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Banco Central de la República Argentina
Subgerencia General de Investigaciones Económicas

Credit vs. Payment Services: Financial Development and Economic Activity Revisited (*)

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Abstract

The purpose of this paper is to assess whether the banking system, over and beyond its credit function, has a significant impact on per capita GDP by providing means of payment. An annual database of 152 spanning the 1980-2007 period is exploited to this end. On the descriptive front, we find that richer economies display higher and increasing levels of demand deposits and lower levels of currency than poor countries. While this was to be expected, more surprising is the fact that the currency to GDP ratio did not diminish much over time, regardless of income level differences. In turn, our regressions confidently support the hypothesis that banks contribute to economic development not only as credit suppliers but also by facilitating transactions. Specifically, along with the ratio of private credit to GDP, the volume of demand deposits to GDP appears to exert a positive influence on per capita GDP. On the contrary, the level of currency to GDP yields a negative loading. The results are robust to different model specifications and endogeneity tests. These findings have valuable implications for a better understanding of the channels through which the banking system affect the economy.

(*) Comments welcome at ricardo.bebczuk@bcra.gov.ar and maximo.sangiacomo@bcra.gov.ar. Useful suggestions on data sources from Jim Cunha, David Humphrey, Robert Hunt and Scott Schuh are greatly appreciated. Santiago Carbó provided insightful comments for improving the paper. The usual disclaimer applies.

Introduction

The finance literature has emphasized in the last 20 years the importance of financial development for long-term economic growth. This hypothesis is grounded on the ability of banks (and eventually other intermediaries) to: (i) Choose the most productive projects, (ii) Monitor and control borrowers up until loan repayment, (iii) Diversify risks, and (iv) Minimize the cost of mobilizing savings.

It is striking, however, the little attention paid so far to the role of the banking system in creating means of payment. For instance, in his comprehensive survey of the finance and growth literature, Levine (2004) briefly mentions that the financial system eases specialization –and thus productivity gains- by facilitating exchange via lower transaction costs, citing Greenwood and Smith (1997) for theoretical support, but without offering any empirical evidence. An apparent indication of the prevalent credit-based view is that the ratio of private credit to GDP, and no variable measuring payment services, is overwhelmingly used in growth regressions as a proxy for financial depth.

A similar omission is encountered in the analysis of the effects of financial crises on economic activity. It is only natural to think that, as cash is gradually replaced by bank-based instruments, a disruption in the payments banking network connecting millions of buyers and sellers across the economy can most likely hit real activity. Stressing the need for an efficient payment system in the midst of a financial crisis, Flannery (1996) asserts that *"Because the payment system is so crucial to a modern economy's functioning, its potential failure elicits great concern"*. On a more anecdotal note, Taylor (2007) takes stock of the 2002 Uruguayan crisis, and notices that *"The immediate need was to stop the bank run and prevent a breakdown in the payments system, which would compound the damage already done to Uruguay's economy"*. However, in measuring the real costs of financial crises, Cecchetti, Kohler and Upper (2009) mention credit availability and its cost as a major channel of transmission to the real sector, but not the disruption of the payment system. Likewise, Claessens, Kose and Terrones (2007) highlight the changes in credit as a key determinant of recessions, yet once again neglecting a specific role for the payments system.

The reasons why a bank-based payments system may improve a country´s economic performance vis-à-vis the direct use of cash are not difficult to pinpoint. First, the handling of physical currency is costly, as it implies onerous distribution, insurance and other expenses for commercial and central banks.[1,2] Second, switching payments from a cash-based to a secure electronic-based platform brings about sizable time savings and efficiency gains to entrepreneurs in the form of better accounting and financial planning systems.[3] Third, non-cash payments reduce the risk of theft and the pecuniary costs of paper invoicing and payments, which are much more labor-intensive and less expedited than electronic processing. Finally, in an electronic environment where all payments get recorded, transaction transparency facilitates internal auditing and the access to credit by alleviating informational asymmetries -as well as a better detection of tax evasion and illegal activities at the macroeconomic level. An even more direct and persuasive argument is the rising revealed preference for non-cash payments, illustrated for instance by Schuh (2007) with US data. In 1995, the share of cash in total payments was 21%; a decade later, in 2005, it was 14%. Debit and credit cards grew in the same period from 19% to 32%, while checks plummeted from 53% to 37% of total transaction value.

The purpose of this paper is to assess whether the banking system, over and beyond its credit function, has a significant impact on per capita GDP by providing means of payment. As a by-product of our investigation, we will take the opportunity to look at long-term trends in the usage of cash versus non-cash payment instruments. Our work will be based on an annual panel dataset covering 152 countries over the 1980-2007 period.

We believe this question to be particularly timely. The advent of the subprime crisis in 2007 (plus 122 systemic banking crises around the globe in the preceding two decades)

[1] For example, Humphrey et al. (2003) estimate that bank payment costs in Norway are about four times higher with cash than with debit cards. For Belgium, De Grauwe, Buyst and Rinaldi (1999) find that the total social cost of operating the cash system amounts to 0.75% of GDP, while the corresponding figure for the card-based system is 0.11% of GDP.

[2] De Grauwe, Rinaldi and Van Cayseele (2006) point out that cash has larger variable but lower fixed costs than electronic payments. After a certain threshold in the number of transactions, the total social costs of the latter should be lower than that of cash.

[3] Our paper is especially concerned with the choice between cash and bank means of payments. But within the latter, another central issue, not covered here, is the transition from checks (which still are a paper-based instrument) to purely electronic instruments.

has fueled a spirited debate about the net social contribution of bank credit flows, especially after one puts on the table two well-documented facts: (i) Credit seems to be growth-promoting in the long-run but destabilizing in the short-run, as forcefully demonstrated by Loayza and Ranciere (2005) in the context of international panel growth regressions, and in IPES (2005) in discussing the probability of financial crises; and (ii) The flow of credit is not a major source of finance for the private sector, in particular when compared to self-finance (see Bebczuk, Burdisso, Carrera and Sangiácomo (2010)). These facts make all the more controversial the high value that societies attach to the credit function of the banking system. As this function is being put under such a stern scrutiny, it is of interest to produce evidence on the effect of the usually disregarded payment function.

Yet another motive justifying this research topic is that the way transactions are settled has profound implications for monetary policy. A long-standing issue in monetary economics is how financial innovations affect the demand for money, complicating the job of central banks in their quest for keeping inflation under control (see Simpson and Blinder (1984)).[4] In a related vein, the degree of substitution between currency and non-cash instruments is bound to have a direct bearing on seigniorage revenue.

The paper is structured in two main sections, one devoted to the introduction of the data and the discussion of some major trends and methodological issues, and the other to the presentation of our econometric findings. Some conclusions and policy implications will appear in the closing section.

[4] It should be noted, though, that there are three levels of substitution between money stock components: (i) Between M1 and other money aggregates, which was at the center of the missing money debate in the 1970s and 1980s; (ii) Between all money aggregates and electronic money (see for example Laster and Wenninger (1995)); and (iii) Between currency and demand deposits within the M1 aggregate (as discussed in Drehmann, Goodhart and Krueger (2002)). Our paper focuses only on (iii).

Section 1: Data

Economic transactions can be carried out in cash outside the banking system or by using bank-based instruments, which include checks and debit and credit cards, among others. It is well-known that a technological revolution beginning in the 1970s has favored the massive adoption of these increasingly inexpensive and secure electronic payment products, which have become a close substitute to cash holdings. These alternative instruments are accepted by sellers because they are backed by cash balances maintained in the banking system mostly as demand deposits (as opposed to savings accounts, which are kept for store of value rather than for transactional uses).

