Moody's ANALYTICS

The Impact of Electronic Payments on Economic Growth

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Table of Contents

Executive Summary

Rising Card Payments Drive Economic Growth

Payment cards are not just convenient–they help stimulate growth for economies as well, according to a study performed by Moody's Analytics.

The rapid proliferation of cards in the past 50 years has changed how consumers pay for goods and services, and how merchants manage their businesses. Cards reduce friction in the economy by providing consumers convenient and secure access to their funds, while reducing cash and check handling for merchants and expanding the pool of customers who are guaranteed to pay.

Moody's Analytics set out to test whether the long-term shift to credit and debit cards stimulates economic growth, and found that electronic card payments continue to have a meaningful impact on the world economy. These findings are notable as the global economy struggles to recover, and as individual countries consider whether to take steps to enable the wider use of cards.

Moody's Analytics studied 56 countries that make up 93% of world gross domestic product, over a five-year span–2008 to 2012. Specifically, it found:

- Greater usage of electronic payment products added $983 billion in real (U.S.) dollars to GDP in the countries studied.
- Card usage raised consumption by an average of 0.7% across the 56 countries.
- That consumption contributed to average additional growth in GDP of 0.17 percentage point per year for this group of countries. For context, real global GDP grew by an average of 1.8% during that time period.
- The additional GDP growth was realized solely by increased card usage and penetration is equivalent to creating 1.9 million jobs during the period of study.
- Looking forward, a future 1% increase in card usage across the countries in this study would produce an annual increase of 0.056% in consumption and a 0.032% increase in GDP.

Key Highlights

- Greater usage of electronic payments added **$983B in global economic growth** (2008–2012)
- Growth in GDP equivalent to creating **1.9M** jobs
- Electronic payments contributed to: **0.8% increase in GDP** in emerging markets & **0.3% increase in GDP** in developed markets
- **Card growth boosts recovery**—Global real GDP was only **1.8%** per annum (2008–2012); without increased card usage, that growth would have been **1.6%**

Of note, increased use of electronic payments added 0.8% to GDP across emerging markets and 0.3% for developed markets. Emerging markets have had the greatest increase in GDP due to a high growth rate of card penetration. For example, a dramatic increase in card usage in China–from 31% in 2008 to an estimated 56% in 2012–corresponded to a 1.7% increase in GDP in that period.

The study also considered the role that card usage will play in future economic growth. Given recent card penetration, growth rates, and the additive effects Moody's Analytics calculated on future GDP, a meaningful 0.25% addition to consumption and 0.16% additional GDP was calculated.

The value derived from the migration to electronic payments is driven by a number of factors:

- Higher potential tax revenue.
- Lower cash handling costs.
- Guaranteed payment for merchants.
- A reduction in the gray economy due to lower unreported cash transactions.
- Greater financial inclusion.

This should provide valuable input to policymakers around the world as they consider policies that could speed card adoption.

Study Methodology

This study looked at the impact of increased card penetration on the private consumption of 56 countries over five years. Real private consumption was modeled as a function of real disposable income, real interest rates, and spending using cards as a share of overall consumer expenditure (the last defined as "card penetration"). The data were pooled for all countries to create a data set with over 280 observations; a statistical technique called "pooled cross-section time series estimation" was used to estimate the model parameters. To isolate the impact of increased card usage, the model used actual income and interest rates during the survey period, while fixing card penetration at the lowest level from 2008 to 2012. The model measured the difference between what actually happened (higher consumption), and what it predicted would have happened in the counterfactual hypothesis where card penetration stayed at its lowest value between 2008 and 2012 (lower consumption). More details of the model are described on Page 9 and in Appendix B.

The Macroeconomic Impact of Card Usage

Fifty years ago, most consumers used cash or checks to buy goods and services, with cash predominating for smaller purchases and checks for more costly transactions. The advent of general purpose payment cards in the 1950s allowed consumers and businesses to buy and sell with greater convenience. Since their introduction, card payments have grown in popularity.

In fact, the popularity of payment cards continues to grow. In 2012, just over 32% of worldwide consumer retail spending was card-based. This figure has grown by an average of 7.7% since 2003, more than three times the rate of PCE growth. There continues to be a slow migration away from cash, check, and other payment methods to electronic payment cards.

Greater worldwide card use raises a number of questions. Foremost, do electronic payments bring macroeconomic benefits?

In the model developed by Moody's Analytics, the impact of card usage on GDP is transmitted through private consumption: Increases in private consumption rising from card usage drive corresponding increases in GDP.

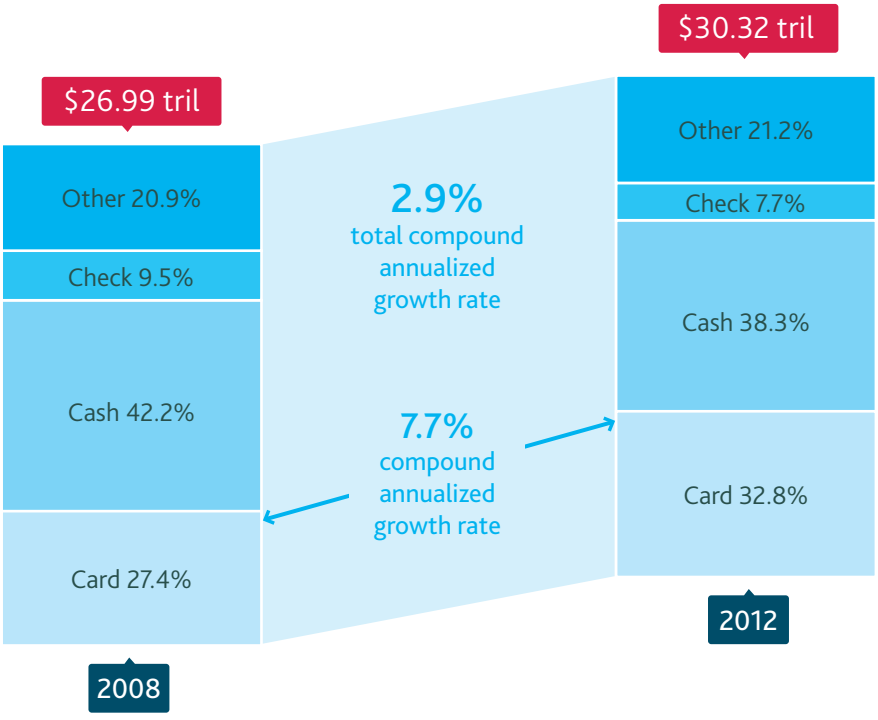
Based on the methodology developed, card usage raised consumption by an average of 0.7% across the 56 countries included in the study from 2008 to 2012.

