

*IL SALONE DEI PAGAMENTI 2017*  
*Payments & the Digital Society*  
Session  
Banknotes and effective cash management

# **The role of cash in payment transactions**

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Milan, 22 November 2017

## *Introduction*<sup>1</sup>

The world of retail payments is changing rapidly. New payment instruments are on the rise, enabling high-speed transactions to be processed in sales outlets (for example, using contactless cards), but which can also be used for person-to-person payments via smartphone applications.

In this new world the question arises as to what place cash will occupy in domestic retail and cross border payments? Should we be anticipating its swift demise, leading it in the not too distant future to take its place among museum exhibits rather than in the pockets of our citizens?

Any response must acknowledge a phenomenon that today is apparent in the numbers, and which, at first glance could seem like a conundrum: in most advanced countries the arrival of new payment instruments has been accompanied by very strong growth in cash, both in absolute terms and relative to macroeconomic variables such as GDP and consumption.

The Eurosystem uses methodologies (the analysis of factors that determine demand for money and its stability; econometric models and statistics) to foresee emerging trends in cash in the medium term (2 to 3 years), also in view of recent payment innovations. Amongst other things, this is a vital stage in the process that shapes the allocation of banknote production among the national central banks (NCBs) of the euro area.

Finally, what is the Eurosystem's policy on cash? Is there a risk of a last ditch 'defence' of banknotes, the traditional product of central banks, and could this have negative repercussions on efficiency?

The remainder of my paper will focus on trends in demand for banknotes in the euro area and in Italy; the apparent conundrum regarding growth in cash and the possible explanations; and the Eurosystem's policy on cash and alternative payment instruments.

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<sup>1</sup> For their help in drafting this text, my thanks go to Manuela Calderini, Alessandra Coccozza, Gianluca Maddaloni, Giorgia Rocco and Ferdinando Sasso, assigned to the Currency Circulation Management Directorate within the Directorate General for Currency Circulation and Accounting. Thanks also to Paola Giucca, from the Market and Payment System Oversight Directorate in the Directorate General for Markets and Payment Services, for her helpful comments and suggestions.

## *The conundrum*

Let's begin with some numbers that illustrate the quantitative aspects of the conundrum. We will start with those relative to the growth in non-cash alternatives.

These have recorded a significant increase in many countries: between 2005 and 2015 transactions per capita rose from 297 to 421 in the United States (representing an annualized increase of 3.5 per cent), while in the euro area they rose from 166 to 215 (growing at an annual average rate of 2.9 per cent). The use of cards in euro-area countries, which are more directly comparable with cash usage at sales points, increased markedly; in the same period, the share of card usage in the total number of transactions using non-cash alternatives rose from 30.1 to 43.7 per cent.

These developments were accompanied by a rise, rather than a drop, in currency in circulation: between 2005 and 2015 the ratio of this aggregate to GDP increased from 6.3 to 7.9 per cent in the United States, from 7.1 to 10.6 per cent in the euro area, and from 9.5 to 11.8 per cent in Switzerland. Sweden is the exception, where the sharp rise in the use of non-cash alternatives (from 213 to 427 transactions per capita) was flanked by a drop in the ratio of currency in circulation to GDP, which declined from 4.0 to 1.7 per cent (Table 1).

**Table 1**

G12 countries	Currency in circulation as a share of GDP			Number of transactions per capita with non-cash alternatives		
	Currency in circulation/GDP			Number of transactions per capita using non-cash alternatives		
	2005	2015	Average change (%)	2005	2015	Average change (%)
Australia	4.4	4.6	0.7	225	417	6.4
Canada	3.7	4.1	1.0	244	335	3.2
Japan	16.7	19.4	1.5	34	88 <sup>(1)</sup>	14.7
Sweden	4.0	1.7	-8.0	213	427	7.2
Switzerland	9.5	11.8	2.2	140	244	5.7
UK	3.4	3.7	0.9	231	355	4.4
USA	6.3	7.9	2.3	297	421	3.5
Euro Area	7.1	10.6	4.1	166 <sup>(2)</sup>	215	2.9

Sources: Red book (BIS) and ECB.

(1) The data refer to 2012. – (2) The data refer to 2006.

