	7.7	8.3	8.3	7.3	7.4	7.3	6.8	6.5	6.0
Nigeria	35.7	34.5	35.1	34.3	33.5	33.5	33.6	32.9	34.1	34.7
Norway	8.1	8.4	8.3	8.7	8.5	8.3	8.5	8.3	8.1	7.5
Pakistan	20.0	19.8	20.3	19.7	20.1	20.2	19.9	19.7	20.6	21.1
Peru	31.7	30.0	31.0	28.0	26.3	25.8	25.7	26.1	27.0	27.4
Philippines	23.6	22.8	24.1	22.5	22.0	21.8	20.6	19.0	18.2	17.9
Poland	16.2	15.0	14.9	14.5	13.5	13.3	13.2	12.7	11.7	11.3
Portugal	15.2	14.3	14.9	14.4	14.1	14.0	14.1	13.4	12.4	12.0
Romania	17.6	16.5	18.3	17.4	16.5	16.3	15.6	14.8	14.9	14.9
Russian Federation	22.5	21.2	23.9	21.9	20.8	20.7	20.9	20.2	21.9	22.3
Saudi Arabia	9.8	8.9	9.8	9.3	9.1	8.7	8.8	9.0	9.6	9.7
Serbia	20.0	19.6	19.9	19.7	20.4	20.7	21.2	21.6	21.8	22.1
Singapore	7.5	7.0	7.7	7.0	6.6	6.4	6.6	6.4	6.0	5.6
South Africa	14.2	13.2	15.2	15.1	14.4	14.4	14.0	13.9	14.3	14.6
South Korea	16.2	15.5	15.0	14.9	13.5	13.6	13.8	13.2	12.9	12.0
Spain	14.7	14.0	15.8	15.5	15.4	15.7	15.8	15.6	14.3	14.1
Sri Lanka	30.9	30.1	31.8	27.2	25.6	24.4	24.8	24.1	23.1	23.7
Sweden	9.0	8.5	8.8	7.3	7.7	7.6	7.8	7.6	7.3	6.9
Switzerland	5.3	5.2	5.8	5.6	5.5	5.5	5.4	5.3	5.7	5.6
Taiwan	20.4	19.6	18.8	18.3	18.2	18.2	18.2	17.5	18.8	18.2
Thailand	31.3	31.1	33.3	31.6	31.1	30.3	30.4	30.7	28.0	29.4
The Netherlands	8.5	7.9	7.5	7.3	6.9	7.0	7.2	7.4	6.8	6.1
Turkey	19.7	18.9	21.0	19.6	18.0	18.2	17.8	17.8	17.8	16.3
Ukraine	25.2	23.8	28.3	27.4	25.5	25.8	26.0	26.0	27.9	28.5
United Arab Emirates	17.8	17.4	16.6	16.3	15.5	15.0	14.6	14.3	15.8	14.3
United Kingdom	8.2	7.6	8.4	7.9	7.8	7.7	7.5	7.0	6.6	6.2
United States	5.9	5.8	6.7	6.4	6.1	5.8	5.7	5.3	5.3	5.2
Uruguay	24.0	22.9	23.2	21.0	19.9	18.4	17.9	16.6	16.5	16.2
Venezuela	18.9	18.7	21.3	20.2	19.7	19.3	19.1	19.7	20.3	22.4
Vietnam	16.3	15.5	15.8	15.6	14.9	14.7	14.8	14.3	14.1	14.9

Sources: Prof. Dr. F. Schneider; A.T. Kearney analysis

Appendix 6: GVA Sector Split and Informal Economy in 10 Focus Markets

		Accommodation and food services	Agriculture, forestry, and fishing	Construction	Transport, postal, and warehousing	Wholesale and retail trade	Manufacturing	Rental, real estate, and professional services	Electricity, gas, water, and waste services	Information, media, and telecommunications	Education and training	Mining	Public administration and safety	Financial and insurance services	Other services
Australia	Sector share in GVA	3%	3%	9%	5%	9%	7%	20%	3%	3%	5%	6%	6%	9%	13%
	IE level within the sector	18%	21%	16%	14%	14%	23%	5%	11%	10%	5%	3%	11%	2%	4%
	Sector's IE as % of total IE	5%	6%	15%	8%	14%	16%	11%	3%	3%	3%	2%	7%	2%	5%
United States	Sector share in GVA	12%	10%	11%	6%	15%	10%	20%	1%	2%	2%	1%	2%	1%	7%
	IE level within the sector	34%	81%	22%	16%	10%	7%	6%	5%	3%	15%	5%	1%	1%	5%
	Sector's IE as % of total IE	12%	10%	11%	6%	15%	10%	20%	1%	2%	2%	1%	2%	1%	7%
Italy	Sector share in GVA	4%	2%	5%	6%	11%	16%	20%	3%	4%	4%	0%	7%	6%	13%
	IE level within the sector	45%	46%	53%	30%	24%	25%	19%	16%	12%	10%	28%	6%	7%	10%
	Sector's IE as % of total IE	8%	5%	12%	8%	13%	19%	18%	2%	2%	2%	1%	2%	2%	7%
Poland	Sector share in GVA	1%	3%	8%	6%	18%	20%	11%	5%	4%	5%	2%	6%	4%	9%
	IE level within the sector	63%	49%	35%	23%	23%	18%	13%	11%	13%	8%	10%	3%	9%	8%
	Sector's IE as % of total IE	4%	7%	15%	8%	22%	20%	8%	3%	3%	2%	1%	1%	2%	4%
Russian Federation	Sector share in GVA	1%	5%	6%	6%	16%	14%	17%	3%	1%	3%	10%	8%	4%	6%
	IE level within the sector	79%	67%	74%	47%	47%	44%	19%	23%	51%	26%	7%	4%	9%	28%
	Sector's IE as % of total IE	2%	9%	14%	9%	23%	18%	10%	2%	2%	2%	2%	1%	1%	5%
Brazil	Sector share in GVA	3%	5%	6%	5%	14%	12%	13%	2%	3%	6%	4%	10%	6%	11%
	IE level within the sector	53%	66%	64%	58%	41%	47%	35%	17%	19%	11%	18%	26%	5%	6%
	Sector's IE as % of total IE	4%	10%	12%	8%	17%	17%	14%	1%	2%	2%	2%	8%	1%	2%
China	Sector share in GVA	2%	9%	7%	4%	10%	30%	10%	2%	2%	3%	4%	4%	7%	4%
	IE level within the sector	49%	27%	28%	35%	14%	9%	7%	6%	11%	9%	8%	7%	4%	17%
	Sector's IE as % of total IE	6%	18%	14%	11%	10%	20%	5%	1%	2%	2%	2%	2%	2%	5%
India	Sector share in GVA	1%	17%	9%	5%	11%	16%	15%	3%	2%	5%	3%	6%	6%	3%
	IE level within the sector	64%	27%	31%	36%	30%	23%	17%	9%	63%	10%	9%	4%	4%	35%
	Sector's IE as % of total IE	3%	21%	12%	8%	14%	16%	11%	1%	5%	2%	1%	1%	1%	4%
Kenya	Sector share in GVA	1%	35%	5%	9%	7%	11%	10%	2%	1%	5%	1%	4%	7%	3%
	IE level within the sector	85%	28%	57%	36%	45%	49%	28%	20%	96%	19%	33%	25%	10%	45%
	Sector's IE as % of total IE	2%	29%	8%	10%	10%	16%	8%	1%	3%	3%	1%	3%	2%	4%
Nigeria	Sector share in GVA	1%	21%	4%	1%	19%	10%	13%	1%	11%	2%	6%	3%	3%	4%
	IE level within the sector	28%	75%	28%	18%	82%	83%	33%	77%	14%	23%	16%	19%	15%	59%
	Sector's IE as % of total IE	1%	30%	2%	1%	30%	15%	8%	1%	3%	1%	2%	1%	1%	5%

Notes: IE is informal economy. Other services includes administrative and support services, health, social assistance, and art. Sector breakdown and size of the informal economy per sector for the selected 10 markets were calculated based on 2015 gross value added (GVA) for all markets, except China and Brazil, for which 2014 GVA levels and sector split was applied.