The most popular measure of the use of cash, and the one we will adopt for our work, is the stock of currency in circulation to GDP -the inverse of the velocity of money. In turn, our proxy for the use of bank (non-cash) payment instruments will be the stock of demand deposits to GDP. Both series were obtained from the IMF's International Financial Statistics. An invaluable advantage of the variables chosen is that they are available for a large number of countries (24 developed and 128 developing) and years (1980 through 2007).

One should be aware, though, that the cash stock issued in a given country may not coincide with the cash stock actually used in registered domestic transactions. First, part of the existing cash may be hoarded by residents, although it is most likely that savings held in the form of cash are marginal as a proportion of the total stock. Second, some national currencies may be demanded by foreign residents (as a financial asset or even for transaction purposes) and governments (for building international reserves). Finally, cash is normally the vehicle to conduct illegal or informal transactions, so as to avoid official controls. This causes two amplifying effects on the currency to GDP ratio: on one hand, countries with a large fraction of underground activities may display a more intensive use of cash vis-à-vis bank payment instruments; on the other hand, since the currency stock is fully recorded but total GDP is underreported, the observed cash to (official) GDP ratio will overestimate the use of cash in economies with a larger shadow economy, in particular developing economies.[5] As the amount of cash actually used in

[5] Schneider (2007) estimates that the shadow economy represents, on average for 1999-2005, 36.7% in 96 developing economies and 14.8% in 21 OECD countries.

domestic transactions cannot be directly observed, we will try to control in different ways for these potential drawbacks when running our regressions.

Similarly, it may be the case that some deposits classified as savings be used for transaction purposes, and hence the ratio of demand deposits to GDP would underestimate the role of non-cash payment instruments. A more direct indicator is the value and number of transactions made with checks, debit and credit cards, and related instruments. The problem here is that statistics of this kind exist for a limited number of advanced countries and for a much shorter period of time. Nevertheless, the available data suggest that we are on the right track when adopting currency and demand deposits as our empirical variables of interest. Work by Snellman, Vesala and Humphrey (2000) and Snellman and Viren (2006) shows that the ratio of cash to GDP moves negatively with different measures of banking means of payment, such as the number of POS terminals and of ATMs per capita, implying that cash and non-cash are substitutes. In turn, Graph 1 reveals that the ratio of currency to demand deposits –our proxy for the weight of cash vis-à-vis non-cash transactions- holds a negative relationship with the number of debit cards per capita –a good direct indicator of the use of non-cash instruments- in 31 countries (with 2006 data from national and multilateral sources). Relatedly, the overall accuracy of the demand deposits as a proxy for non-cash payments is demonstrated in Graph 2 by confirming its positive correlation with debit cards per capita.

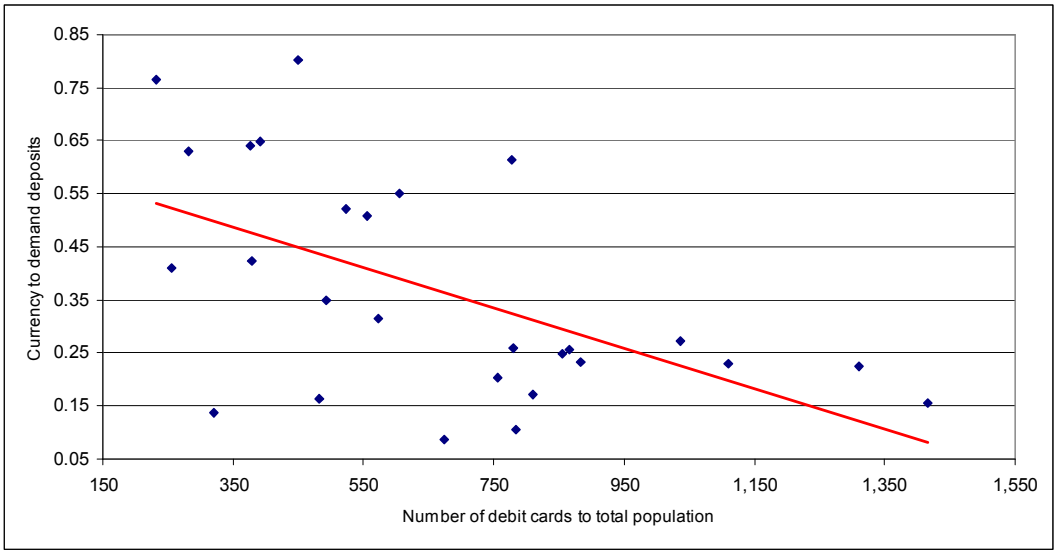
Table 1 displays the ratio of currency in circulation and demand deposits to GDP, as well as the ratio between both for our 152 countries and for different country groups classified by per capita income. World and region averages are weighted by per capita GDP. A first glance at the data uncovers quite interesting trends. To start, currency in circulation does not evidence any change in the last three decades, remaining in a level close to 5% of GDP. It is curious that the demand for currency has remained relatively stable over time despite the emergence of technological, cash-saving competitors. An answer to this puzzle is offered by Drehmann, Goodhart and Krueger (2002), who contend that currency has the irreplaceable advantage of preserving anonymity, an asset for people conducting illegal or immoral activities. If anything, electronic means of payments may be a substitute for small and legal transactions.

Looking at differences across country groups in 2007, low income (6.4%) and lower middle income economies (7.4%) have slightly larger levels of currency to GDP than rich ones (5.8% in OECD and 2.5% in non-OECD). As a rule, with the only exception of a rather substantial increase of 30.4% in upper middle income countries, all groups experienced a modest reduction in cash balances over the last three decades.

A distinct situation is found when inspecting the evolution of demand deposits over time, which jumped to 18.6% of GDP in 2007, up from 8.8% in 1980. This upward path is common to all country groups, save for low income economies. However, for 2007, OECD countries stand out by their stock of demand deposits (29.8%) against figures of between 5% and 10% in the other groups.

The ratio of currency to demand deposits –which, as said before, is a summary indicator of the relative usage of cash to non-cash payments- declined markedly from 1980 to 2007 for the whole sample (from 46.2% to 26%) and for all country groups of upper middle income and above. At the other extreme, in low income countries the ratio leaped from 88.9% in 1980 to 189.2%. Here the wedge between richer and poorer countries becomes much more conspicuous than when watching at currency and demand deposits separately. Graphs 3 through 5 portray the trajectory of the three variables on a yearly basis over 1980-2007, showing that in the intervening years the differences across groups stayed roughly the same as those commented in the last paragraphs.