This extra consumption led to an increase in global GDP of $983 billion (2008 US$) cumulatively from 2008 to 2012, a yearly average of 0.4% in additional GDP over the five-year period. To put this in context, real GDP grew at an average of 1.8% in the same period, of which 0.17 percentage point is attributable to increased card penetration.

The impact of payment cards varied considerably among the 56 countries because of differing growth rates, higher penetration in some countries, and the consumer reaction to a more robust card infrastructure. At the high end, card usage increased consumption in China by 4.89%, in Chile by 1.28%, and in Brazil by 1.15%. This compares with 0.01% in Egypt and 0.04% in Greece on the low end. This is a function of very low relative growth rates in these two countries, with political strife in Egypt and ongoing economic depression in Greece. In Egypt, card penetration increased by a statistically negligible 2.4% between 2008 and 2012–from 2.09% to 2.14%. In Greece, card penetration dropped 10%–from 5.4% to 4.9% in the five-year period.

Global Retail Purchases Payment Breakdown *(in US$)*

Source: Euromonitor International Merchant Segment Study 2012



Card Payments, Private Consumption and GDP

The level of consumption and card usage is highly correlated. Consumers in wealthier countries with more robust card infrastructure have the opportunity to use cards more often than in poorer countries. A natural question is how much greater credit and debit card usage or penetration (defined as payments made using credit and debit cards as a percent of total spending) contributes to consumption and GDP.

Essentially, the impact of card usage on GDP is a function of three factors:

- Card penetration as a percent of total PCE.
- The growth of card usage year-over-year relative to PCE.
- The actual percentage of GDP that is represented by personal consumption.

Results Differ for Developed and Emerging Economies

In general, a higher percentage of consumers in wealthier, developed countries use cards than in lower-income, emerging market countries. The assumption is that increased penetration and more frequent usage of cards elicits meaningfully different responses from the two groups based on a variety of factors, including the established penetration rate for cards at the beginning point of the study (2008), the growth rate over the course of the study (2008-2012), and the overall size of a given economy. Because emerging economies have lower card penetration, they are able to report sharp increases in card use, as they can advance penetration rates by merely copying the retail infrastructure of developed economies.

Card Penetration Contribution to Consumption

%, average 2008 to 2012

Country	Average
UAE	0.527
Argentina	0.942
Australia	0.865
Austria	0.514
Belgium	1.055
Brazil	1.147
Canada	0.274
Switzerland	0.270
Chile	1.285
China	4.891
Colombia	0.102
Czech Republic	0.364
Germany	0.194
Denmark	0.300
Egypt	0.007
Spain	0.163
Finland	0.895
France	0.803
U.K.	1.035
Greece	0.070
Hong Kong	0.486
Hungary	0.666
Indonesia	0.459
India	0.047
Ireland	0.989
Italy	0.211
Japan	0.212
South Korea	1.051
Kuwait	0.846
Mexico	0.273
Malaysia	1.037
Netherlands	0.858
Norway	0.429
New Zealand	1.096
Peru	0.474
Philippines	0.361
Poland	0.572
Puerto Rico	0.091
Portugal	0.392
Russia	1.070
Saudi Arabia	0.523
Singapore	1.001
Serbia	0.263
Sweden	0.081
Thailand	0.293
Turkey	0.695
Taiwan	0.293
Ukraine	0.399
U.S.	0.313
Venezuela	0.079
Vietnam	0.491
South Africa	1.090
Kazakhstan	0.248
Qatar	0.382
Costa Rica	0.351
Dominican Republic	0.339
Rwanda	0.048
Total	**0.702**

In developed economies, where card usage has matured, the increase was at a slower rate and was slowed further by the outsize impact of the Great Recession on this group. We hypothesize different results for these countries based on the different maturity level, growth rate, and consumer usage pattern for cards.

The model was consistent with this hypothesis. Increased card usage added 1.6% to consumption in emerging markets and 0.4% in developed countries. The same figures for GDP were 0.8% for emerging countries and 0.3% for developed countries. All figures are averages over the countries and the sample period. Card usage drove consumption and in turn GDP for each and every country, regardless of the size of the economy, card penetration or growth rate.

However, within these broad groupings are interesting anomalies. The U.K., for example, experienced one of the highest effects with 0.7% in additional GDP. One possible reason is a high penetration of cards to PCE (over 50%), paired with robust growth in card usage (23%) between 2008 and 2012. An even more striking result pops up in the emerging market camp with outstanding benefits accruing to China, which had a GDP impact of 1.7%. China's swelling middle class prompted an explosion of retail spending in recent years and with it, demand for more efficient payment methods. China's penetration rate soared from 31% in 2008, to an estimated 56% for 2012.

We do observe that card usage begets further card usage, however, not in a linear fashion. As more cards are issued and more merchants accept cards, transaction volume grows exponentially. The overall size of the payments network in a given market–more merchants and more cardholders–has a multiplier effect. Consumers will feel more comfortable about using their cards for a larger percentage of their overall transactions as a critical mass of merchant locations is reached. Likewise, merchants will want access to the growing pool of cardholders with guaranteed payment. We observe this phenomenon even in mature markets with close to 50% card penetration.

Rwanda: Hypothetical Addition to GDP Growth Rate Due to Increased Card Penetration (%)

Penetration growth rate at EM	2009	2010	2011	2012
Minimum	0.002	0.000	0.002	0.000
Median	0.015	0.017	0.016	0.013
Maximum	0.056	0.075	0.082	0.082
Mean	0.017	0.018	0.018	0.014
5th percentile	0.002	0.003	0.002	0.002
20th percentile	0.010	0.008	0.009	0.007
80th percentile	0.019	0.023	0.023	0.020
95th percentile	0.039	0.046	0.048	0.047

This table shows how card usage could have affected the Rwandan economy under various growth assumptions for card penetration. All calculations assume that Rwanda began 2008 with 1% card penetration, and grew thereafter and the rates stated in the first column. For example, the first row shows how Rwandan GDP would have grown if card penetration advanced at the lowest observed rate of emerging market economies. Likewise, the final row shows how Rwanda would have performed if card penetration advanced at the 95th percentile of the emerging market distribution; that is, if only 5% of emerging markets outperformed Rwanda in card adoption speed. In all likelihood, a country like Rwanda, with very low card penetration, should see rapid initial adoption, given proper financial infrastructure. Other tables in this paper that include Rwanda, assume—quite conservatively—that card penetration grew at the emerging market median.