Sources: EIU, Eurostat, OECD, countries' national statistical offices, Prof. Dr. F. Schneider; A.T. Kearney analysis

Appendix 7: Five-Year Cumulative Effect on Informal Economy from Increasing Digital Payments for 60 Markets (change in percentage points)

	5% increase in number of digital payments per capita				10% increase in number of digital payments per capita				15% increase in number of digital payments per capita				20% increase in number of digital payments per capita			
	Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound	
Market	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level
Argentina	−1.77%	−2.11%	−2.73%	−3.24%	−2.17%	−2.98%	−3.34%	−4.59%	−2.37%	−3.33%	−3.65%	−5.12%	−2.63%	−3.57%	−4.05%	−5.49%
Australia	−0.63%	−0.75%	−0.97%	−1.16%	−0.78%	−1.06%	−1.19%	−1.64%	−0.85%	−1.19%	−1.30%	−1.83%	−0.94%	−1.28%	−1.45%	−1.96%
Bangladesh	−1.81%	−2.16%	−2.79%	−3.32%	−2.23%	−3.05%	−3.42%	−4.70%	−2.43%	−3.40%	−3.73%	−5.24%	−2.69%	−3.66%	−4.14%	−5.62%
Belgium	−1.34%	−1.59%	−2.06%	−2.45%	−1.64%	−2.25%	−2.52%	−3.46%	−1.79%	−2.51%	−2.75%	−3.86%	−1.99%	−2.70%	−3.05%	−4.15%
Bolivia	−3.26%	−3.88%	−5.02%	−5.97%	−4.00%	−5.49%	−6.16%	−8.45%	−4.37%	−6.13%	−6.72%	−9.43%	−4.85%	−6.58%	−7.46%	−10.12%
Brazil	−2.57%	−3.05%	−3.95%	−4.70%	−3.15%	−4.32%	−4.84%	−6.64%	−3.43%	−4.82%	−5.28%	−7.41%	−3.81%	−5.17%	−5.86%	−7.96%
Canada	−0.77%	−0.92%	−1.19%	−1.42%	−0.95%	−1.30%	−1.46%	−2.00%	−1.03%	−1.45%	−1.59%	−2.23%	−1.15%	−1.56%	−1.77%	−2.40%
Chile	−0.93%	−1.10%	−1.43%	−1.70%	−1.14%	−1.56%	−1.75%	−2.40%	−1.24%	−1.74%	−1.91%	−2.68%	−1.38%	−1.87%	−2.12%	−2.88%
China	−1.02%	−1.21%	−1.57%	−1.86%	−1.25%	−1.71%	−1.92%	−2.63%	−1.36%	−1.91%	−2.09%	−2.94%	−1.51%	−2.05%	−2.32%	−3.15%
Colombia	−1.75%	−2.08%	−2.69%	−3.20%	−2.14%	−2.94%	−3.30%	−4.53%	−2.34%	−3.28%	−3.60%	−5.05%	−2.60%	−3.52%	−3.99%	−5.42%
Costa Rica	−1.48%	−1.75%	−2.27%	−2.70%	−1.81%	−2.48%	−2.78%	−3.82%	−1.97%	−2.77%	−3.04%	−4.26%	−2.19%	−2.97%	−3.37%	−4.57%
Croatia	−1.69%	−2.01%	−2.60%	−3.09%	−2.07%	−2.84%	−3.19%	−4.37%	−2.26%	−3.17%	−3.48%	−4.87%	−2.51%	−3.40%	−3.86%	−5.23%
Czech Republic	−1.10%	−1.31%	−1.70%	−2.02%	−1.35%	−1.86%	−2.08%	−2.85%	−1.48%	−2.07%	−2.27%	−3.18%	−1.64%	−2.22%	−2.52%	−3.42%
Dominican Republic	−2.00%	−2.38%	−3.07%	−3.66%	−2.45%	−3.36%	−3.77%	−5.17%	−2.67%	−3.75%	−4.11%	−5.77%	−2.97%	−4.03%	−4.56%	−6.20%
Egypt	−2.29%	−2.72%	−3.52%	−4.19%	−2.81%	−3.85%	−4.32%	−5.93%	−3.06%	−4.30%	−4.71%	−6.61%	−3.40%	−4.61%	−5.23%	−7.10%
France	−0.85%	−1.01%	−1.31%	−1.56%	−1.04%	−1.43%	−1.61%	−2.20%	−1.14%	−1.60%	−1.75%	−2.46%	−1.26%	−1.71%	−1.94%	−2.64%
Germany	−0.72%	−0.85%	−1.10%	−1.31%	−0.88%	−1.21%	−1.35%	−1.86%	−0.96%	−1.35%	−1.48%	−2.07%	−1.06%	−1.45%	−1.64%	−2.22%
Greece	−1.97%	−2.34%	−3.03%	−3.60%	−2.41%	−3.31%	−3.72%	−5.10%	−2.63%	−3.69%	−4.05%	−5.68%	−2.92%	−3.97%	−4.50%	−6.10%
Hong Kong, SAR	−0.85%	−1.01%	−1.30%	−1.55%	−1.04%	−1.42%	−1.60%	−2.19%	−1.13%	−1.59%	−1.74%	−2.44%	−1.26%	−1.71%	−1.93%	−2.62%
Hungary	−1.45%	−1.72%	−2.23%	−2.65%	−1.78%	−2.44%	−2.73%	−3.75%	−1.94%	−2.72%	−2.98%	−4.18%	−2.15%	−2.92%	−3.31%	−4.49%
India	−1.64%	−1.95%	−2.52%	−2.99%	−2.01%	−2.75%	−3.09%	−4.24%	−2.19%	−3.07%	−3.37%	−4.72%	−2.43%	−3.30%	−3.74%	−5.07%
Indonesia	−2.02%	−2.40%	−3.10%	−3.69%	−2.47%	−3.39%	−3.80%	−5.22%	−2.70%	−3.78%	−4.15%	−5.82%	−2.99%	−4.06%	−4.60%	−6.25%
Ireland	−0.81%	−0.96%	−1.24%	−1.48%	−0.99%	−1.36%	−1.53%	−2.09%	−1.08%	−1.52%	−1.66%	−2.33%	−1.20%	−1.63%	−1.85%	−2.51%
Israel	−1.27%	−1.51%	−1.95%	−2.32%	−1.56%	−2.13%	−2.39%	−3.28%	−1.70%	−2.38%	−2.61%	−3.66%	−1.88%	−2.55%	−2.90%	−3.93%
Italy	−1.37%	−1.63%	−2.11%	−2.51%	−1.68%	−2.31%	−2.59%	−3.56%	−1.84%	−2.58%	−2.83%	−3.96%	−2.04%	−2.77%	−3.14%	−4.26%
Japan	−0.57%	−0.67%	−0.87%	−1.04%	−0.70%	−0.95%	−1.07%	−1.47%	−0.76%	−1.06%	−1.17%	−1.64%	−0.84%	−1.14%	−1.30%	−1.76%
Kazakhstan	−2.35%	−2.80%	−3.62%	−4.31%	−2.89%	−3.96%	−4.44%	−6.09%	−3.15%	−4.42%	−4.84%	−6.79%	−3.49%	−4.74%	−5.38%	−7.30%
Kenya	−2.37%	−2.82%	−3.64%	−4.33%	−2.91%	−3.99%	−4.47%	−6.13%	−3.17%	−4.45%	−4.88%	−6.84%	−3.52%	−4.77%	−5.41%	−7.34%