Graph 1
Currency to Demand Deposits and Debit Cards Per Capita
Data for 31 countries in 2006



Graph 2
Demand Deposits to GDP and Debit Cards Per Capita
Data for 31 countries in 2006

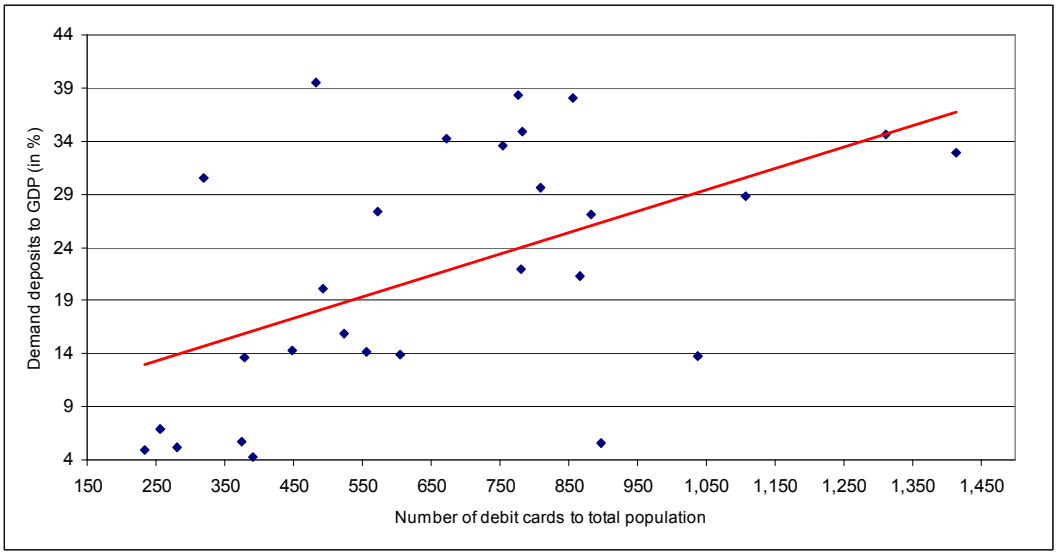
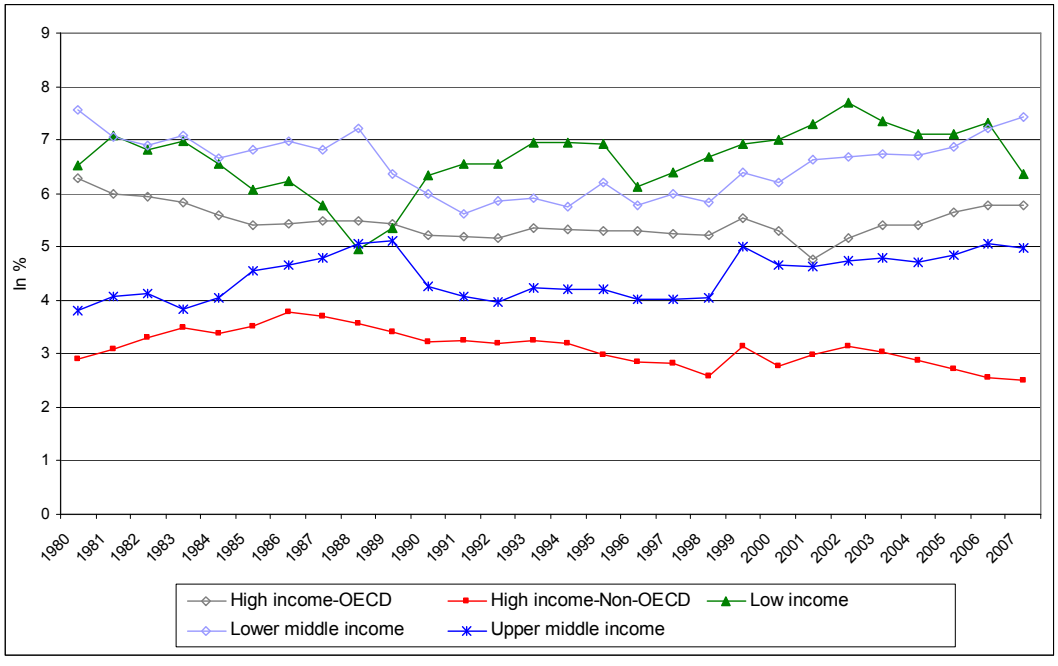


Table 1
Currency in Circulation and Demand Deposits in 1980 and 2007
Per capita GDP-Weighted Values

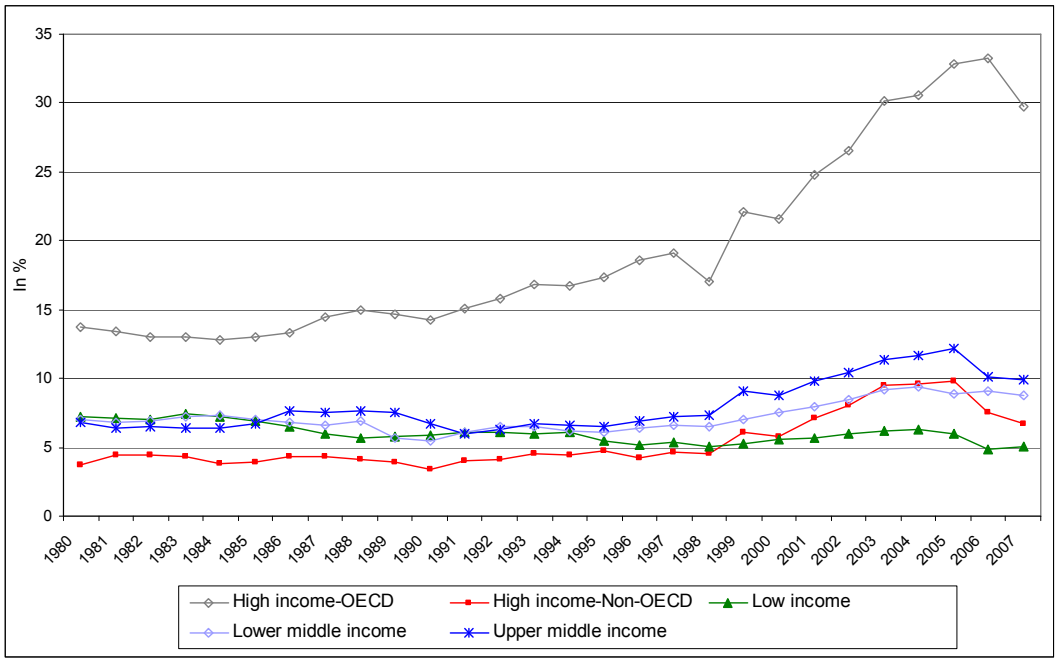
Country Group/Period &Variable	Currency in Circulation (in % of GDP)			Demand Deposits (in % of GDP)			Currency to Demand Deposits		
	1980	2007	*Change (in %)*	1980	2007	*Change (in %)*	1980	2007	*Change (in %)*
World	4.8	4.9	*0.8*	8.8	18.6	*111.8*	46.2	26.0	*-43.7*
High Income OECD	6.3	5.8	*-8.1*	13.7	29.8	*116.7*	46.8	22.3	*-52.4*
High Income Non-OECD	2.9	2.5	*-13.7*	3.7	6.7	*80.4*	40.9	10.5	*-74.3*
Upper Middle Income	3.8	5.0	*30.4*	6.8	10.0	*46.0*	49.8	36.9	*-25.9*
Lower Middle Income	7.6	7.4	*-1.9*	7.0	8.8	*25.9*	61.7	64.9	*5.2*
Low Income	6.5	6.4	*-2.3*	7.3	5.0	*-30.6*	88.7	189.2	*113.3*

Source: Own elaboration based on IMF International Financial Statistics.