Cumulative Contribution to GDP Growth From Greater Card Penetration

2008$ bil, 2008-2012

Country	Total
UAE	4.2
Argentina	8.1
Australia	20.8
Austria	4.7
Belgium	11.5
Brazil	51.3
Canada	9.7
Switzerland	3.2
Chile	6.4
China	374.5
Colombia	0.7
Czech Republic	1.6
Germany	16.1
Denmark	1.9
Egypt	0.0
Spain	5.7
Finland	5.1
France	52.7
U.K.	68.0
Greece	0.6
Hong Kong	2.8
Hungary	9.1
Indonesia	6.4
India	1.5
Ireland	5.1
Italy	11.4
Japan	24.5
South Korea	23.0
Kuwait	1.2
Mexico	7.8
Malaysia	4.2
Netherlands	13.2
Norway	3.2
New Zealand	3.5
Peru	1.7
Philippines	2.0
Poland	7.9
Puerto Rico	0.2
Portugal	2.6
Russia	36.0
Saudi Arabia	4.7
Singapore	3.3
Serbia	0.3
Sweden	0.8
Thailand	1.8
Turkey	15.4
Taiwan	3.0
Ukraine	1.8
U.S.	127.4
Venezuela	0.5
Vietnam	1.2
South Africa	7.8
Kazakhstan	0.8
Qatar	0.4
Costa Rica	0.3
Dominican Republic	0.3
Rwanda	0.0
Total	**983.9**

Methodology

This study looked at the impact of increased card penetration on consumption for 56 countries over five years. Real private consumption was modeled as a function of three factors: real disposable income, real interest rates, and spending using cards as a percentage of overall consumer expenditure (the last defined as card penetration).

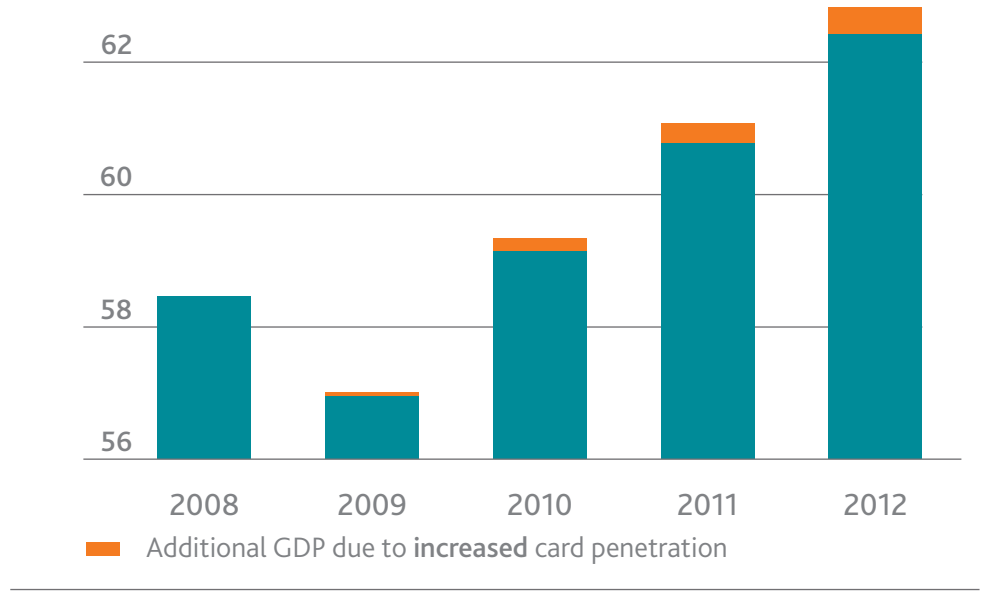
- The model used observed and actual disposable income and interest rates from 2008 to 2012.
- Card penetration was held at its lowest level for the five-year period (usually in the first year).
- The model measured the difference between what actually happened (higher consumption) and what it predicted would have happened if card penetration stayed at the minimum value (lower consumption).
- Finally, to measure the impact of card usage on actual GDP, the consumption figure was multiplied by the portion of GDP that is represented by consumer spending in each country. The credit and debit card model can therefore estimate the impact of card usage on the overall economy.

More detailed information on the methodology can be found in Appendix B.

Penetration Ratio

To isolate the impact of electronic payments, card penetration was fixed to the minimum observed value over 2008-2012 for each country in the model. The model used the minimum penetration because for most countries, the penetration ratio was rising steadily over this period, and 2008 became the minimum level and the starting point, the troubled Greek economy was a glaring exception to this generality. For a handful of countries, mainly developing ones, the relatively small penetration ratio fluctuates over the period. An appropriate measure of the contribution to GDP should look at the deviation of the card penetration ratio from the lowest level of penetration.

Real Global GDP *(2008 US$ tril)*



The Value of Card Payments: Less Friction, More Efficiency

Cards Benefit All Parties Involved in Many Ways

Within the electronic payments ecosystem are two main parties: buyer and seller or consumer and merchant. The evolution to electronic payments from cash and checks has changed the behavior of, and in some cases the relationship between, consumers and merchants.

This study focused specifically on the proliferation of cards and the additional GDP growth realized solely by increased card usage. From these increases, we can look to efficiencies and other external benefits traditionally gained by using electronic payment cards. The advent of credit and debit cards has greatly aided the consumers' ability to optimize consumption decisions by giving them secure and immediate access to all of their funds on deposit or a line of credit. Merchants also benefit because there is less cash and check handling in the system as they have access to a large pool of customers with guaranteed payment. They are freed from developing and maintaining their own credit systems, allowing them to focus on their core competencies. Cards are also a necessary part of e-commerce, with its inherent efficiencies.

This leads to a virtuous economic cycle whereby increased consumption leads to increased production, more jobs and greater income as highlighted in the graphic below.

Benefits to Consumers and Merchants

- Cards provide access to financial resources. Consumers using cash or checks may be limited in the amount of funds they have for particular transactions. With cash, consumers are limited to the funds they have on hand. Merchants may be reluctant to accept checks for bigger transactions because of the risk of nonpayment. Cards address both these issues: They provide consumers with access to all available funds or lines of credit for a given transaction, and they give merchants peace of mind about payment guarantees, provided they follow appropriate payment procedures.
- Access to credit helps calibrate periodic income with continuous consumption. Wages and salaries are typically paid weekly, biweekly or monthly. Consumer spending, however, has no time profile. Food on the table or a broken-down vehicle should not have to wait for the next paycheck. Credit smooths the consumption of durable and nondurable goods by lessening the need to wait for paydays. In obtaining credit, consumers generally have three options: bank loans, store credit or credit cards. Credit cards are more convenient and offer lower consumer transaction costs, as the former two involve paperwork, hassle, and a potential waiting period.