Malaysia	−1.78%	−2.12%	−2.74%	−3.26%	−2.18%	−3.00%	−3.36%	−4.61%	−2.38%	−3.34%	−3.66%	−5.14%	−2.64%	−3.59%	−4.07%	−5.52%
Mexico	−1.96%	−2.33%	−3.02%	−3.59%	−2.41%	−3.30%	−3.70%	−5.08%	−2.62%	−3.68%	−4.04%	−5.66%	−2.91%	−3.95%	−4.48%	−6.08%
New Zealand	−0.65%	−0.77%	−1.00%	−1.18%	−0.79%	−1.09%	−1.22%	−1.67%	−0.87%	−1.21%	−1.33%	−1.87%	−0.96%	−1.30%	−1.48%	−2.01%
Nigeria	−3.76%	−4.47%	−5.78%	−6.87%	−4.61%	−6.32%	−7.09%	−9.72%	−5.03%	−7.05%	−7.73%	−10.85%	−5.58%	−7.57%	−8.58%	−11.65%
Norway	−0.81%	−0.96%	−1.24%	−1.48%	−0.99%	−1.36%	−1.52%	−2.09%	−1.08%	−1.51%	−1.66%	−2.33%	−1.20%	−1.63%	−1.84%	−2.50%
Pakistan	−2.28%	−2.71%	−3.51%	−4.17%	−2.80%	−3.83%	−4.30%	−5.90%	−3.05%	−4.28%	−4.69%	−6.58%	−3.38%	−4.59%	−5.21%	−7.07%
Peru	−2.97%	−3.53%	−4.57%	−5.43%	−3.64%	−4.99%	−5.60%	−7.68%	−3.97%	−5.57%	−6.11%	−8.57%	−4.41%	−5.98%	−6.78%	−9.20%
Philippines	−1.94%	−2.30%	−2.98%	−3.55%	−2.38%	−3.26%	−3.66%	−5.02%	−2.59%	−3.64%	−3.99%	−5.60%	−2.88%	−3.91%	−4.43%	−6.01%
Poland	−1.22%	−1.45%	−1.88%	−2.24%	−1.50%	−2.06%	−2.31%	−3.17%	−1.64%	−2.30%	−2.52%	−3.53%	−1.82%	−2.47%	−2.79%	−3.79%
Portugal	−1.30%	−1.55%	−2.00%	−2.38%	−1.60%	−2.19%	−2.45%	−3.37%	−1.74%	−2.44%	−2.68%	−3.76%	−1.93%	−2.62%	−2.97%	−4.03%
Romania	−1.61%	−1.91%	−2.48%	−2.94%	−1.97%	−2.71%	−3.04%	−4.17%	−2.15%	−3.02%	−3.31%	−4.65%	−2.39%	−3.24%	−3.68%	−4.99%
Russian Federation	−2.41%	−2.87%	−3.71%	−4.41%	−2.96%	−4.06%	−4.55%	−6.25%	−3.23%	−4.53%	−4.97%	−6.97%	−3.58%	−4.86%	−5.51%	−7.48%
Saudi Arabia	−1.05%	−1.25%	−1.61%	−1.92%	−1.29%	−1.76%	−1.98%	−2.71%	−1.40%	−1.97%	−2.16%	−3.02%	−1.56%	−2.11%	−2.39%	−3.25%
Serbia	−2.39%	−2.84%	−3.68%	−4.37%	−2.93%	−4.02%	−4.51%	−6.19%	−3.20%	−4.48%	−4.92%	−6.90%	−3.55%	−4.82%	−5.46%	−7.41%
Singapore	−0.61%	−0.72%	−0.93%	−1.11%	−0.74%	−1.02%	−1.14%	−1.57%	−0.81%	−1.14%	−1.25%	−1.75%	−0.90%	−1.22%	−1.38%	−1.88%
South Africa	−1.58%	−1.87%	−2.42%	−2.88%	−1.93%	−2.65%	−2.97%	−4.08%	−2.11%	−2.96%	−3.24%	−4.55%	−2.34%	−3.17%	−3.60%	−4.88%
South Korea	−1.29%	−1.54%	−1.99%	−2.37%	−1.59%	−2.18%	−2.44%	−3.35%	−1.73%	−2.43%	−2.66%	−3.74%	−1.92%	−2.61%	−2.96%	−4.01%
Spain	−1.53%	−1.81%	−2.35%	−2.79%	−1.87%	−2.57%	−2.88%	−3.95%	−2.04%	−2.86%	−3.14%	−4.41%	−2.27%	−3.07%	−3.49%	−4.73%
Sri Lanka	−2.56%	−3.05%	−3.94%	−4.69%	−3.14%	−4.31%	−4.83%	−6.63%	−3.43%	−4.81%	−5.27%	−7.39%	−3.80%	−5.16%	−5.85%	−7.94%
Sweden	−0.75%	−0.89%	−1.15%	−1.37%	−0.92%	−1.26%	−1.41%	−1.94%	−1.00%	−1.41%	−1.54%	−2.16%	−1.11%	−1.51%	−1.71%	−2.32%
Switzerland	−0.60%	−0.72%	−0.93%	−1.11%	−0.74%	−1.02%	−1.14%	−1.57%	−0.81%	−1.13%	−1.24%	−1.75%	−0.90%	−1.22%	−1.38%	−1.87%
Taiwan	−1.97%	−2.34%	−3.03%	−3.60%	−2.42%	−3.32%	−3.72%	−5.10%	−2.64%	−3.70%	−4.06%	−5.69%	−2.93%	−3.97%	−4.50%	−6.11%
Thailand	−3.18%	−3.78%	−4.89%	−5.82%	−3.90%	−5.35%	−6.00%	−8.23%	−4.25%	−5.97%	−6.54%	−9.18%	−4.72%	−6.41%	−7.26%	−9.86%
The Netherlands	−0.66%	−0.79%	−1.02%	−1.21%	−0.81%	−1.11%	−1.25%	−1.71%	−0.88%	−1.24%	−1.36%	−1.91%	−0.98%	−1.33%	−1.51%	−2.05%
Turkey	−1.76%	−2.10%	−2.72%	−3.23%	−2.16%	−2.97%	−3.33%	−4.57%	−2.36%	−3.31%	−3.63%	−5.10%	−2.62%	−3.56%	−4.03%	−5.47%
Ukraine	−3.09%	−3.67%	−4.75%	−5.65%	−3.79%	−5.19%	−5.83%	−7.99%	−4.13%	−5.79%	−6.35%	−8.91%	−4.58%	−6.22%	−7.05%	−9.57%
United Arab Emirates	−1.55%	−1.84%	−2.38%	−2.84%	−1.90%	−2.61%	−2.92%	−4.01%	−2.07%	−2.91%	−3.19%	−4.47%	−2.30%	−3.12%	−3.54%	−4.80%
United Kingdom	−0.67%	−0.79%	−1.02%	−1.22%	−0.82%	−1.12%	−1.26%	−1.72%	−0.89%	−1.25%	−1.37%	−1.92%	−0.99%	−1.34%	−1.52%	−2.06%
United States	−0.56%	−0.67%	−0.87%	−1.03%	−0.69%	−0.95%	−1.06%	−1.46%	−0.75%	−1.06%	−1.16%	−1.62%	−0.84%	−1.13%	−1.28%	−1.74%
Uruguay	−1.75%	−2.08%	−2.69%	−3.20%	−2.15%	−2.95%	−3.30%	−4.53%	−2.34%	−3.29%	−3.60%	−5.06%	−2.60%	−3.53%	−4.00%	−5.43%
Venezuela	−2.42%	−2.88%	−3.73%	−4.43%	−2.97%	−4.08%	−4.57%	−6.27%	−3.24%	−4.55%	−4.99%	−7.00%	−3.60%	−4.88%	−5.53%	−7.51%
Vietnam	−1.61%	−1.91%	−2.48%	−2.95%	−1.98%	−2.71%	−3.04%	−4.17%	−2.15%	−3.02%	−3.31%	−4.65%	−2.39%	−3.25%	−3.68%	−4.99%