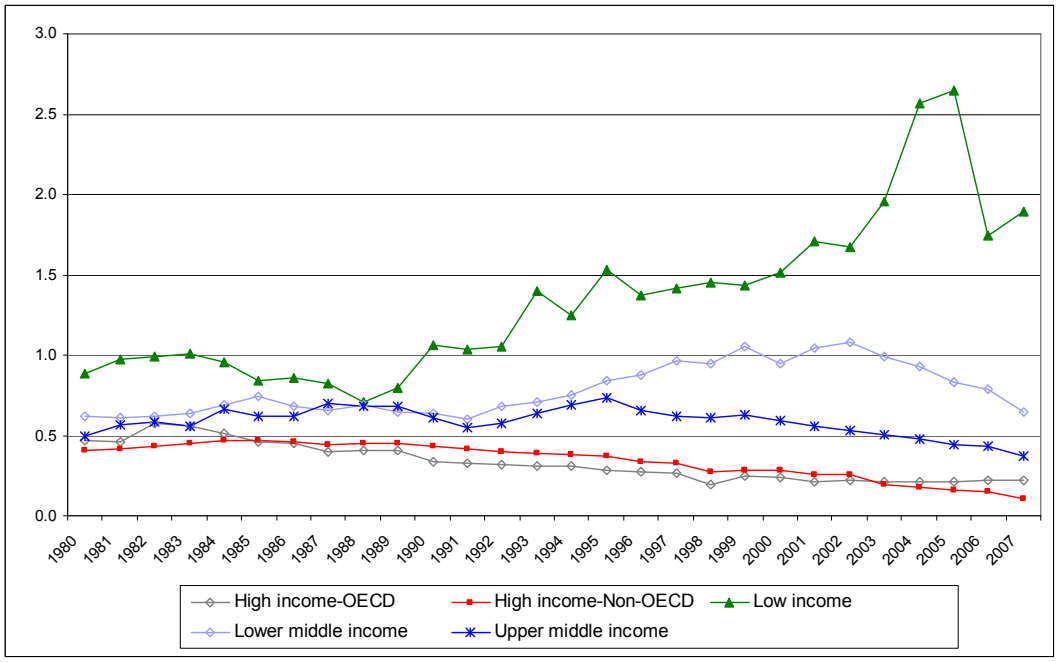
Graph 3
Currency in Circulation to GDP by Country Group
Per Capita GDP-Weighted Average for 152 Countries, 1980-2007



Graph 4
Demand Deposits to GDP by Country Group
Per Capita GDP-Weighted Average for 152 Countries, 1980-2007



Graph 5
Ratio of Currency to Demand Deposits by Country Group
Per Capita GDP-Weighted Average for 152 Countries, 1980-2007



Before proceeding, our working hypothesis (that banking services go beyond credit and also encompasses payment services) admits two possible immediate criticisms. One is that deposits might just be the reflection of credit on the liabilities side of the banking system balance sheet, and thus the researcher would be unable to disentangle the independent effect of each other –or, rephrasing, that a positive loading on demand deposits may in practice be picking up the beneficial impact of credit. Graph 6 replies by showing that in 2007 private credit (82.6% of GDP) was about 4.5 times demand deposits (18.6% of GDP) for the world at large, meaning that they can hardly been considered the mirror of each other. Table 2 reinforces this statement by displaying the Credit to Demand Deposits ratio for each income country group, confirming that between 1980 and 2007 this ratio has grown in all groups except for the OECD. The lack of proportion between credit and demand deposits is linked to a large extent to the omission of other deposits -in the same table appears the ratio of Credit to Total Deposits, which goes from 1.1 in 1980 to 1.4 in 2007 for the whole sample.[6] This issue looks even much less worrying after taking a look at Graph 7, where a negative correlation comes up between the currency-to-demand deposits ratio and private credit to GDP.

The other criticism, in turn, is that any correlation between per capita GDP (our dependent variable) and the explanatory financial variables casts the usual doubt about whether the latter explain the former or the other way around. In fact, Graph 8 renders a close correlation between per capita GDP and demand deposits, while currency seems to meander around a rather constant level, as noticed earlier. Several remedies will be tried in the next section to deal with the potential presence of endogeneity.

[6] The Credit to Total Deposits ratio is larger in high income compared to middle to low income countries. Possible reasons for this are, first, that liquid reserves tend to be larger in poorer and more unstable economies and, second, that banks in well-developed economies are more likely to tap capital markets to increase their funding above their deposits stock. Table 2 also shows that the proportion of Demand to Saving Deposits is generally higher in middle to low income countries, which may be related to the preference for shorter-term, more liquid assets in response to macroeconomic volatility.

Graph 6
Currency, Demand Deposits and Credit to GDP
Per Capita GDP-Weighted Average for 152 Countries, 1980-2007

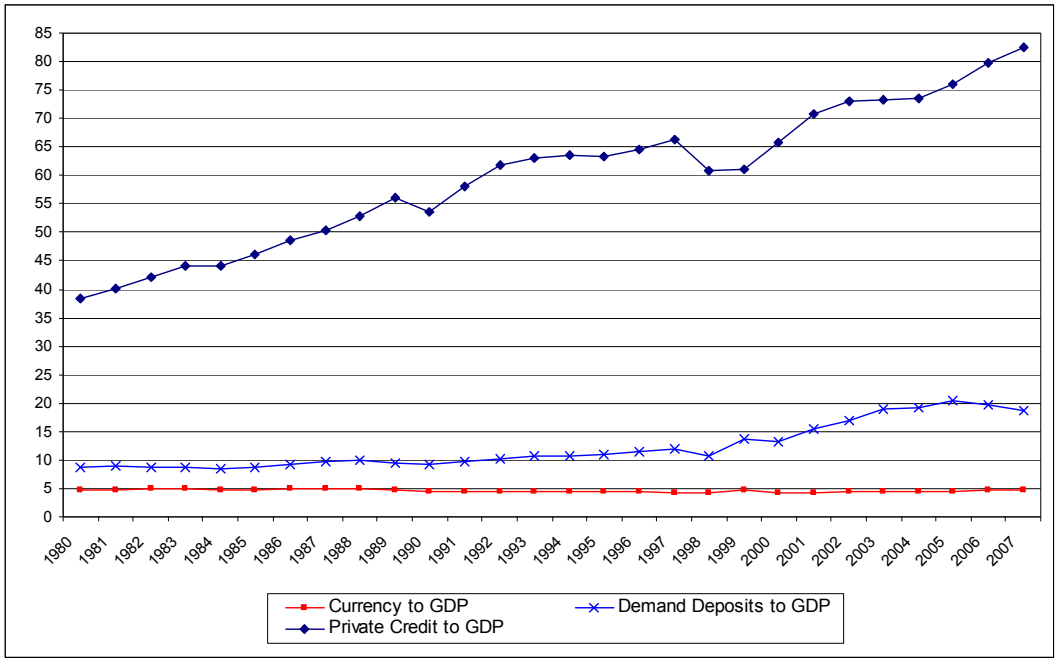
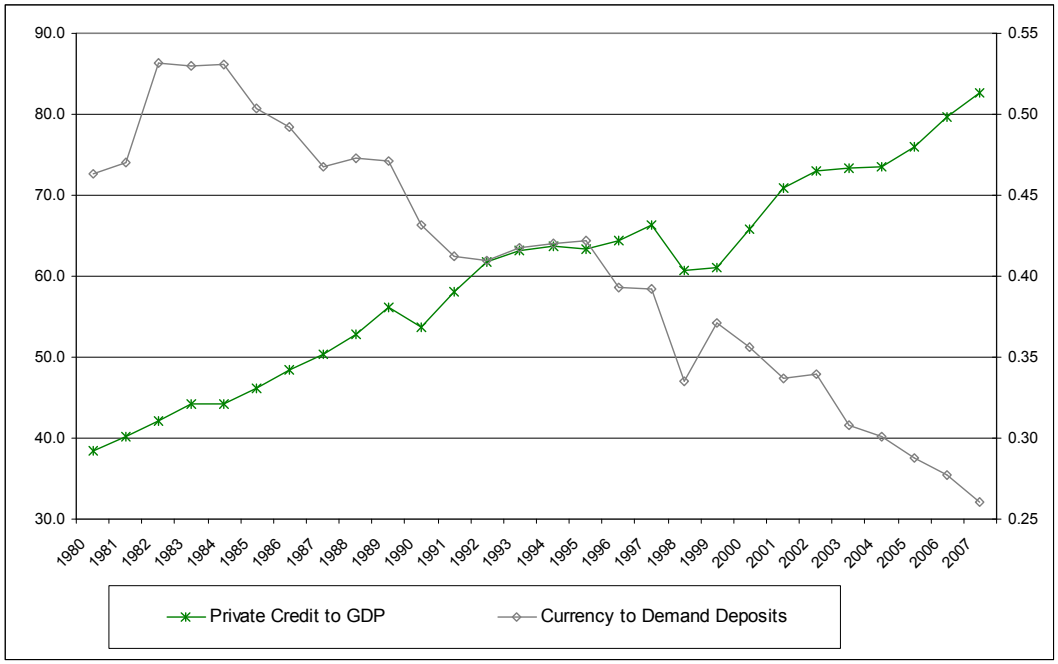