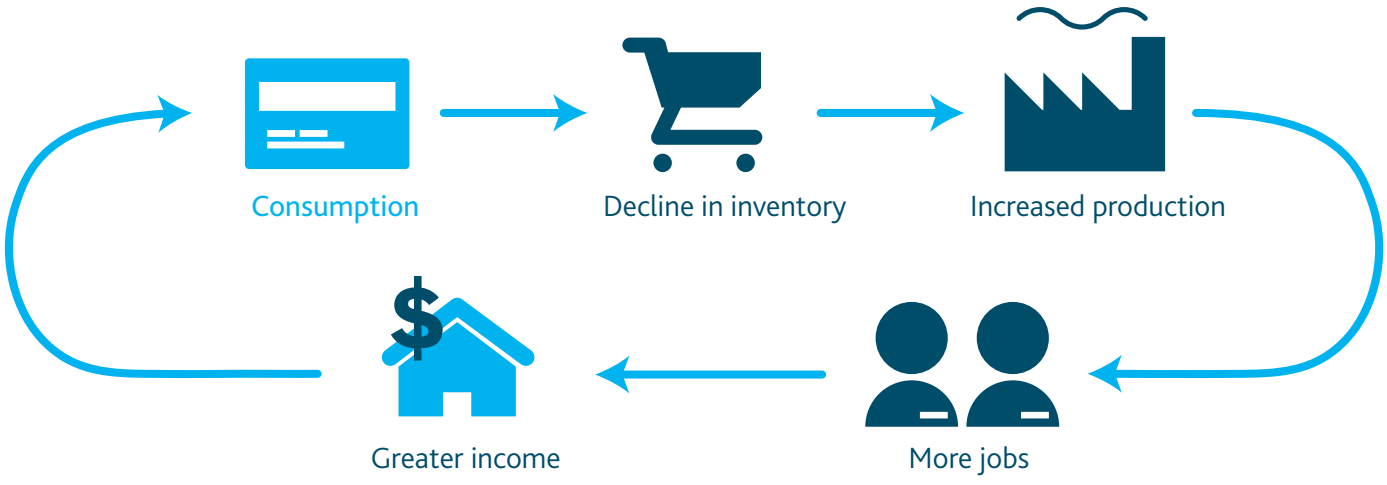
Security

- Trust in card transactions further drives consumption. With cards, consumers have recourse for fraudulent transactions and the card networks police unscrupulous merchant behavior. The peace of mind that merchants have with guaranteed payment also extends to consumers, who feel more comfortable making purchases when they can pay with a card. This trust in the payment system eases friction, bolstering consumption and GDP.

Convenience

- Cards provide convenience. Consumers cite the convenience of cards, whether it means not having to visit the ATM to obtain cash or not having to count out the cash at the point of transaction. This

Economic Cycle



convenience benefits merchants as well. For instance, when consumers swipe their own cards at the self-service gasoline pump, it lowers labor costs for merchants. Each small portion of friction that cards eliminate from the system contributes to higher consumption and GDP.

- Cards enable e-commerce and travel and tourism. Payment cards supported by global payment networks enable growth in key economic sectors including e-commerce and travel and tourism. Increasingly, business is transacted online and in a diverse global economy, the ability to buy and sell online has been essential for many businesses and consumers. This would be impossible without global electronic payments. Similarly, when consumers travel, they want a payment form that works across borders and reduces concerns about exchanging and carrying foreign currency while providing security against loss or theft. In the travel sector, merchants also gain access to an expanded consumer base of international visitors, with more purchasing power than they would have with only cash.

Transparency

- Cards leave more funds flowing through the economy. The need to provide change during a cash transaction potentially removes a certain amount of money from circulation. The change sitting unused impedes economic growth. Increased penetration of cards as a percentage of PCE keeps the "spare change" where it can be more readily spent.
- Cards reduce central bank costs in providing currency. By reducing paper transactions, card usage can reduce the cost to central banks of providing notes and coins or to treasury or finance departments of processing paper money, thereby improving overall efficiency in commerce and the economy.
- Cards eliminate a substantial portion of the gray economy. Retailers who do not report some or all of their transactions to avoid paying sales tax prefer cash transactions. Card transactions, on the other hand, are "above board" and create an audit trail that greatly reduces unreported transactions, thereby raising tax revenues.

Ongoing Effects on GDP of Greater Card Penetration: Measuring Elasticity by Country

The steady migration from paper to electronic forms of payment around the world raises another interesting question: What effect would a continued growth in card penetration have on overall consumption and therefore GDP across the surveyed countries?

The simulation result in the following table measures elasticity. In this study, this is the percent increase in private consumption and GDP due to a 1% increase in credit and debit card volume, while all other variables are held constant. For policymakers, this is the growth-promoting payment card metric (see Tables 2A and 2B in Appendix B).

- Overall, a 1% increase in card usage produces a 0.056% increase in consumption and a 0.032% increase in GDP.
- For developed countries, the same metric was a 0.055% increase in consumption and a 0.034% increase in GDP.
- In emerging markets, a 1% increase in card usage results in a 0.056% increase in consumption and a 0.028% increase in GDP.

The estimated elasticity shows wide variation among countries. In general, developed countries have higher elasticities than emerging markets. Compared with emerging markets, developed countries have well-established payment networks, consumers are comfortable using cards and they are accepted by most merchants. Hence, an increase in card usage in developed countries has a greater multiplier impact.

GDP Growth and Card Penetration

A key question from a growth-accounting perspective is how much increased card penetration lifts GDP growth. This is calculated as the difference between growth in observed GDP and growth in GDP without increased card penetration. The results are presented in Table 3 in Appendix B.

Globally, increased card penetration added 0.17 percentage point to the average annual real GDP growth rate reported from 2008 to 2012. Global real GDP growth during this period was only 1.8% per annum. Without increased card usage, that growth would have been 1.6%. Card penetration and usage provided an important boost to economies, helping to mitigate what would otherwise have been an even slower recovery from the Great Recession.