Note: IE is informal economy.

Sources: Prof. Dr. F. Schneider; A.T. Kearney analysis

Appendix 8: Five-Year Cumulative Effect on GDP from Increasing Digital Payments for 60 Markets (change in percentage points)

	5% increase in number of digital payments per capita				10% increase in number of digital payments per capita				15% increase in number of digital payments per capita				20% increase in number of digital payments per capita			
	Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound	
Market	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level
Argentina	1.30%	1.57%	2.01%	2.42%	1.62%	2.28%	2.50%	3.52%	1.78%	2.57%	2.75%	3.98%	1.99%	2.78%	3.07%	4.31%
Australia	0.46%	0.56%	0.72%	0.86%	0.58%	0.81%	0.89%	1.25%	0.63%	0.91%	0.97%	1.41%	0.71%	0.99%	1.09%	1.52%
Bangladesh	1.34%	1.60%	2.06%	2.48%	1.66%	2.33%	2.56%	3.61%	1.82%	2.63%	2.81%	4.07%	2.04%	2.85%	3.15%	4.41%
Belgium	0.98%	1.18%	1.52%	1.82%	1.22%	1.72%	1.88%	2.65%	1.34%	1.93%	2.07%	2.99%	1.50%	2.09%	2.31%	3.24%
Bolivia	2.41%	2.90%	3.73%	4.49%	3.00%	4.23%	4.65%	6.57%	3.29%	4.78%	5.10%	7.42%	3.69%	5.17%	5.72%	8.05%
Brazil	1.89%	2.28%	2.93%	3.52%	2.35%	3.31%	3.64%	5.13%	2.58%	3.74%	4.00%	5.80%	2.89%	4.05%	4.47%	6.28%
Canada	0.57%	0.68%	0.87%	1.05%	0.70%	0.99%	1.09%	1.53%	0.77%	1.12%	1.19%	1.72%	0.86%	1.21%	1.33%	1.86%
Chile	0.68%	0.82%	1.05%	1.26%	0.85%	1.19%	1.30%	1.83%	0.93%	1.34%	1.43%	2.07%	1.04%	1.45%	1.60%	2.24%
China	0.75%	0.90%	1.15%	1.38%	0.93%	1.30%	1.43%	2.01%	1.02%	1.47%	1.57%	2.27%	1.14%	1.59%	1.75%	2.45%
Colombia	1.29%	1.55%	1.99%	2.39%	1.60%	2.25%	2.47%	3.47%	1.75%	2.53%	2.71%	3.92%	1.96%	2.74%	3.03%	4.25%
Costa Rica	1.09%	1.30%	1.67%	2.01%	1.35%	1.89%	2.08%	2.93%	1.48%	2.14%	2.28%	3.30%	1.65%	2.31%	2.55%	3.57%
Croatia	1.24%	1.49%	1.92%	2.30%	1.54%	2.17%	2.38%	3.35%	1.69%	2.45%	2.61%	3.78%	1.89%	2.65%	2.93%	4.10%
Czech Republic	0.81%	0.97%	1.25%	1.50%	1.01%	1.41%	1.55%	2.18%	1.10%	1.59%	1.70%	2.46%	1.23%	1.72%	1.90%	2.66%
Dominican Republic	1.47%	1.77%	2.27%	2.73%	1.83%	2.57%	2.82%	3.98%	2.01%	2.90%	3.10%	4.49%	2.24%	3.14%	3.47%	4.87%
Egypt	1.69%	2.03%	2.61%	3.13%	2.10%	2.95%	3.24%	4.57%	2.30%	3.33%	3.56%	5.16%	2.57%	3.61%	3.98%	5.59%
France	0.62%	0.75%	0.96%	1.16%	0.78%	1.09%	1.19%	1.68%	0.85%	1.23%	1.31%	1.89%	0.95%	1.33%	1.47%	2.05%
Germany	0.53%	0.63%	0.81%	0.97%	0.65%	0.92%	1.01%	1.41%	0.72%	1.03%	1.10%	1.59%	0.80%	1.12%	1.23%	1.73%
Greece	1.45%	1.74%	2.24%	2.69%	1.80%	2.53%	2.78%	3.92%	1.98%	2.86%	3.05%	4.42%	2.21%	3.09%	3.42%	4.79%
Hong Kong, SAR	0.62%	0.75%	0.96%	1.15%	0.77%	1.08%	1.19%	1.67%	0.85%	1.22%	1.30%	1.88%	0.95%	1.32%	1.46%	2.04%
Hungary	1.07%	1.28%	1.64%	1.97%	1.32%	1.86%	2.04%	2.87%	1.45%	2.10%	2.24%	3.24%	1.62%	2.27%	2.51%	3.51%
India	1.20%	1.45%	1.86%	2.23%	1.49%	2.10%	2.31%	3.25%	1.64%	2.37%	2.53%	3.67%	1.83%	2.57%	2.83%	3.97%
Indonesia	1.48%	1.78%	2.29%	2.75%	1.84%	2.59%	2.85%	4.01%	2.02%	2.93%	3.13%	4.53%	2.26%	3.17%	3.50%	4.91%
Ireland	0.59%	0.71%	0.91%	1.10%	0.74%	1.03%	1.13%	1.60%	0.81%	1.17%	1.25%	1.80%	0.90%	1.26%	1.39%	1.95%
Israel	0.93%	1.12%	1.44%	1.73%	1.16%	1.63%	1.78%	2.51%	1.27%	1.83%	1.96%	2.83%	1.42%	1.98%	2.19%	3.07%
Italy	1.01%	1.21%	1.56%	1.87%	1.25%	1.76%	1.93%	2.72%	1.38%	1.99%	2.12%	3.07%	1.54%	2.15%	2.37%	3.32%
Japan	0.42%	0.50%	0.64%	0.77%	0.52%	0.73%	0.80%	1.12%	0.57%	0.82%	0.87%	1.26%	0.63%	0.88%	0.98%	1.36%
Kazakhstan	1.74%	2.09%	2.68%	3.22%	2.16%	3.04%	3.33%	4.70%	2.37%	3.42%	3.66%	5.31%	2.65%	3.71%	4.10%	5.75%
Kenya	1.75%	2.10%	2.70%	3.24%	2.17%	3.06%	3.35%	4.73%	2.38%	3.45%	3.68%	5.34%	2.67%	3.73%	4.12%	5.79%