Table 2
Credit, Demand Deposits and Saving Deposits in 1980 and 2007
Per capita GDP-Weighted Values

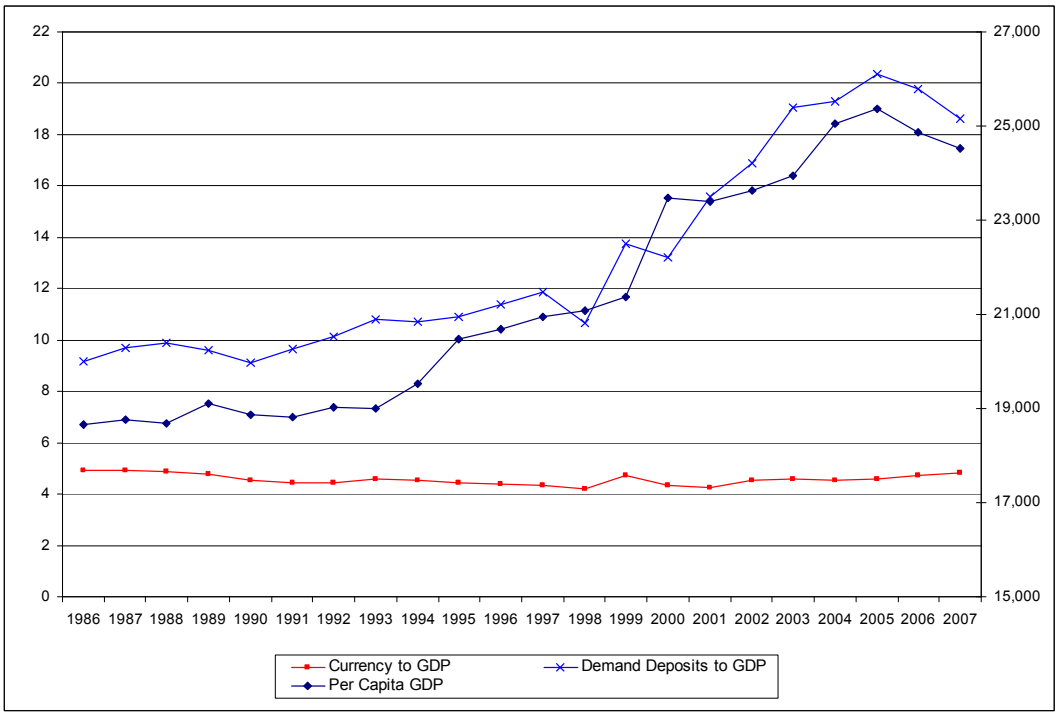
Country Group/Period &Variable	Credit to Demand Deposits			Credit to Total Deposits			Demand to Saving Deposits		
	1980	2007	*Change (in %)*	1980	2007	*Change (in %)*	1980	2007	*Change (in %)*
World	4.4	4.4	*1.4*	1.1	1.4	*32.4*	0.3	0.5	*45.5*
High Income OECD	4.9	4.2	*-13.0*	1.2	1.5	*29.3*	0.3	0.6	*77.4*
High Income Non-OECD	3.6	6.7	*86.6*	0.9	1.5	*75.9*	0.3	0.3	*-6.3*
Upper Middle Income	3.3	4.4	*34.0*	0.8	1.0	*20.5*	0.3	0.3	*-11.8*
Lower Middle Income	2.5	3.1	*22.7*	1.0	1.0	*-5.9*	0.7	0.5	*-32.8*
Low Income	1.9	3.1	*64.0*	0.9	1.3	*40.0*	1.0	0.7	*-25.3*

Source: Own elaboration based on IMF International Financial Statistics.

Graph 7
Ratio of Currency to Demand Deposits, and Private Credit to GDP
Per Capita GDP-Weighted Average for 152 Countries, 1980-2007



Graph 8
Currency, Demand Deposits and Per Capita GDP
Per Capita GDP-Weighted Average for 152 Countries, 1980-2007



Section 2: Econometric Results

Next we present our estimations of the effect on per capita GDP of bank payment instruments (proxied by the ratio of demand deposits to GDP), cash payments (measured by the ratio of currency in circulation to GDP), and private credit to GDP. Our sample covers a maximum of 152 countries over 1980-2007. The main novelty vis-à-vis the existing literature on financial development and growth lies in the two first regressors. But another key distinction is that our dependent variable is not the customary GDP growth rate but the level of GDP per capita (in PPP units). Unlike credit, which might boost both the volume and the quality of investment, we expect that a variation in the availability of payment instruments have only a scale effect (by encouraging a one-time improvement in the efficiency of resource allocation) rather than accelerate the rate of economic growth. GDP level regressions have been previously estimated, among others, by Mankiw, Romer and Weil (1992), Hall and Jones (1997) and Bernanke and Gürkaynak (2001).

Core results appear in Table 3. Regression (1) through (3) explain per capita GDP only in terms of credit, demand deposits and currency, alternating fixed and random effects as well as country and annual effects. In the three cases, the estimates are highly significant (at a 1% confidence level) and display the expected sign, that is, positive for credit and demand deposits, and negative for currency. Regressions (4) and (5) introduce five classical controls in the growth literature: government consumption to GDP, exports plus imports to GDP, secondary school enrollment, gross fixed investment to GDP, and the annual inflation rate. It can be noticed that neither the significance nor the value of the estimated coefficients are modified in any worth-mentioning way, despite the drop in the number of countries (from 152 to 141) and of observations (from 3,599 to 2,837).[7]

[7] Although we have and will present some random effects estimations, we consider that country fixed effects are better suited for the problem at hand, because they allow to control for institutional quality differences across countries –a critical determinant of GDP level divergence, as put forward by Hall and Jones (1997). Since institutions are not directly observable and tend to be highly persistent over time, fixed effects appear as a nice proxy. It is well-known, anyway, that scholars have come up with a number of ingenious time-varying, non-binary institutional measures, and in fact we will use one of them later on in the paper.