GDP Elasticity w.r.t Card Penetration (Percent)

% increase in GDP due to 1% increase in cards, 2008-2012

Country	Average
UAE	0.025
Argentina	0.032
Australia	0.050
Austria	0.017
Belgium	0.038
Brazil	0.041
Canada	0.061
Switzerland	0.031
Chile	0.042
China	0.044
Colombia	0.016
Czech Republic	0.019
Germany	0.013
Denmark	0.044
Egypt	0.005
Spain	0.017
Finland	0.045
France	0.034
U.K.	0.055
Greece	0.006
Hong Kong	0.067
Hungary	0.022
Indonesia	0.012
India	0.004
Ireland	0.041
Italy	0.019
Japan	0.014
South Korea	0.047
Kuwait	0.019
Mexico	0.015
Malaysia	0.033
Netherlands	0.036
Norway	0.045
New Zealand	0.055
Peru	0.017
Philippines	0.021
Poland	0.020
Puerto Rico	0.013
Portugal	0.050
Russia	0.011
Saudi Arabia	0.013
Singapore	0.031
Serbia	0.013
Sweden	0.041
Thailand	0.020
Turkey	0.038
Taiwan	0.024
Ukraine	0.007
U.S.	0.042
Venezuela	0.023
Vietnam	0.013
South Africa	0.043
Kazakhstan	0.009
Qatar	0.006
Costa Rica	0.017
Dominican Republic	0.013
Rwanda	0.003
Total	**0.032**

Conclusions

Card usage makes the economy more efficient, yielding a meaningful boost to economic growth year after year through a multitude of factors, including transaction efficiencies, consumer access to credit, and consumer confidence in the payment system overall. Usage and penetration increase personal consumption in aggregate across economies. The Moody's Analytics economic model documents this benefit.

Because of varying card penetration and growth rates over the time period analyzed, the efficiencies affected different players in the payments environment in different ways, but for all economies and markets analyzed, there is a positive correlation between card penetration and usage and economic growth.

The study therefore supports the adoption of policies that encourage the use of cards. Increased usage of cards boosts consumption and GDP. The impact of that boost increases as penetration increases. The study calculates that the 56 countries in the sample added $983 billion cumulatively to real GDP from 2008 to 2012 as a result of increased card usage. This amounts to 0.3% of their total GDP per year over this period.

Increased credit and debit card usage contributes to economic activity by reducing transaction costs and improving efficiency in the flow of goods and services. All cards–credit and debit–reduce transactional and opportunity costs by eliminating the need to carry cash, which can be particularly burdensome in developed and emerging markets. Encouraging the adoption of electronic payments, and policies that support their adoption will continue to enhance economic growth and reduce friction in the global economy.

Appendix A: Country by Country Information

A zero in Table 1A marks the base year and starting point from where contributions to consumption and GDP are calculated. While most had the base point in 2008, several countries such as Kazakhstan, Qatar and Egypt regressed slightly in card penetration and reached the base point after 2008. The model calculates the card contribution to consumption in each year from that base point. Increased card penetration accelerated contribution to consumption. The final column provides the average contribution from 2008 through 2012.

Table 1A: Cumulative Credit and Debit Cards' Contribution to Consumption, Percent

	2008	2009	2010	2011	2012	Average
UAE	0.02	0.00	0.47	0.67	0.89	0.53
Argentina	0.00	0.25	0.77	1.10	1.50	0.94
Australia	0.00	0.46	0.73	0.98	1.25	0.86
Austria	0.00	0.24	0.42	0.63	0.75	0.51
Belgium	0.00	0.24	0.97	1.37	1.61	1.06
Brazil	0.00	0.62	1.00	1.31	1.58	1.15
Canada	0.00	0.10	0.17	0.32	0.49	0.27
Switzerland	0.00	0.08	0.23	0.30	0.46	0.27
Chile	0.00	0.45	1.21	1.52	1.79	1.28
China	0.00	1.74	3.97	5.73	7.46	4.89
Colombia	0.00	0.04	0.07	0.12	0.17	0.10
Czech Republic	0.00	0.27	0.24	0.34	0.61	0.36
Germany	0.00	0.07	0.14	0.26	0.30	0.19
Denmark	0.00	0.15	0.04	0.29	0.71	0.30
Egypt	0.00	0.00	0.00	0.01	0.02	0.01
Spain	0.00	0.04	0.12	0.22	0.28	0.16
Finland	0.00	0.82	0.86	0.93	0.96	0.89
France	0.00	0.60	0.75	0.96	0.90	0.80
U.K.	0.00	0.26	0.74	1.30	1.84	1.04
Greece	0.13	0.08	0.02	0.00	0.03	0.07
Hong Kong	0.00	0.18	0.52	0.57	0.63	0.49
Hungary	0.00	0.21	0.49	0.88	1.17	0.67
Indonesia	0.00	0.31	0.34	0.50	0.66	0.46
India	0.02	0.00	0.02	0.05	0.09	0.05
Ireland	0.12	0.00	0.71	1.29	1.87	0.99
Italy	0.00	0.13	0.21	0.23	0.27	0.21
Japan	0.00	0.06	0.17	0.26	0.36	0.21
South Korea	0.00	0.79	0.97	1.13	1.29	1.05
Kuwait	0.00	0.06	0.74	1.08	1.42	0.85
Mexico	0.00	0.11	0.25	0.32	0.39	0.27
Malaysia	0.00	0.46	0.90	1.24	1.53	1.04
Netherlands	0.00	0.59	0.80	0.96	1.08	0.86
Norway	0.00	0.21	0.30	0.60	0.59	0.43
New Zealand	0.00	0.66	1.01	1.24	1.44	1.10
Peru	0.00	0.16	0.37	0.56	0.74	0.47
Philippines	0.00	0.01	0.21	0.44	0.73	0.36
Poland	0.00	0.18	0.44	0.73	0.90	0.57
Puerto Rico	0.00	0.00	0.08	0.12	0.16	0.09
Portugal	0.00	0.37	0.40	0.42	0.38	0.39
Russia	0.00	0.32	0.82	1.30	1.70	1.07
Saudi Arabia	0.00	0.10	0.44	0.66	0.87	0.52
Singapore	0.00	0.20	0.72	1.24	1.72	1.00
Serbia	0.00	0.16	0.23	0.30	0.36	0.26
Sweden	0.11	0.00	0.04	0.07	0.11	0.08
Thailand	0.00	0.12	0.25	0.34	0.45	0.29
Turkey	0.00	0.19	0.47	0.74	1.28	0.70
Taiwan	0.00	0.03	0.29	0.37	0.46	0.29
Ukraine	0.00	0.00	0.29	0.51	0.66	0.40
U.S.	0.12	0.00	0.22	0.40	0.49	0.31
Venezuela	0.00	0.04	0.05	0.09	0.13	0.08
Vietnam	0.00	0.00	0.48	0.65	0.82	0.49
South Africa	0.00	0.61	0.82	1.22	1.64	1.09
Kazakhstan	0.20	0.00	0.09	0.26	0.41	0.25
Qatar	0.17	0.00	0.22	0.42	0.57	0.38
Costa Rica	0.09	0.00	0.17	0.41	0.67	0.35
Dominican Republic	0.09	0.00	0.17	0.41	0.67	0.34
Rwanda	0.00	0.02	0.04	0.06	0.08	0.05
Total	**0.04**	**0.24**	**0.56**	**0.84**	**1.10**	**0.70**

Table 1B takes the product of the consumption contribution figures from Table 1A with the percentage of GDP for each country represented by personal consumption to obtain the card contribution to GDP. For example, U.S. GDP averaged 69% personal consumption over the study time frame, so 0.31% (from Table 1A) * 0.69=0.22% for the U.S. entry in Table 1B, the card contribution to U.S. GDP.