Malaysia	1.31%	1.57%	2.02%	2.43%	1.63%	2.29%	2.51%	3.54%	1.79%	2.58%	2.76%	3.99%	2.00%	2.80%	3.09%	4.33%
Mexico	1.45%	1.74%	2.23%	2.68%	1.79%	2.53%	2.77%	3.91%	1.97%	2.85%	3.04%	4.41%	2.20%	3.08%	3.41%	4.78%
New Zealand	0.47%	0.57%	0.73%	0.88%	0.59%	0.83%	0.91%	1.27%	0.65%	0.93%	1.00%	1.44%	0.72%	1.01%	1.11%	1.55%
Nigeria	2.78%	3.35%	4.30%	5.18%	3.46%	4.88%	5.36%	7.58%	3.80%	5.51%	5.89%	8.58%	4.25%	5.97%	6.60%	9.30%
Norway	0.59%	0.71%	0.91%	1.10%	0.74%	1.03%	1.13%	1.59%	0.81%	1.16%	1.24%	1.80%	0.90%	1.26%	1.39%	1.94%
Pakistan	1.68%	2.02%	2.59%	3.12%	2.09%	2.94%	3.22%	4.55%	2.29%	3.31%	3.54%	5.14%	2.56%	3.59%	3.96%	5.56%
Peru	2.19%	2.64%	3.39%	4.08%	2.72%	3.84%	4.22%	5.95%	2.99%	4.33%	4.63%	6.73%	3.35%	4.69%	5.19%	7.29%
Philippines	1.43%	1.71%	2.20%	2.65%	1.77%	2.49%	2.74%	3.86%	1.95%	2.81%	3.01%	4.35%	2.18%	3.05%	3.36%	4.72%
Poland	0.90%	1.08%	1.39%	1.67%	1.12%	1.57%	1.72%	2.42%	1.22%	1.77%	1.89%	2.73%	1.37%	1.91%	2.11%	2.96%
Portugal	0.96%	1.15%	1.47%	1.77%	1.19%	1.67%	1.83%	2.58%	1.30%	1.88%	2.01%	2.91%	1.46%	2.04%	2.25%	3.15%
Romania	1.18%	1.42%	1.83%	2.20%	1.47%	2.07%	2.27%	3.20%	1.61%	2.33%	2.49%	3.61%	1.80%	2.52%	2.79%	3.90%
Russian Federation	1.78%	2.14%	2.75%	3.30%	2.21%	3.11%	3.42%	4.82%	2.43%	3.51%	3.75%	5.44%	2.71%	3.80%	4.20%	5.90%
Saudi Arabia	0.77%	0.92%	1.19%	1.42%	0.96%	1.34%	1.47%	2.07%	1.05%	1.51%	1.62%	2.34%	1.17%	1.64%	1.81%	2.53%
Serbia	1.76%	2.12%	2.72%	3.27%	2.19%	3.08%	3.38%	4.77%	2.40%	3.48%	3.72%	5.39%	2.69%	3.77%	4.16%	5.84%
Singapore	0.44%	0.53%	0.68%	0.82%	0.55%	0.77%	0.85%	1.19%	0.60%	0.87%	0.93%	1.34%	0.68%	0.94%	1.04%	1.45%
South Africa	1.16%	1.39%	1.79%	2.15%	1.44%	2.02%	2.22%	3.13%	1.58%	2.28%	2.44%	3.53%	1.77%	2.47%	2.73%	3.82%
South Korea	0.95%	1.14%	1.47%	1.76%	1.18%	1.66%	1.82%	2.56%	1.30%	1.87%	2.00%	2.89%	1.45%	2.03%	2.24%	3.13%
Spain	1.12%	1.35%	1.73%	2.08%	1.39%	1.96%	2.15%	3.03%	1.53%	2.21%	2.36%	3.42%	1.71%	2.39%	2.64%	3.70%
Sri Lanka	1.89%	2.27%	2.92%	3.51%	2.35%	3.31%	3.63%	5.12%	2.58%	3.73%	3.99%	5.79%	2.88%	4.04%	4.46%	6.27%
Sweden	0.55%	0.66%	0.85%	1.02%	0.68%	0.96%	1.05%	1.48%	0.75%	1.08%	1.15%	1.67%	0.84%	1.17%	1.29%	1.80%
Switzerland	0.44%	0.53%	0.68%	0.82%	0.55%	0.77%	0.85%	1.19%	0.60%	0.87%	0.93%	1.34%	0.68%	0.94%	1.04%	1.45%
Taiwan	1.45%	1.74%	2.24%	2.69%	1.80%	2.54%	2.78%	3.92%	1.98%	2.86%	3.06%	4.43%	2.21%	3.10%	3.42%	4.80%
Thailand	2.35%	2.83%	3.63%	4.37%	2.92%	4.12%	4.52%	6.39%	3.21%	4.65%	4.97%	7.22%	3.59%	5.03%	5.56%	7.83%
The Netherlands	0.49%	0.58%	0.75%	0.90%	0.60%	0.85%	0.93%	1.30%	0.66%	0.95%	1.02%	1.47%	0.74%	1.03%	1.14%	1.59%
Turkey	1.30%	1.56%	2.00%	2.41%	1.61%	2.27%	2.49%	3.51%	1.77%	2.56%	2.73%	3.96%	1.98%	2.77%	3.06%	4.29%
Ukraine	2.28%	2.74%	3.53%	4.24%	2.84%	4.00%	4.39%	6.20%	3.11%	4.51%	4.82%	7.01%	3.48%	4.89%	5.40%	7.59%
United Arab Emirates	1.14%	1.37%	1.76%	2.11%	1.42%	1.99%	2.18%	3.08%	1.55%	2.24%	2.40%	3.47%	1.74%	2.43%	2.68%	3.76%
United Kingdom	0.49%	0.59%	0.75%	0.90%	0.61%	0.85%	0.93%	1.31%	0.67%	0.96%	1.02%	1.48%	0.74%	1.04%	1.15%	1.60%
United States	0.41%	0.50%	0.64%	0.76%	0.51%	0.72%	0.79%	1.11%	0.56%	0.81%	0.87%	1.25%	0.63%	0.88%	0.97%	1.35%
Uruguay	1.29%	1.55%	1.99%	2.39%	1.60%	2.25%	2.47%	3.48%	1.76%	2.54%	2.71%	3.93%	1.96%	2.75%	3.03%	4.25%
Venezuela	1.79%	2.15%	2.76%	3.32%	2.22%	3.13%	3.43%	4.84%	2.44%	3.53%	3.77%	5.47%	2.73%	3.82%	4.22%	5.92%
Vietnam	1.18%	1.42%	1.83%	2.20%	1.47%	2.07%	2.27%	3.20%	1.61%	2.33%	2.49%	3.61%	1.81%	2.53%	2.79%	3.91%

Note: IE is informal economy.