Table 4 presents some robustness checks preserving the full controlling set. Regressions (6) and (7) exclude the US and the US, Japan and Germany, respectively. The rationale is that these economies (in particular, the US) are major suppliers of international liquidity and even store of value in some emerging economies, and thus foreign holdings may be sizable. Hence, the level of currency to GDP may not reflect an intensive use of cash in transactions, which is the concept relevant to our empirical model. The results remain largely unchanged, as they do as well when we exclude the 15 most dollarized economies (regression (8)) or the 20 countries with the largest share of shadow economy (regression (9)). The level of deposit dollarization for 1995-2001 is taken from De Nicoló, Honohan and Ize (2003) and the share of underground economy for 1999-2005 from Schneider (2007). Both phenomena are prone to distort the normal use of domestic payment instruments. A dollarization process unmasks a lack of trust in local currency owing to a track record of inflation or deposit expropriation, which might lead to smaller cash and deposit balances in local currency (compensated by larger holding of foreign currency-denominated money balances). In turn, economic agents operating in the shadow economy tend to conduct their outright and borderline illegal transactions in cash in order to circumvent government controls, so the use of currency is inflated vis-à-vis other economies. The exclusion of these countries was innocuous for our estimates. Just to check whether the results are driven mainly by the early years in the sample (where, in addition, the number of countries is much lower and the critical mass comes from the developed world), we run our unbalanced panel regression for the more recent subperiod 1995-2007 in regression (10), where it can be observed that the estimates slightly weaken but without threatening their robustness. The last column of Table 4 reproduces a cross-section regression using the whole period average of all variables involved, which yields even stronger results than with the panel structure.[8]

As anticipated at the end of Section 1, one legitimate suspicion is that the underlying causation might not run from the financial variables to GDP but the other way around. Although we have offered a number of reasons why the use of bank payment instruments (contrary to the use of cash) should improve economic performance, it remains to be seen whether increasing payment sophistication is not to some extent a

[8] Another reason for running a cross-section estimation is that the likely non-stationarity of GDP and the financial variables of interest can raise concerns about a spurious regression problem. By dropping the time dimension such a caveat is removed. However, Smith (2001) asserts that, unlike the purely time series case, adding the cross-section dimension within a panel avoids the spurious regression case, which means that non-stationarity is not an issue undermining the validity of our panel estimations.

byproduct of economic development.[9] If that were the case, the estimated coefficients would be overstating the actual parameters. To tackle this potential endogeneity, we start by running system GMM regressions on our baseline and alternative model specifications. Regressions (12) through (17) suggest that the estimates, rather than shrink, actually get enlarged after applying this internal instrumental-variable panel technique, hopefully defusing any reservations about endogeneity bias.[10]

Another route to control for endogeneity is through an external instrumental variable. The obstacle in this case is that finding a variable with the required properties (high correlation with the endogenous independent variable and exogeneity with respect to the dependent variable) is quite challenging. Fortunately, in the present context we can exploit the fact that the boom in the usage of non-cash payment devices since the 1980s and 1990s was largely triggered by technological breakthroughs (such as low-cost telecommunications, secure and real-time point-of-sale verification, and massive internet access, among others) that are independent from the level of activity and instead rely on the effort, creativity, and random luck of engineers and scientists (see Rosenberg (1982) and Aghion and Howitt (1998) for compelling accounts about uncertainty and randomness of technological advances). These periodical shifts in the technological frontier dramatically reduced the costs of electronic transactions over time.[11]

We have taken as our instrument (common for all countries) for demand deposits to GDP the consumer price index for information technology services, elaborated since 1988 by the US Bureau of Labor Statistics, combined with the one presented in Jorgenson (2001), Table 1, for 1980-1987. The IV estimation appears in regression (18) from Table 6, and confirms that endogeneity is not driving our findings. The next regression additionally instruments private credit, as done in the recent law and finance

[9] As a first exploratory exercise, we carried out a novel panel Granger regression based on the Im-Pesaran-Shin methodology for unit roots (see Bebczuk et al. (2010) for details), and were unable to reject the hypothesis of a two-way relationship between each of the three financial variables (credit, demand deposits and currency) and per capita GDP. This gives us some preliminary hint at a Granger causality running in both directions, and not only from the real to the financial side of the economy. Unreported results are available upon request.

[10] The only exception is demand deposits in regression (17), which becomes non-significant after excluding countries with the largest proportion of shadow economy.

[11] This argument does not deny that, over the course of time, income levels may ease the dissemination of new technologies by supporting an expanding demand and the emergence of economies of scale. But this comes at a later stage in the technology´s life cycle. More to the point, demand deposits, as can be seen in Graph 4, were rather flat until the late 1990s around 10% of GDP and then they tripled in less than a decade. This evolution is hard to rationalize unless the technological factor enters the scene.

literature, with the index of creditor rights of Djankov, McLiesh and Shleifer (2007). While the instrument works nicely, it turns the currency coefficient non-significant. An alternative instrument for demand deposits is the index of payment unit costs estimated by Carbó, Humphrey and Rodríguez (2010). In this case (Regression (20)), the sample is restricted to 1987-2006, but this does not affect the strong significance of the instrumented private credit and demand deposits, although it persists the lack of statistical significance for currency. In response to this, we re-estimated our main equations in Table 7 by replacing the separate data on currency and demand deposits with the demand deposits-to-currency ratio (see regressions (21) through (24)). Not only the result continues to support our hypothesis but it is robust to the IV approach under the two above instruments.

Finally, as a way of summarizing and standardizing the information conveyed by the various regressions performed, Table 8 presents all point estimates in elasticity form.[12] On average across all regressions, all elasticities are at first sight low: 0.36 for private credit to GDP, 0.24 for demand deposits to GDP, -0.29 for currency to GDP, and 0.43 for demand deposits to currency. However, this conclusion might be misleading unless one bears in mind that some of the ratios have been substantially growing in the medium run. For instance, Table 1 shows that demand deposits to GDP increased 112% between 1980 and 2007. In light of the above elasticity, such increment would explain an increase of around 26% in per capita GDP over the whole period. Another remarkable feature of Table 8 is that the original explanatory variables consistently yield lower elasticities than when those variables are instrumented –IV estimates are 3 to 6 times larger depending of the financial variable under analysis. This looks striking under the presumption of endogeneity bias, but is reassuring when it comes to validate the robustness of the empirical model.

[12] These elasticities are to be read as the percentage change in per capita GDP brought about by a one-percent-change in a given financial ratio (private credit to GDP, demand deposits to GDP, currency to GDP and demand deposits to currency).

Table 3
Baseline Results

Dependent Variable: Per Capita, PPP Adjusted GDP	(1)	(2)	(3)	(4)	(5)
Private Credit to GDP	58.99***	57.11***	41.81***	44.14***	42.89***
	[3.891]	[12.49]	[11.37]	[3.705]	[11.72]
Demand Deposits to GDP	137.6***	136.9***	87.82***	91.03***	88.70***
	[10.84]	[29.13]	[26.42]	[11.53]	[30.22]
Currency to GDP	-210.6***	-208.6***	-143.4***	-102.6***	-97.92***
	[18.40]	[52.07]	[40.84]	[12.23]	[28.83]
Government Consumption to GDP				-69.47***	-73.67*
				[18.05]	[39.34]
Exports plus Imports to GDP				8.387***	7.215
				[2.749]	[6.145]
Secondary School Enrollment				6.939	-2.918
				[5.131]	[16.08]
Gross Fixed Investment to GDP				-5.856	-6.964
				[7.641]	[11.16]
Annual Inflation Rate				0.00932	0.0121
				[0.0333]	[0.0430]
Constant	7222***	7072***	6886***	9087***	7194***
	[724.5]	[548.1]	[936.6]	[935.2]	[1239]
Observations	3599	3599	3599	2837	2837
Countries	152	152	152	141	141
Time period	1980-2008	1980-2008	1980-2008	1980-2008	1980-2008
Joint Significance Test (p-value)	0.000	0.000	0.000	0.000	0.000
R^2 - overall	0.438	0.437	0.370	0.430	0.355
Panel data technique	RE	FE	FE	RE	FE
Country Fixed Effects	No	Yes	Yes	No	Yes
Annual Time Effects	No	No	Yes	Yes	Yes

Notes: Robust standard errors in brackets. ***Significant at 1%, **Significant at 5%, ***Significant at 10%.