Table 1B: Cumulative Credit and Debit Cards' Contribution to GDP, Percent

	2008	2009	2010	2011	2012	Average
UAE	0.01	0.00	0.30	0.36	0.49	0.31
Argentina	0.00	0.14	0.44	0.64	0.86	0.54
Australia	0.00	0.25	0.39	0.54	0.69	0.47
Austria	0.00	0.13	0.23	0.34	0.42	0.28
Belgium	0.00	0.13	0.52	0.73	0.87	0.57
Brazil	0.00	0.39	0.62	0.81	0.98	0.71
Canada	0.00	0.05	0.10	0.19	0.28	0.16
Switzerland	0.00	0.05	0.13	0.17	0.27	0.16
Chile	0.00	0.27	0.76	0.98	1.15	0.81
China	0.00	0.61	1.35	1.91	2.49	1.66
Colombia	0.00	0.03	0.04	0.08	0.10	0.06
Czech Republic	0.00	0.14	0.12	0.17	0.30	0.18
Germany	0.00	0.04	0.08	0.14	0.17	0.11
Denmark	0.00	0.07	0.02	0.14	0.34	0.15
Egypt	0.00	0.00	0.00	0.01	0.01	0.01
Spain	0.00	0.02	0.07	0.12	0.16	0.09
Finland	0.00	0.45	0.47	0.51	0.53	0.49
France	0.00	0.35	0.44	0.56	0.52	0.47
U.K.	0.00	0.17	0.47	0.81	1.15	0.66
Greece	0.09	0.06	0.02	0.00	0.03	0.05
Hong Kong	0.00	0.12	0.33	0.37	0.41	0.31
Hungary	0.00	0.14	0.31	0.54	0.53	0.39
Indonesia	0.00	0.19	0.21	0.29	0.38	0.27
India	0.01	0.00	0.01	0.03	0.05	0.02
Ireland	0.07	0.00	0.37	0.66	0.96	0.51
Italy	0.00	0.08	0.13	0.14	0.17	0.13
Japan	0.00	0.04	0.10	0.16	0.22	0.13
South Korea	0.00	0.43	0.52	0.60	0.68	0.56
Kuwait	0.00	0.02	0.23	0.29	0.38	0.25
Mexico	0.00	0.07	0.16	0.20	0.25	0.17
Malaysia	0.00	0.22	0.43	0.58	0.71	0.49
Netherlands	0.00	0.29	0.39	0.45	0.51	0.41
Norway	0.00	0.09	0.12	0.25	0.24	0.18
New Zealand	0.00	0.39	0.59	0.73	0.85	0.64
Peru	0.00	0.11	0.23	0.35	0.47	0.30
Philippines	0.00	0.01	0.15	0.33	0.54	0.27
Poland	0.00	0.11	0.27	0.44	0.54	0.35
Puerto Rico	0.00	0.00	0.06	0.08	0.11	0.06
Portugal	0.00	0.25	0.27	0.28	0.25	0.26
Russia	0.00	0.16	0.42	0.67	0.91	0.55
Saudi Arabia	0.00	0.05	0.20	0.29	0.38	0.23
Singapore	0.00	0.08	0.27	0.46	0.64	0.38
Serbia	0.00	0.10	0.15	0.19	0.23	0.17
Sweden	0.05	0.00	0.02	0.03	0.05	0.04
Thailand	0.00	0.07	0.13	0.19	0.25	0.16
Turkey	0.00	0.14	0.33	0.52	0.89	0.49
Taiwan	0.00	0.02	0.17	0.21	0.27	0.17
Ukraine	0.00	0.00	0.18	0.34	0.48	0.26
U.S.	0.08	0.00	0.15	0.28	0.34	0.22
Venezuela	0.00	0.02	0.02	0.05	0.07	0.04
Vietnam	0.00	0.00	0.33	0.42	0.50	0.32
South Africa	0.00	0.38	0.51	0.77	1.05	0.68
Kazakhstan	0.14	0.00	0.06	0.19	0.30	0.18
Qatar	0.03	0.00	0.03	0.06	0.11	0.06
Costa Rica	0.04	0.00	0.09	0.22	0.36	0.19
Dominican Republic	0.04	0.00	0.07	0.16	0.26	0.14
Rwanda	0.00	0.02	0.03	0.05	0.06	0.04
Total	**0.02**	**0.14**	**0.32**	**0.49**	**0.64**	**0.41**

Table 2A shows the percentage change in consumption resulting from a 1% change in card penetration–for each year of the study and also the average. For example, a 1% change in card penetration as a percentage of PCE in the U.S. will add 0.06% to U.S. consumption. This amounts to an increase of more than $30 billion in consumption over the five-year period for each 1% increase in card penetration.

Table 2A: Consumption Elasticity w.r.t. Card Penetration (Percent)