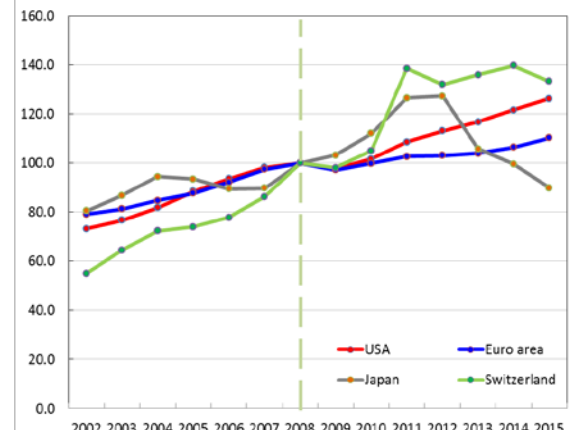
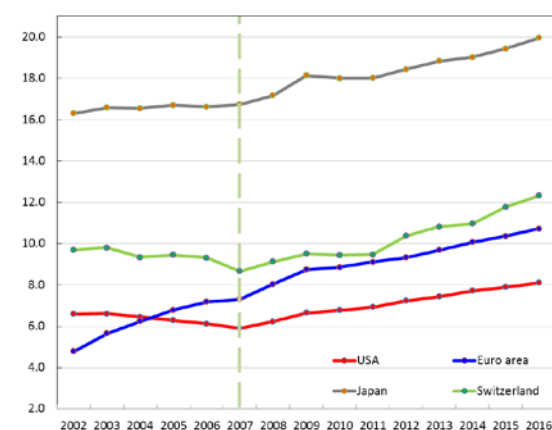
From 2002 to 2007, the ratio of currency in circulation to GDP declined in the United States and Switzerland (Figure 1.a) and increased instead in the euro area and in Japan. In the financial crisis triggered in 2008 by the collapse of the investment bank Lehman Brothers, and in connection with other episodes of financial instability (the 2011 sovereign debt crisis and the resurgence of the Greek crisis in 2014), this share increased in all the countries considered (Figure 1.a).

**Figure 1**

**International comparison of the ratio of currency in circulation to GDP**

**(a) Currency in circulation/GDP**

**(b) Index numbers relative to GDP  
(base 2008)**



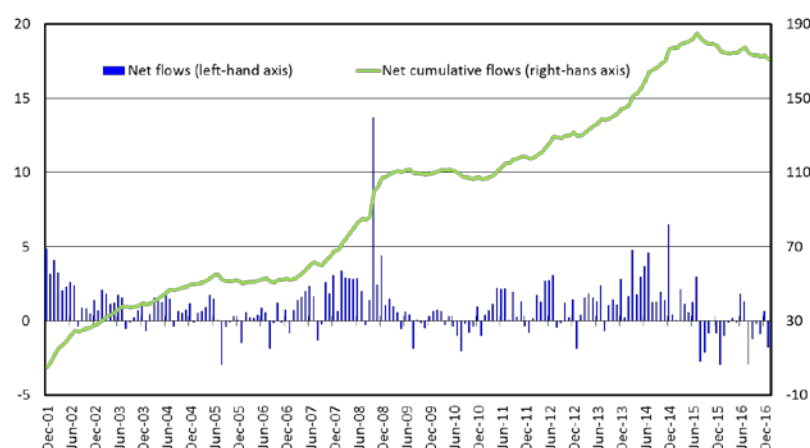
Source: BIS; for 2016, provisional data.

In the euro area in 2016 the stock of currency in circulation slowed, recording an increase of 3.9 per cent compared with 6.6 per cent in 2015. This may have partly reflected the decision taken by the Eurosystem in May 2016 to halt the issue of €500 notes towards the end of 2018, leading to a sharp increase in lodgments of these notes (€36.9 billion), which was only partially offset by greater withdrawals of €200 and €100 notes; the slowdown in foreign demand may also have been a contributory factor.

The ECB recently estimated that at the end of 2016 some 30 per cent of euro banknotes were held outside of the bloc.<sup>2</sup> At the end of 2016 the stock of banknotes held outside of the euro area that built up owing to net shipments alone (i.e. sales/purchases of euro banknotes to/by persons outside of the area by financial institutions specialized in foreign exchange trading) amounted to €173 billion or 15 per cent of total issues. Outflows were greatest at times of economic uncertainty and severe financial tensions. In 2016, moreover, inward flows of euro banknotes from abroad exceeded outflows (Figure 2); this may also have reflected the decline in demand for euro banknotes for currency reserves associated with reduced uncertainty in neighbouring regions.<sup>3</sup>

**Figure 2**

**Net shipments of banknotes**  
(billions of euros)



Source: ECB.