Table 4
Robustness Checks

Dependent Variable: Per Capita, PPP-Adjusted GDP	(6) Excluding US	(7) Excluding US-Japan-Germany	(8) Excluding 15 most dollarized countries	(9) Excluding 20 countries with largest share of shadow economy	(10) Subperiod 1995-2008	(11) Cross-Section
Private Credit to GDP	37.18***	35.03***	44.40***	51.97***	29.42***	77.08***
	[10.98]	[11.11]	[12.03]	[13.45]	[8.238]	[27.63]
Demand Deposits to GDP	101.9***	107.7***	87.11***	57.82**	41.74**	350.8**
	[28.72]	[32.82]	[30.43]	[24.88]	[18.39]	[174.7]
Currency to GDP	-109.7***	-113.5***	-97.64***	-86.21***	-58.18*	-369.7**
	[26.63]	[26.56]	[29.30]	[30.12]	[32.41]	[146.5]
Observations	2811	2770	2648	2564	1582	145
Countries	140	138	129	125	141	145
Time period	1980-2008	1980-2008	1980-2008	1980-2008	1995-2008	1980-2008
Joint Significance Test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000
R^2 - overall	0.376	0.356	0.386	0.423	0.0043	0.584
Panel data technique	FE	FE	FE	FE	FE	No
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	No
Annual Time Effects	Yes	Yes	Yes	Yes	Yes	No

Notes: Robust standard errors in brackets. ***Significant at 1%, **Significant at 5%, ***Significant at 10%.
Regressions include additional unreported controls: Government consumption to GDP, Exports plus imports to GDP, Secondary School Enrollment, Gross fixed investment to GDP, and the annual inflation rate, plus a constant.

Table 5
System GMM Estimation

Dependent Variable: Per Capita, PPP-Adjusted GDP	(12) Baseline	(13) Excluding US	(14) Excluding US-Japan-Germany	(15) Excluding 15 most dollarized countries	(16) Subperiod 1995-2008	(17) Excluding 20 countries with largest share of shadow economy
Private Credit to GDP	128.2***	109.9***	103.1***	122.3***	136.7**	141.9***
	[35.41]	[37.40]	[37.99]	[36.66]	[63.33]	[39.70]
Demand Deposits to GDP	219.8**	265.7***	300.7***	208.7**	446.1**	154.0
	[98.89]	[102.7]	[104.4]	[99.04]	[222.6]	[101.9]
Currency to GDP	-699.8***	-697.7***	-733.5***	-730.6***	-2111***	-601.3***
	[214.2]	[203.7]	[210.5]	[227.5]	[638.4]	[228.3]
Observations	2773	2747	2706	2593	1519	2506
Countries	141	140	138	129	141	125
Time period	1980-2008	1980-2008	1980-2008	1980-2008	1995-2008	1980-2008
Joint Significance Test (p-value)	0.000	0.000	0.000	0.000	0.000	0.000
Panel data technique	System GMM	System GMM	System GMM	System GMM	System GMM	System GMM
Country Fixed Effects	No	No	No	No	No	No
Annual Time Effects	Yes	Yes	Yes	Yes	Yes	Yes
AB First-Order Correlation	0.920	0.885	0.873	0.867	0.819	0.497
AB Second-Order Correlation	0.390	0.434	0.506	0.465	0.888	0.207
Hansen Test	0.240	0.205	0.227	0.353	0.0676	0.295

Notes: Robust standard errors in brackets. ***Significant at 1%, **Significant at 5%, ***Significant at 10%.
Regressions include additional unreported controls: Government consumption to GDP, Exports plus imports to GDP, Secondary School Enrollment, Gross fixed investment to GDP, and the annual inflation rate, plus a constant.

Table 6
IV Estimation

Dependent Variable: Per Capita, PPP-Adjusted GDP	(18)	(19)	(20)
Private Credit to GDP	51.45***		
	[3.781]		
Currency to GDP	-54.03***	11.54	3.871
	[10.47]	[11.96]	[11.22]
Private Credit to GDP (IV)		178.6***	220.5***
		[57.26]	[63.11]
Demand Deposits to GDP (IV1)	565.7***	680.0***	
	[90.16]	[93.10]	
Demand Deposits to GDP (IV 2)			811.9***
			[76.99]
Observations	2888	2943	2307
Countries	142	146	145
Time period	1980-2008	1980-2008	1987-2006
Joint Significance Test (p-value)	0.000	0.000	0.000
R^2 - overall	0.406	0.165	0.0683
Panel data technique	RE	RE	RE
Country Fixed Effects	No	No	No
Annual Time Effects	Yes	Yes	Yes

Notes: Robust standard errors in brackets. ***Significant at 1%, **Significant at 5%, ***Significant at 10%. Regressions include additional unreported controls: Government consumption to GDP, Exports plus imports to GDP, Secondary School Enrollment, Gross fixed investment to GDP, and the annual inflation rate, plus a constant.

Table 7
Demand Deposits to Currency

Dependent Variable: Per Capita, PPP-Adjusted GDP	(21)	(22)	(23)	(24)
Private Credit to GDP	42.48***	41.23***		
	[3.569]	[11.35]		
Demand Deposits / Currency	614.6***	608.5***		
	[57.37]	[147.8]		
Private Credit to GDP (IV)			196.6***	246.0***
			[64.35]	[68.82]
Demand Deposits / Currency (IV1)			3060***	
			[415.0]	
Demand Deposits / Currency (IV2)				3662***
				[344.8]
Observations	2830	2830	3149	2435
Countries	141	141	149	148
Time period	1980-2008	1980-2008	1980-2008	1987-2006
Joint Significance Test (p-value)	0.000	0.000	0.000	0.000
R^2 - overall	0.434	0.365	0.173	0.0748
Panel data technique	RE	FE	RE	RE
Country Fixed Effects	No	Yes	No	No
Annual Time Effects	Yes	Yes	Yes	Yes

Notes: Robust standard errors in brackets. ***Significant at 1%, **Significant at 5%, ***Significant at 10%. Regressions include additional unreported controls: Government consumption to GDP, Exports plus imports to GDP, Secondary School Enrollment, Gross fixed investment to GDP, and the annual inflation rate, plus a constant.