	2008	2009	2010	2011	2012	Average
UAE	0.0	0.0	0.0	0.0	0.0	0.042
Argentina	0.0	0.1	0.1	0.1	0.1	0.056
Australia	0.1	0.1	0.1	0.1	0.1	0.091
Austria	0.0	0.0	0.0	0.0	0.0	0.032
Belgium	0.1	0.1	0.1	0.1	0.1	0.070
Brazil	0.1	0.1	0.1	0.1	0.1	0.067
Canada	0.1	0.1	0.1	0.1	0.1	0.107
Switzerland	0.1	0.1	0.1	0.1	0.1	0.054
Chile	0.1	0.1	0.1	0.1	0.1	0.067
China	0.1	0.1	0.1	0.1	0.2	0.129
Colombia	0.0	0.0	0.0	0.0	0.0	0.026
Czech Republic	0.0	0.0	0.0	0.0	0.0	0.038
Germany	0.0	0.0	0.0	0.0	0.0	0.022
Denmark	0.1	0.1	0.1	0.1	0.1	0.090
Egypt	0.0	0.0	0.0	0.0	0.0	0.006
Spain	0.0	0.0	0.0	0.0	0.0	0.030
Finland	0.1	0.1	0.1	0.1	0.1	0.084
France	0.1	0.1	0.1	0.1	0.1	0.059
U.K.	0.1	0.1	0.1	0.1	0.1	0.087
Greece	0.0	0.0	0.0	0.0	0.0	0.008
Hong Kong	0.1	0.1	0.1	0.1	0.1	0.106
Hungary	0.0	0.0	0.0	0.0	0.0	0.036
Indonesia	0.0	0.0	0.0	0.0	0.0	0.020
India	0.0	0.0	0.0	0.0	0.0	0.007
Ireland	0.1	0.1	0.1	0.1	0.1	0.078
Italy	0.0	0.0	0.0	0.0	0.0	0.031
Japan	0.0	0.0	0.0	0.0	0.0	0.023
South Korea	0.1	0.1	0.1	0.1	0.1	0.088
Kuwait	0.1	0.1	0.1	0.1	0.1	0.067
Mexico	0.0	0.0	0.0	0.0	0.0	0.024
Malaysia	0.1	0.1	0.1	0.1	0.1	0.071
Netherlands	0.1	0.1	0.1	0.1	0.1	0.076
Norway	0.1	0.1	0.1	0.1	0.1	0.112
New Zealand	0.1	0.1	0.1	0.1	0.1	0.094
Peru	0.0	0.0	0.0	0.0	0.0	0.027
Philippines	0.0	0.0	0.0	0.0	0.0	0.028
Poland	0.0	0.0	0.0	0.0	0.0	0.032
Puerto Rico	0.0	0.0	0.0	0.0	0.0	0.019
Portugal	0.1	0.1	0.1	0.1	0.1	0.075
Russia	0.0	0.0	0.0	0.0	0.0	0.021
Saudi Arabia	0.0	0.0	0.0	0.0	0.0	0.029
Singapore	0.1	0.1	0.1	0.1	0.1	0.080
Serbia	0.0	0.0	0.0	0.0	0.0	0.020
Sweden	0.1	0.1	0.1	0.1	0.1	0.086
Thailand	0.0	0.0	0.0	0.0	0.0	0.037
Turkey	0.0	0.0	0.1	0.1	0.1	0.054
Taiwan	0.0	0.0	0.0	0.0	0.0	0.041
Ukraine	0.0	0.0	0.0	0.0	0.0	0.012
U.S.	0.1	0.1	0.1	0.1	0.1	0.061
Venezuela	0.0	0.0	0.0	0.0	0.0	0.045
Vietnam	0.0	0.0	0.0	0.0	0.0	0.019
South Africa	0.1	0.1	0.1	0.1	0.1	0.068
Kazakhstan	0.0	0.0	0.0	0.0	0.0	0.013
Qatar	0.0	0.0	0.0	0.0	0.0	0.035
Costa Rica	0.0	0.0	0.0	0.0	0.0	0.032
Dominican Republic	0.0	0.0	0.0	0.0	0.0	0.032
Rwanda	0.0	0.0	0.0	0.0	0.0	0.003
Total	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.056**

Table 2B shows the percentage change of GDP represented by a 1% change in card penetration–for each year of the study and also the average. For example, a 1% change in card penetration as a percentage of PCE in the U.S. will add 0.04% to U.S. GDP.

Table 2B: GDP Elasticity w.r.t. Card Penetration (Percent)

	2008	2009	2010	2011	2012	Average
UAE	0.024	0.027	0.027	0.024	0.025	0.025
Argentina	0.028	0.029	0.032	0.034	0.036	0.032
Australia	0.046	0.048	0.050	0.052	0.053	0.050
Austria	0.015	0.017	0.017	0.018	0.020	0.017
Belgium	0.032	0.035	0.039	0.040	0.042	0.038
Brazil	0.034	0.039	0.041	0.044	0.045	0.041
Canada	0.058	0.060	0.061	0.062	0.063	0.061
Switzerland	0.029	0.031	0.031	0.031	0.032	0.031
Chile	0.034	0.037	0.043	0.046	0.048	0.042
China	0.032	0.038	0.044	0.049	0.054	0.044
Colombia	0.016	0.016	0.016	0.017	0.017	0.016
Czech Republic	0.017	0.019	0.019	0.019	0.020	0.019
Germany	0.011	0.012	0.013	0.013	0.013	0.013
Denmark	0.042	0.043	0.043	0.044	0.046	0.044
Egypt	0.004	0.005	0.005	0.005	0.005	0.005
Spain	0.016	0.017	0.017	0.018	0.018	0.017
Finland	0.040	0.046	0.046	0.047	0.047	0.045
France	0.030	0.035	0.035	0.036	0.036	0.034
U.K.	0.050	0.052	0.055	0.057	0.061	0.055
Greece	0.007	0.006	0.006	0.006	0.006	0.006
Hong Kong	0.062	0.066	0.068	0.070	0.071	0.067
Hungary	0.020	0.022	0.022	0.024	0.019	0.022
Indonesia	0.010	0.012	0.012	0.013	0.013	0.012
India	0.004	0.003	0.003	0.004	0.004	0.004
Ireland	0.038	0.037	0.041	0.042	0.045	0.041
Italy	0.017	0.019	0.019	0.019	0.019	0.019
Japan	0.012	0.013	0.014	0.015	0.015	0.014
South Korea	0.043	0.048	0.048	0.048	0.048	0.047
Kuwait	0.017	0.021	0.021	0.019	0.020	0.019
Mexico	0.014	0.014	0.015	0.016	0.016	0.015
Malaysia	0.028	0.033	0.034	0.035	0.036	0.033
Netherlands	0.033	0.037	0.037	0.037	0.038	0.036
Norway	0.042	0.044	0.046	0.047	0.047	0.045
New Zealand	0.050	0.053	0.055	0.057	0.058	0.055
Peru	0.015	0.016	0.017	0.018	0.019	0.017
Philippines	0.019	0.019	0.020	0.022	0.024	0.021
Poland	0.017	0.018	0.020	0.021	0.022	0.020
Puerto Rico	0.012	0.013	0.013	0.013	0.014	0.013
Portugal	0.048	0.051	0.052	0.051	0.050	0.050
Russia	0.006	0.008	0.011	0.013	0.016	0.011
Saudi Arabia	0.012	0.012	0.013	0.014	0.015	0.013
Singapore	0.029	0.030	0.030	0.031	0.033	0.031
Serbia	0.013	0.013	0.013	0.014	0.014	0.013
Sweden	0.041	0.042	0.041	0.041	0.041	0.041
Thailand	0.019	0.020	0.020	0.021	0.022	0.020
Turkey	0.034	0.036	0.037	0.039	0.042	0.038
Taiwan	0.023	0.024	0.024	0.024	0.026	0.024
Ukraine	0.005	0.005	0.007	0.009	0.011	0.007
U.S.	0.041	0.040	0.042	0.043	0.044	0.042
Venezuela	0.023	0.023	0.023	0.023	0.024	0.023
Vietnam	0.010	0.010	0.014	0.014	0.014	0.013
South Africa	0.037	0.040	0.042	0.045	0.048	0.043
Kazakhstan	0.009	0.008	0.008	0.010	0.011	0.009
Qatar	0.005	0.005	0.005	0.005	0.007	0.006
Costa Rica	0.015	0.015	0.017	0.018	0.020	0.017
Dominican Republic	0.013	0.012	0.013	0.014	0.014	0.013
Rwanda	0.002	0.003	0.003	0.003	0.003	0.003
Total	**0.029**	**0.031**	**0.032**	**0.034**	**0.035**	**0.032**