Sources: Prof. Dr. F. Schneider; A.T. Kearney analysis

Appendix 9: Five-Year Cumulative Effect on Tax Revenue from Increasing Digital Payments for 60 Markets (change in percentage points)

	5% increase in number of digital payments per capita				10% increase in number of digital payments per capita				15% increase in number of digital payments per capita				20% increase in number of digital payments per capita			
	Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound	
Market	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level
Argentina	0.37%	0.44%	0.56%	0.68%	0.45%	0.64%	0.70%	0.99%	0.50%	0.72%	0.77%	1.11%	0.56%	0.78%	0.86%	1.21%
Australia	0.16%	0.20%	0.25%	0.30%	0.20%	0.28%	0.31%	0.44%	0.22%	0.32%	0.34%	0.49%	0.25%	0.35%	0.38%	0.53%
Bangladesh	0.32%	0.39%	0.49%	0.59%	0.40%	0.56%	0.61%	0.87%	0.44%	0.63%	0.67%	0.98%	0.49%	0.68%	0.76%	1.06%
Belgium	0.34%	0.41%	0.53%	0.64%	0.43%	0.60%	0.66%	0.93%	0.47%	0.68%	0.72%	1.05%	0.52%	0.73%	0.81%	1.13%
Bolivia	0.58%	0.70%	0.90%	1.08%	0.72%	1.02%	1.11%	1.58%	0.79%	1.15%	1.23%	1.78%	0.89%	1.24%	1.37%	1.93%
Brazil	0.53%	0.64%	0.82%	0.99%	0.66%	0.93%	1.02%	1.44%	0.72%	1.05%	1.12%	1.62%	0.81%	1.13%	1.25%	1.76%
Canada	0.20%	0.24%	0.31%	0.37%	0.25%	0.35%	0.38%	0.53%	0.27%	0.39%	0.42%	0.60%	0.30%	0.42%	0.47%	0.65%
Chile	0.24%	0.29%	0.37%	0.44%	0.30%	0.42%	0.46%	0.64%	0.32%	0.47%	0.50%	0.72%	0.36%	0.51%	0.56%	0.78%
China	0.21%	0.25%	0.32%	0.39%	0.26%	0.36%	0.40%	0.56%	0.28%	0.41%	0.44%	0.63%	0.32%	0.45%	0.49%	0.69%
Colombia	0.36%	0.43%	0.56%	0.67%	0.45%	0.63%	0.69%	0.97%	0.49%	0.71%	0.76%	1.10%	0.55%	0.77%	0.85%	1.19%
Costa Rica	0.30%	0.36%	0.47%	0.56%	0.38%	0.53%	0.58%	0.82%	0.41%	0.60%	0.64%	0.92%	0.46%	0.65%	0.71%	1.00%
Croatia	0.43%	0.52%	0.67%	0.81%	0.54%	0.76%	0.83%	1.17%	0.59%	0.86%	0.91%	1.32%	0.66%	0.93%	1.02%	1.43%
Czech Republic	0.28%	0.34%	0.44%	0.52%	0.35%	0.49%	0.54%	0.76%	0.39%	0.56%	0.60%	0.86%	0.43%	0.60%	0.67%	0.93%
Dominican Republic	0.41%	0.50%	0.64%	0.76%	0.51%	0.72%	0.79%	1.11%	0.56%	0.81%	0.87%	1.26%	0.63%	0.88%	0.97%	1.36%
Egypt	0.41%	0.49%	0.63%	0.75%	0.50%	0.71%	0.78%	1.10%	0.55%	0.80%	0.85%	1.24%	0.62%	0.87%	0.96%	1.34%
France	0.22%	0.26%	0.34%	0.40%	0.27%	0.38%	0.42%	0.59%	0.30%	0.43%	0.46%	0.66%	0.33%	0.46%	0.51%	0.72%
Germany	0.18%	0.22%	0.28%	0.34%	0.23%	0.32%	0.35%	0.49%	0.25%	0.36%	0.39%	0.56%	0.28%	0.39%	0.43%	0.60%
Greece	0.51%	0.61%	0.78%	0.94%	0.63%	0.89%	0.97%	1.37%	0.69%	1.00%	1.07%	1.55%	0.77%	1.08%	1.20%	1.68%
Hong Kong, SAR	0.22%	0.26%	0.34%	0.40%	0.27%	0.38%	0.42%	0.58%	0.30%	0.43%	0.46%	0.66%	0.33%	0.46%	0.51%	0.71%
Hungary	0.37%	0.45%	0.57%	0.69%	0.46%	0.65%	0.71%	1.01%	0.51%	0.73%	0.78%	1.13%	0.57%	0.79%	0.88%	1.23%
India	0.29%	0.35%	0.45%	0.54%	0.36%	0.50%	0.55%	0.78%	0.39%	0.57%	0.61%	0.88%	0.44%	0.62%	0.68%	0.95%
Indonesia	0.36%	0.43%	0.55%	0.66%	0.44%	0.62%	0.68%	0.96%	0.49%	0.70%	0.75%	1.09%	0.54%	0.76%	0.84%	1.18%
Ireland	0.21%	0.25%	0.32%	0.38%	0.26%	0.36%	0.40%	0.56%	0.28%	0.41%	0.44%	0.63%	0.32%	0.44%	0.49%	0.68%
Israel	0.33%	0.39%	0.50%	0.60%	0.40%	0.57%	0.62%	0.88%	0.44%	0.64%	0.69%	0.99%	0.50%	0.69%	0.77%	1.07%
Italy	0.35%	0.42%	0.54%	0.65%	0.44%	0.62%	0.68%	0.95%	0.48%	0.70%	0.74%	1.07%	0.54%	0.75%	0.83%	1.16%
Japan	0.15%	0.17%	0.22%	0.27%	0.18%	0.25%	0.28%	0.39%	0.20%	0.29%	0.31%	0.44%	0.22%	0.31%	0.34%	0.48%
Kazakhstan	0.49%	0.58%	0.75%	0.90%	0.60%	0.85%	0.93%	1.32%	0.66%	0.96%	1.02%	1.49%	0.74%	1.04%	1.15%	1.61%
Kenya	0.42%	0.50%	0.65%	0.78%	0.52%	0.73%	0.80%	1.14%	0.57%	0.83%	0.88%	1.28%	0.64%	0.90%	0.99%	1.39%