Any analysis of the growth in the ratio of currency in circulation to GDP and the accompanying rise of alternative instruments must take account of the fact that, all other things being equal, as the use of new instruments increases, that of cash decreases. Even in countries such as Italy, where demand for cash is high, the replacement process is under way.

<sup>2</sup> ECB (2017), 'Estimation of euro currency in circulation outside the euro area'.

<sup>3</sup> ECB (2017), 'The international role of the euro'.

The simultaneous expansion of currency in circulation and spread of new payment methods must, therefore, be accounted for by factors that work in opposing directions, driving demand for notes. One contribution can come from analysing trends in the traditional determinants of demand for cash.

The theory tells us that people want cash for transactional, precautionary and speculative purposes; for each purpose, banknotes are requested by residents and non-residents, for uses associated with legal transactions or with the underground and illegal economies.

The increase in GDP that we have seen in the euro area and the lowering of interest rates following the adoption of expansionary monetary policy measures are undoubtedly at the core of the rise in demand for banknotes. Trends in euro exchange rates may also have affected demand for banknotes on the part of foreign operators resident in countries with weak currencies and exposed to financial and geopolitical risks.

Finally, in the period under examination, we will take a look at the role of the underground and illegal economies, given that the transactions connected with these worlds are cash intensive. Is there any evidence that an expansion in the number of transactions concluded in the underground or illegal economies may have contributed to the rising stock of banknotes? Notwithstanding the difficulties of measuring these transactions, the available evidence does not suggest that in recent years there has been an expansion of the black and illegal economies.<sup>4</sup>

Higher GDP and consumption, and lower interest rates, explain the increase in cash usage; the (scarce) information available on the underground economy point, instead, move in the opposite direction. Finally, demand for currency has grown in concomitance with rising financial tensions and economic uncertainty. All told, *there is no conundrum*; the latter is the product of an erroneous partial equilibrium analysis that only takes account of the current process of substitution with new instruments without considering the other, more traditional, variables, that determine demand for cash.

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<sup>4</sup> Jobst, C., Stix, H. (2017). 'Doomed to Disappear? The Surprising Return of Cash Across Time and Across Countries', CEPR Discussion Paper No. DP12327\* Medina, L., Schneider, F. (2017). 'Shadow Economies around the World: New Results for 158 Countries over 1991-2015', Department of Economics, Johannes Kepler, University of Linz.

## *Cash models and forecasts; the allocation among the countries that print euro banknotes*

In addition to studying the relationships between demand for currency and economic variables, the objective of economic analysis is to make forecasts,<sup>5</sup> which for the euro area have important repercussions on day-to-day operations: the production and distribution of banknotes to meet the demand of economic operators, with a view to ensuring the orderly conduct of payment transactions.

The ECB<sup>6</sup> makes forecasts of overall demand for banknotes, relying on a set of models that go from simple extrapolative formulae (an autoregressive integrated moving average or ARIMA) to more complex multivariate models<sup>7</sup> designed to estimate long-term equilibria between demand for cash and the explanatory variables.

*The models examine GDP to capture the transactional component; short- and long-term interest rates are used as indicators of the opportunity cost of holding cash; a linear trend is also introduced to estimate the impact of financial innovation. Distancing themselves somewhat from the more traditional models, the ECB includes the exchange rate among the explanatory variables to capture demand for banknotes from abroad.<sup>8</sup> The final forecasts are based on the average of the estimates of the various models, excluding those whose performance is not satisfactory. Once the forecasts for total demand for banknotes have been finalized, simple extrapolative statistical models are used to estimate the demand for individual denominations. Over the longer term, it appears difficult to capture discontinuities connected with the impact of innovation and changes in the population's demographics (for example, changes in demand reflecting the growing importance of the demographic cohort known as millennials).*

The Eurosystem forecasts are made over a horizon of two and a half years, an interval that takes account of production planning requirements. When determining the quantities for the bloc, operational aspects of the banknote circuit are also taken into account, such as the estimated volume of banknotes that central banks must withdraw annually because they are no longer fit for purpose and replaced with new notes. Finally, it is also important to maintain logistical stocks at a minimum (the benchmark), in a way that takes account of the risks of peaks in demand (for example, linked to strikes in the cash-in-transit (CIT) sector or to other factors impeding the regular distribution of banknotes nationwide).