Table 3 shows how increased card penetration affects the GDP growth rate (as opposed to the GDP amount). Keeping with the U.S. example, card penetration added 7 basis points on average to the GDP growth rate over the course of the study.

Table 3: Addition to GDP Growth Rate Due to Increased Card Penetration (%)

	2009	2010	2011	2012	Average
UAE	-0.009	0.326	0.085	0.130	0.133
Argentina	0.145	0.325	0.219	0.231	0.230
Australia	0.254	0.148	0.147	0.158	0.176
Austria	0.129	0.097	0.112	0.081	0.105
Belgium	0.125	0.403	0.214	0.138	0.220
Brazil	0.385	0.248	0.204	0.171	0.252
Canada	0.053	0.043	0.092	0.100	0.072
Switzerland	0.046	0.089	0.039	0.094	0.067
Chile	0.271	0.515	0.236	0.186	0.302
China	0.659	0.819	0.628	0.636	0.686
Colombia	0.027	0.017	0.034	0.031	0.027
Czech Republic	0.132	-0.020	0.051	0.129	0.073
Germany	0.039	0.042	0.064	0.028	0.043
Denmark	0.070	-0.054	0.122	0.203	0.085
Egypt	0.002	0.001	0.004	0.004	0.003
Spain	0.021	0.045	0.055	0.037	0.040
Finland	0.411	0.022	0.039	0.020	0.123
France	0.343	0.092	0.115	-0.036	0.128
U.K.	0.159	0.313	0.344	0.346	0.291
Greece	-0.029	-0.044	-0.015	0.024	-0.016
Hong Kong	0.113	0.225	0.048	0.039	0.106
Hungary	0.123	0.169	0.230	-0.010	0.128
Indonesia	0.194	0.021	0.094	0.096	0.101
India	-0.009	0.011	0.018	0.022	0.011
Ireland	-0.061	0.372	0.289	0.297	0.224
Italy	0.077	0.047	0.011	0.027	0.040
Japan	0.034	0.068	0.056	0.060	0.055
South Korea	0.434	0.093	0.079	0.083	0.172
Kuwait	0.014	0.232	0.079	0.090	0.103
Mexico	0.068	0.091	0.047	0.049	0.064
Malaysia	0.209	0.212	0.159	0.127	0.177
Netherlands	0.278	0.100	0.066	0.055	0.125
Norway	0.084	0.039	0.124	-0.002	0.061
New Zealand	0.386	0.209	0.146	0.118	0.215
Peru	0.108	0.140	0.126	0.122	0.124
Philippines	0.007	0.155	0.183	0.217	0.141
Poland	0.115	0.162	0.176	0.105	0.139
Puerto Rico	0.000	0.058	0.026	0.027	0.028
Portugal	0.241	0.019	0.012	-0.030	0.061
Russia	0.148	0.268	0.267	0.245	0.232
Saudi Arabia	0.047	0.157	0.096	0.092	0.098
Singapore	0.080	0.217	0.200	0.190	0.172
Serbia	0.100	0.044	0.044	0.039	0.057
Sweden	-0.047	0.021	0.015	0.017	0.001
Thailand	0.067	0.070	0.057	0.060	0.063
Turkey	0.130	0.210	0.204	0.385	0.232
Taiwan	0.021	0.162	0.047	0.059	0.072
Ukraine	0.002	0.187	0.168	0.148	0.126
U.S.	-0.078	0.158	0.128	0.065	0.068
Venezuela	0.021	0.001	0.023	0.025	0.018
Vietnam	0.001	0.317	0.100	0.083	0.125
South Africa	0.371	0.136	0.269	0.288	0.266
Kazakhstan	-0.137	0.064	0.135	0.121	0.045
Qatar	-0.029	0.035	0.041	0.047	0.023
Costa Rica	-0.040	0.100	0.132	0.148	0.085
Dominican Republic	-0.036	0.075	0.096	0.102	0.059
Rwanda	0.015	0.017	0.016	0.013	0.015
Total	**0.116**	**0.191**	**0.171**	**0.150**	**0.157**

Appendix B: The Model

This model looks at the impact of credit and debit cards on consumers and the overall economy in 56 countries over five years. The data for the 56 countries are pooled for robust estimation. Real per capita private consumption is modeled as a function of real per capita disposable income, real interest rates, and credit and debit card penetration with fixed cross-country effects. A trend term is included for emerging economies to account for strong "catch-up" technology adoption and trade expansion in these countries in recent years. The estimated equation is shown below.

Log linear
Dependent variable: Real private consumption per capita
Method: Pooled least squares
Date: 08/08/12 Time: 16:20
Sample: 2008 2012
Included observations: 6
Cross-sections included: 56
Total pool (unbalanced) observations: 282

Variable	Coefficient	Std. Error	t-Statistic	Prob
Constant	2.019	0.043	46.847	0.000
Card spending as a percent of total spending in developed countries	0.168	0.160	1.050	0.295
Card spending as a percent of total spending in developing countries	0.289	0.234	1.237	0.217
Per capita disposable income in developed countries	0.289	0.038	7.526	0.000
Per capita disposable income in developing countries	0.198	0.031	6.297	0.000
Real interest rate in developed countries	-0.002	0.001	-1.615	0.108
Real interest rate in developing countries	-0.002	0.001	-2.366	0.019
Time trend in developing countries	0.018	0.003	5.535	0.000
Fixed Effects (Cross)				

R-squared	0.999	Mean dependent var	1.971
Adjusted R-squared	0.999	S.D. dependent var	1.239
S.E. of regression	0.042	Akaike info criterion	-3.322
Sum squared resid	0.381	Schwarz criterion	-2.509
Log likelihood	531.433	Hannan-Quinn criter.	-2.996
F-statistic	3996.024	Durbin-Watson stat	1.082
Prob(F-statistic)	0.000		

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