Malaysia	0.37%	0.44%	0.57%	0.68%	0.46%	0.64%	0.70%	0.99%	0.50%	0.72%	0.77%	1.12%	0.56%	0.78%	0.86%	1.21%
Mexico	0.35%	0.42%	0.54%	0.64%	0.43%	0.61%	0.67%	0.94%	0.47%	0.68%	0.73%	1.06%	0.53%	0.74%	0.82%	1.15%
New Zealand	0.17%	0.20%	0.26%	0.31%	0.21%	0.29%	0.32%	0.45%	0.23%	0.33%	0.35%	0.50%	0.25%	0.35%	0.39%	0.54%
Nigeria	0.67%	0.80%	1.03%	1.24%	0.83%	1.17%	1.29%	1.82%	0.91%	1.32%	1.41%	2.06%	1.02%	1.43%	1.58%	2.23%
Norway	0.21%	0.25%	0.32%	0.38%	0.26%	0.36%	0.40%	0.56%	0.28%	0.41%	0.44%	0.63%	0.32%	0.44%	0.49%	0.68%
Pakistan	0.40%	0.48%	0.62%	0.75%	0.50%	0.71%	0.77%	1.09%	0.55%	0.80%	0.85%	1.23%	0.62%	0.86%	0.95%	1.34%
Peru	0.61%	0.74%	0.95%	1.14%	0.76%	1.07%	1.18%	1.67%	0.84%	1.21%	1.30%	1.88%	0.94%	1.31%	1.45%	2.04%
Philippines	0.34%	0.41%	0.53%	0.64%	0.43%	0.60%	0.66%	0.93%	0.47%	0.68%	0.72%	1.04%	0.52%	0.73%	0.81%	1.13%
Poland	0.31%	0.38%	0.49%	0.58%	0.39%	0.55%	0.60%	0.85%	0.43%	0.62%	0.66%	0.96%	0.48%	0.67%	0.74%	1.03%
Portugal	0.33%	0.40%	0.52%	0.62%	0.42%	0.58%	0.64%	0.90%	0.46%	0.66%	0.70%	1.02%	0.51%	0.71%	0.79%	1.10%
Romania	0.33%	0.40%	0.51%	0.61%	0.41%	0.58%	0.64%	0.89%	0.45%	0.65%	0.70%	1.01%	0.51%	0.71%	0.78%	1.09%
Russian Federation	0.43%	0.51%	0.66%	0.79%	0.53%	0.75%	0.82%	1.16%	0.58%	0.84%	0.90%	1.31%	0.65%	0.91%	1.01%	1.42%
Saudi Arabia	0.27%	0.32%	0.42%	0.50%	0.33%	0.47%	0.52%	0.72%	0.37%	0.53%	0.57%	0.82%	0.41%	0.57%	0.63%	0.88%
Serbia	0.49%	0.59%	0.76%	0.92%	0.61%	0.86%	0.95%	1.34%	0.67%	0.97%	1.04%	1.51%	0.75%	1.05%	1.16%	1.64%
Singapore	0.12%	0.15%	0.19%	0.23%	0.15%	0.22%	0.24%	0.33%	0.17%	0.24%	0.26%	0.38%	0.19%	0.26%	0.29%	0.41%
South Africa	0.32%	0.39%	0.50%	0.60%	0.40%	0.57%	0.62%	0.88%	0.44%	0.64%	0.68%	0.99%	0.49%	0.69%	0.76%	1.07%
South Korea	0.27%	0.32%	0.41%	0.49%	0.33%	0.46%	0.51%	0.72%	0.36%	0.52%	0.56%	0.81%	0.41%	0.57%	0.63%	0.88%
Spain	0.39%	0.47%	0.61%	0.73%	0.49%	0.69%	0.75%	1.06%	0.54%	0.77%	0.83%	1.20%	0.60%	0.84%	0.92%	1.29%
Sri Lanka	0.45%	0.55%	0.70%	0.84%	0.56%	0.79%	0.87%	1.23%	0.62%	0.90%	0.96%	1.39%	0.69%	0.97%	1.07%	1.50%
Sweden	0.19%	0.23%	0.30%	0.36%	0.24%	0.34%	0.37%	0.52%	0.26%	0.38%	0.40%	0.58%	0.29%	0.41%	0.45%	0.63%
Switzerland	0.16%	0.19%	0.24%	0.29%	0.19%	0.27%	0.30%	0.42%	0.21%	0.30%	0.33%	0.47%	0.24%	0.33%	0.36%	0.51%
Taiwan	0.51%	0.61%	0.78%	0.94%	0.63%	0.89%	0.97%	1.37%	0.69%	1.00%	1.07%	1.55%	0.77%	1.08%	1.20%	1.68%
Thailand	0.66%	0.79%	1.02%	1.22%	0.82%	1.15%	1.27%	1.79%	0.90%	1.30%	1.39%	2.02%	1.01%	1.41%	1.56%	2.19%
The Netherlands	0.17%	0.20%	0.26%	0.31%	0.21%	0.30%	0.32%	0.46%	0.23%	0.33%	0.36%	0.51%	0.26%	0.36%	0.40%	0.56%
Turkey	0.36%	0.44%	0.56%	0.67%	0.45%	0.64%	0.70%	0.98%	0.50%	0.72%	0.77%	1.11%	0.55%	0.78%	0.86%	1.20%
Ukraine	0.55%	0.66%	0.85%	1.02%	0.68%	0.96%	1.05%	1.49%	0.75%	1.08%	1.16%	1.68%	0.84%	1.17%	1.30%	1.82%
United Arab Emirates	0.40%	0.48%	0.62%	0.74%	0.50%	0.70%	0.76%	1.08%	0.54%	0.79%	0.84%	1.21%	0.61%	0.85%	0.94%	1.32%
United Kingdom	0.17%	0.21%	0.26%	0.32%	0.21%	0.30%	0.33%	0.46%	0.23%	0.34%	0.36%	0.52%	0.26%	0.36%	0.40%	0.56%
United States	0.14%	0.17%	0.22%	0.27%	0.18%	0.25%	0.28%	0.39%	0.20%	0.28%	0.30%	0.44%	0.22%	0.31%	0.34%	0.47%
Uruguay	0.36%	0.43%	0.56%	0.67%	0.45%	0.63%	0.69%	0.97%	0.49%	0.71%	0.76%	1.10%	0.55%	0.77%	0.85%	1.19%
Venezuela	0.50%	0.60%	0.77%	0.93%	0.62%	0.88%	0.96%	1.36%	0.68%	0.99%	1.06%	1.53%	0.76%	1.07%	1.18%	1.66%
Vietnam	0.28%	0.34%	0.44%	0.53%	0.35%	0.50%	0.54%	0.77%	0.39%	0.56%	0.60%	0.87%	0.43%	0.61%	0.67%	0.94%