Table 8
Summary Table: Estimated Point Elasticities of Financial Variables

Regression # / Elasticity of Per Capita GDP to:	Private Credit to GDP	Demand Deposits to GDP	Currency to GDP	Demand Deposits to Currency
(1)	0.246	0.155	-0.156	
(2)	0.244	0.158	-0.158	
(3)	0.179	0.101	-0.109	
(4)	0.194	0.106	-0.077	
(5)	0.188	0.104	-0.074	
(6)	0.164	0.122	-0.085	
(7)	0.153	0.129	-0.090	
(8)	0.196	0.104	-0.073	
(9)	0.125	0.048	-0.037	
(10)	0.240	0.071	-0.070	
(11)	0.321	0.420	-0.292	
(12)	**0.562**	**0.255**	**-0.524**	
(13)	**0.484**	**0.317**	**-0.537**	
(14)	**0.449**	**0.359**	**-0.580**	
(15)	**0.539**	**0.247**	**-0.545**	
(16)	**0.576**	**0.505**	**-1.323**	
(17)	**0.655**	**0.188**	**-0.484**	
(18)	0.227	**0.650**	-0.040	
(19)	**0.009**	**0.681**		
(20)	**0.942**	**0.003**		
(21)	0.187			0.134
(22)	0.181			0.132
(23)	**0.744**			**0.675**
(24)	**0.881**			**0.786**
Overall average	*0.362*	*0.236*	*-0.292*	*0.432*
Non-IV Estimates	*0.203*	*0.138*	*-0.105*	*0.133*
*IV Estimates (**in bold**)*	*0.584*	*0.356*	*-0.665*	*0.731*

Conclusions

In outright contrast to most of the banking literature, which stresses the credit function of banks and neglects their payment function, our paper explores the role of banks on the level of per capita GDP as providers of means of payment. To do so, we employ a dataset of 152 countries spanning the 1980 to 2007 period with annual data. Given the macroeconomic scope of our study, we take the ratio of demand deposits to GDP as our variable of interest. To investigate the influence of non-bank payment instruments –the alternative to debit and credit cards, checks and other bank-based instruments- we also introduce in our empirical research the currency to GDP ratio, as well as the ratio of demand deposits to currency.

On the descriptive front, we find that richer economies display higher and increasing levels of demand deposits and lower levels of currency than poor countries. While this was to be expected, more surprising is the fact that the currency to GDP ratio did not diminish much over time, regardless of income level differences. In turn, our regressions confidently support the hypothesis that banks contribute to economic development not only as credit suppliers but also by facilitating transactions. The results are robust to different model specifications and endogeneity tests.

At a time in which the impact of credit flows on the economy at large is under a heated debate in academic and policy circles, this new evidence suggests that banks are still central to economic development. Nevertheless, it invites to revisit the precise channels through which such beneficial influence takes place.

References

Aghion P. and P. Howitt (1998), *Endogenous Growth Theory*, MIT Press.

Bebczuk R., T. Burdisso, J. Carrera and M. Sangiácomo (2010), "A New Look into Credit Procyclicality", mimeo, Central Bank of Argentina.

Bernanke B. and R. Gürkaynak (2001), "Is Growth Exogenous? Taking Mankiw, Romer, and Weil Seriously", NBER Working Paper 8365, July.

Carbó S., D. Humphrey and F. Rodríguez (2010), "A Revenue-Based Frontier Measure of Banking Competition", Documento de Trabajo No. 495, Fundación de las Cajas de Ahorro, January.

Cecchetti S., M. Kohler, and C. Upper (2009), "Financial Crises and Economic Activity", NBER Working Paper 15379, September.

Claessens S., A. Kose, and M. Terrones (2007), "What Happens During Recessions, Crunches and Busts?", IMF Working Paper 08/274, International Monetary Fund.

De Grauwe P., L. Rinaldi and P. Van Cayseele (2006), "Issues of Efficiency in the Use of Cash and Cards", mimeo, University of Leuven, March.

De Grauwe P., E. Buyst y L. Rinaldi (1999), "The cost of cash and cards compared: the cases of Iceland and Belgium", mimeo, University of Leuven.

Djankov S., C. McLiesh and A. Shleifer (2007), "Private credit in 129 countries," Journal of Financial Economics, Vol. 84, No. 2, 299-329.

De Nicoló G., P. Honohan and A. Ize (2003), "Dollarization of the Banking System: Good or Bad?", Policy Research Working Paper No. 3116, August.

Drehmann M., C. Goodhart, and M. Krueger (2002), "The Challenges Facing Currency Usage: Will the Traditional Transaction Medium Be Able to Resist Competition from New Technologies?", Economic Policy, Vol. 17, No. 34, 195-227.

Flannery M. (1996), "Financial Crises, Payment System Problems, and Discount Window Lending", Journal of Money, Credit and Banking, Vol. 28, No. 4, Part 2, 804-824.

Hall R. and C. Jones (1997), "Levels of Economic Activity across Countries", American Economic Review, Vol.87, No.2, 173-177.

Humphrey D. (2007), "Retail Payments: Overview, Empirical Results, and Unanswered Questions", Norges Bank Research Conference on Payment Systems, Oslo, November.

Humphrey D., M. Willesson, T. Lindblom, and G. Bergendahl (2003), "What does it Cost to Make a Payment?", Review of Network Economics, Vol. 2, Issue 2, June.

Islam N. (1995), "Growth Empirics: A Panel Data Approach", Quarterly Journal of Economics, Vol.110, No.4, 1127-1170.

Jorgenson D. (2001), "Information Technology and the U.S. Economy", American Economic Review, Vol. 91, No. 1, 1-32.

Khamis M. and A. Leone (2001), "Can Currency Demand Be Stable Under a Financial Crisis? The Case of Mexico", IMF Staff Papers, Vol. 48, No. 2, International Monetary Fund.

Laster D. and J. Wenninger (1995), "Policy Issues Raised by Electronic Money", mimeo, Federal Reserve Bank of New York, April.

Levine R. (2004), "Finance and Growth: Theory and Evidence", NBER Working Papers, No. 10766, September.

Listfield R. and F. Montes-Negret (1994), "Modernizing Payment Systems in Emerging Economies", Policy Research Working Paper No. 1336, World Bank, August.

Loayza N. and R. Ranciere (2005), "Financial Development, Financial Fragility, and Growth", Working Paper No. 05/170, IMF, August.

Mankiw G., D. Romer, and D. Weil (1992), "A Contribution to the Empirics of Economic Growth", Quarterly Journal of Economics, Vol.107, 407-437.

Mester L. (2006), "Changes in the Use of Electronic Means of Payment: 1995-2004", Business Review, Second Quarter, Federal Reserve of Philadelphia.

Rogoff K., F. Giavazzi and F. Schneider (1998), "Blessing or Curse? Foreign and Underground Demand for Euro Notes", Economic Policy, Vol.13, No.26, CEPR, 263-303.

Rosenberg N. (1982), "Uncertainty and Technological Progress," in R. Landau (ed.), *The Mosaic of Economic Growth*, Stanford University Press.

Schneider F. (2007), "Shadow Economies and Corruption All Over the World: New Estimates for 145 Countries", Economics No. 2007-9.

Schuh S. (2007), "The Role of Payment Characteristics in Consumer Payment Choice", mimeo, Federal Reserve Bank of Boston.

Simpson T. and A. Blinder (1984), "Changes in the Financial System: Implications for Monetary Policy", Brookings Papers on Economic Activity, Vol. 1984, No. 1, 249-272

Smith R. (2001), "Estimation and inference with non-stationary panel time-series data", mimeo, Department of Economics, Birkbeck College, London, September.

Snellman H. and M. Viren (2007), "ATM Networks and Cash Usage", mimeo, Bank of Finland.

Snellman H., J. Vesala, and D. Humphrey (2000), "Substitution of Noncash Payment Instruments for Cash in Europe", Discussion Paper 1/2000, Bank of Finland.

Taylor J. (2007), "The 2002 Uruguayan Financial Crisis: Five Years Later", mimeo, Hoover Institution, Stanford University.