Note: IE is informal economy.

Sources: Prof. Dr. F. Schneider; A.T. Kearney analysis

Appendix 10: Five-Year Cumulative Effect on Tax Revenue by Type from Increasing Digital Payments in 10 Focus Countries (change in percentage points)

Country	5% increase in number of digital payments per capita				10% increase in number of digital payments per capita				15% increase in number of digital payments per capita				20% increase in number of digital payments per capita			
	Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound		Lower IE bound		Upper IE bound	
	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level	Lower confidence level	Upper confidence level
Impact on personal income tax																
Australia	0.06%	0.07%	0.09%	0.11%	0.07%	0.10%	0.11%	0.15%	0.08%	0.11%	0.12%	0.17%	0.09%	0.12%	0.13%	0.19%
Brazil	0.04%	0.05%	0.07%	0.08%	0.05%	0.08%	0.08%	0.12%	0.06%	0.09%	0.09%	0.13%	0.07%	0.09%	0.10%	0.15%
China	0.01%	0.01%	0.02%	0.02%	0.01%	0.02%	0.02%	0.03%	0.02%	0.02%	0.02%	0.03%	0.02%	0.02%	0.03%	0.04%
India	0.06%	0.07%	0.09%	0.11%	0.07%	0.10%	0.11%	0.15%	0.08%	0.11%	0.12%	0.17%	0.09%	0.12%	0.13%	0.19%
Italy	0.10%	0.12%	0.15%	0.18%	0.12%	0.17%	0.19%	0.27%	0.14%	0.20%	0.21%	0.30%	0.15%	0.21%	0.23%	0.33%
Kenya	0.11%	0.13%	0.16%	0.20%	0.13%	0.18%	0.20%	0.29%	0.14%	0.21%	0.22%	0.32%	0.16%	0.23%	0.25%	0.35%
Nigeria	0.03%	0.04%	0.05%	0.06%	0.04%	0.06%	0.07%	0.09%	0.05%	0.07%	0.07%	0.11%	0.05%	0.07%	0.08%	0.11%
Poland	0.05%	0.06%	0.08%	0.10%	0.07%	0.09%	0.10%	0.14%	0.07%	0.11%	0.11%	0.16%	0.08%	0.11%	0.13%	0.18%
Russian Federation	0.06%	0.07%	0.09%	0.11%	0.07%	0.10%	0.11%	0.16%	0.08%	0.12%	0.12%	0.18%	0.09%	0.13%	0.14%	0.19%
United States	0.06%	0.07%	0.17%	0.11%	0.07%	0.10%	0.21%	0.16%	0.08%	0.12%	0.23%	0.18%	0.09%	0.13%	0.26%	0.19%
Impact on corporate tax																
Australia	0.02%	0.03%	0.04%	0.04%	0.03%	0.04%	0.04%	0.06%	0.03%	0.04%	0.05%	0.07%	0.03%	0.05%	0.05%	0.07%
Brazil	0.05%	0.06%	0.07%	0.09%	0.06%	0.08%	0.09%	0.13%	0.07%	0.10%	0.10%	0.15%	0.07%	0.10%	0.11%	0.16%
China	0.04%	0.05%	0.06%	0.07%	0.05%	0.07%	0.07%	0.10%	0.05%	0.08%	0.08%	0.12%	0.06%	0.08%	0.09%	0.13%
India	0.10%	0.12%	0.15%	0.18%	0.12%	0.17%	0.19%	0.26%	0.13%	0.19%	0.21%	0.30%	0.15%	0.21%	0.23%	0.32%
Italy	0.02%	0.02%	0.03%	0.03%	0.02%	0.03%	0.03%	0.04%	0.02%	0.03%	0.03%	0.05%	0.03%	0.04%	0.04%	0.05%
Kenya	0.09%	0.10%	0.13%	0.16%	0.11%	0.15%	0.17%	0.23%	0.12%	0.17%	0.18%	0.26%	0.13%	0.18%	0.20%	0.29%
Nigeria	0.14%	0.17%	0.22%	0.27%	0.18%	0.25%	0.27%	0.39%	0.19%	0.28%	0.30%	0.44%	0.22%	0.31%	0.34%	0.48%
Poland	0.02%	0.03%	0.03%	0.04%	0.03%	0.04%	0.04%	0.06%	0.03%	0.04%	0.04%	0.06%	0.03%	0.04%	0.05%	0.07%
Russian Federation	0.06%	0.07%	0.09%	0.10%	0.07%	0.10%	0.11%	0.15%	0.08%	0.11%	0.12%	0.17%	0.09%	0.12%	0.13%	0.18%
United States	0.01%	0.01%	0.04%	0.02%	0.02%	0.02%	0.04%	0.03%	0.02%	0.02%	0.05%	0.04%	0.02%	0.03%	0.05%	0.04%
Impact on value-added tax																
Australia	0.04%	0.05%	0.06%	0.07%	0.05%	0.07%	0.08%	0.11%	0.05%	0.08%	0.08%	0.12%	0.06%	0.09%	0.09%	0.13%
Brazil	0.24%	0.29%	0.37%	0.45%	0.30%	0.42%	0.46%	0.65%	0.33%	0.48%	0.51%	0.74%	0.37%	0.51%	0.57%	0.80%
China	0.13%	0.15%	0.19%	0.23%	0.16%	0.22%	0.24%	0.34%	0.17%	0.25%	0.27%	0.38%	0.19%	0.27%	0.30%	0.42%
India	0.09%	0.11%	0.14%	0.17%	0.11%	0.16%	0.17%	0.24%	0.12%	0.18%	0.19%	0.27%	0.14%	0.19%	0.21%	0.30%
Italy	0.10%	0.12%	0.16%	0.19%	0.13%	0.18%	0.19%	0.27%	0.14%	0.20%	0.21%	0.31%	0.15%	0.22%	0.24%	0.33%
Kenya	0.15%	0.18%	0.23%	0.28%	0.19%	0.26%	0.29%	0.41%	0.21%	0.30%	0.32%	0.46%	0.23%	0.32%	0.36%	0.50%
Nigeria	0.11%	0.13%	0.17%	0.20%	0.13%	0.19%	0.21%	0.29%	0.15%	0.21%	0.23%	0.33%	0.16%	0.23%	0.26%	0.36%
Poland	0.13%	0.16%	0.21%	0.25%	0.17%	0.24%	0.26%	0.36%	0.18%	0.26%	0.28%	0.41%	0.21%	0.29%	0.32%	0.44%
Russian Federation	0.12%	0.14%	0.18%	0.22%	0.15%	0.21%	0.23%	0.32%	0.16%	0.23%	0.25%	0.36%	0.18%	0.25%	0.28%	0.39%
United States	0.02%	0.03%	0.07%	0.04%	0.03%	0.04%	0.08%	0.06%	0.03%	0.05%	0.09%	0.07%	0.04%	0.05%	0.10%	0.08%
Impact on social security																
Australia	0.02%	0.03%	0.04%	0.04%	0.03%	0.04%	0.05%	0.07%	0.03%	0.05%	0.05%	0.07%	0.04%	0.05%	0.06%	0.08%
Brazil	0.15%	0.18%	0.24%	0.28%	0.19%	0.27%	0.29%	0.41%	0.21%	0.30%	0.32%	0.47%	0.23%	0.33%	0.36%	0.51%
China	0.01%	0.01%	0.02%	0.02%	0.01%	0.02%	0.02%	0.03%	0.01%	0.02%	0.02%	0.03%	0.01%	0.02%	0.02%	0.03%
India	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Italy	0.11%	0.13%	0.17%	0.20%	0.14%	0.19%	0.21%	0.30%	0.15%	0.22%	0.23%	0.33%	0.17%	0.23%	0.26%	0.36%
Kenya	0.03%	0.04%	0.05%	0.06%	0.04%	0.06%	0.07%	0.09%	0.05%	0.07%	0.07%	0.11%	0.05%	0.07%	0.08%	0.12%
Nigeria	0.15%	0.18%	0.24%	0.29%	0.19%	0.27%	0.30%	0.42%	0.21%	0.30%	0.33%	0.47%	0.23%	0.33%	0.36%	0.51%
Poland	0.09%	0.11%	0.14%	0.16%	0.11%	0.15%	0.17%	0.24%	0.12%	0.17%	0.18%	0.27%	0.13%	0.19%	0.21%	0.29%
Russian Federation	0.10%	0.12%	0.15%	0.18%	0.12%	0.17%	0.18%	0.26%	0.13%	0.19%	0.20%	0.29%	0.15%	0.20%	0.23%	0.32%
United States	0.03%	0.04%	0.09%	0.06%	0.04%	0.06%	0.12%	0.09%	0.04%	0.06%	0.13%	0.10%	0.05%	0.07%	0.14%	0.11%

Note: IE is informal economy.
Sources: Prof. Dr. F. Schneider; A.T. Kearney analysis

Appendix 11: Suggested Further Reading

"Implausible Large Differences in the Sizes of Underground Economies in Highly Developed European Countries? A Comparison of Different Estimation Methods" by Friedrich Schneider, 2016 (revised in 2017)

"Estimating the Size of the Shadow Economy: Methods, Problems and Open Questions" by Friedrich Schneider and Andreas Buehn, 2016

"Informal and Underground Economy" by Bruno Frey and Friedrich Schneider, 2000

"The Economics of the Informal Sector: a Simple Model and Some Empirical Evidence from Latin America" by Norman A. Loayza, 1997

Cheating the Government: The Economics of Evasion by Frank A. Cowell, 1990

"World Underneath: The Origins, Dynamics, and Effects of the Informal Economy" by Manuel Castells and Alejandro Portes, 1989

Beating the System: The Underground Economy by Carl Simon and Ann Witte, 1982

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The signature of our namesake and founder, Andrew Thomas Kearney, on the cover of this document represents our pledge to live the values he instilled in our firm and uphold his commitment to ensuring "essential rightness" in all that we do.

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