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<sup>5</sup> Fish T., R. Whymark (2015). 'How cash usage evolved in recent decades? What may drive demand in the future?', Bank of England, *Quarterly Bulletin*, Vol. 55.

<sup>6</sup> Fisher B., P. Kohler and F. Seitz (2004), 'The demand for euro area currencies: past, present and future', ECB Working Paper Series, No. 330.

<sup>7</sup> VAR, (B)VAR, VECM and FAVAR models.

<sup>8</sup> Dummy variables are also included in relation to specific events that have led to level shifts in the demand for banknotes, such as the euro changeover in 2002 and the financial tensions following the collapse of Lehman Brothers in 2008.

*Specific forecasting requirements are linked to the replacement of banknotes with a new series, as is happening with the introduction of the second series of euro notes: in addition to the demand for each denomination, annual lodgements of the old series must also be estimated, factoring in the issuance scenarios adopted for new issues. To estimate banknote requirements connected with these aspects, the Eurosystem draws on the operational experience of the NCBs and on data compiled through contacts with operators.*

## ***Demand for cash in Italy***

*In analysing the circulation of cash in Italy (as for the other countries in the bloc) it is possible to refer to three sets of data: 1) those entered on the liability side of the NCB balance sheets, based on a conventional criterion that attributes to each country a share in the area's total issues relative to the respective share in the ECB's capital key;<sup>9</sup> 2) the data in the financial accounts that for Italy are obtained from the balance sheet of the Bank of Italy with a number of adjustments;<sup>10</sup> 3) cumulated net issuance,<sup>11</sup> which can differ from actual circulation insofar as they exclude banknotes issued in Italy and sent abroad or notes issued abroad that have entered the country. In the analysis of the circulation data for our country, it is well to take account of the third aggregate given that this alone permits us to capture the impact on domestic circulation of shocks specific to Italy, an impact that is not quantifiable in the first two aggregates, which instead reflect shocks to the euro area as a whole.*

By international standards, Italy reports a low number of transactions using non-cash alternatives: in 2015, these amounted to 88 transactions per capita (92 in 2016) compared with an average of 215 in the euro area. The use of these instruments, however, has grown considerably: on average in the period between 2012 and 2015 transactions using credit cards rose by 14.7 per cent compared with a euro-area average of 7.7 per cent.<sup>12</sup>

The trend in the ratio of currency in circulation to GDP displays some peculiar traits compared to the rest of the bloc. Until 2011 Italy's currency in circulation also grew in the years in which GDP was falling. The result of these opposing trends was an increase in the ratio that exceeded the average for the euro area as a whole.

At the end of 2011, currency in circulation began to decline; GDP fell but not to the same extent; accordingly, the currency in circulation/GDP ratio also declined, to below the average levels recorded in the euro area. The turnaround occurred at the same time as the legal limit on cash payments was lowered to €1,000 (from the

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<sup>9</sup> NCBs' shares in the ECB's capital key are determined based on the populations and GDP of the respective countries.

<sup>10</sup> The Bank of Italy's balance sheet data are adjusted on the basis of the net balance of tourism expenditure in cash recorded annually by the central bank in an *ad hoc* survey.

<sup>11</sup> Cumulated net issuance is equal to the difference between the total value of banknotes issued by the Bank of Italy starting from the euro changeover and the total value of banknotes returned to the Bank from the same date.

<sup>12</sup> See the Bank of Italy's *Annual Report for 2016* – Appendix, Table a14.14.



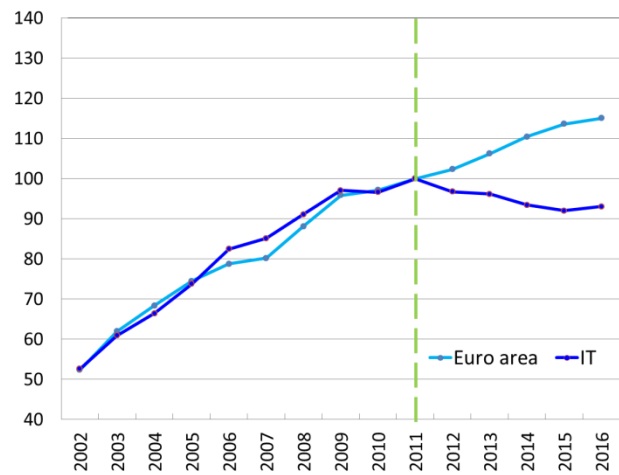
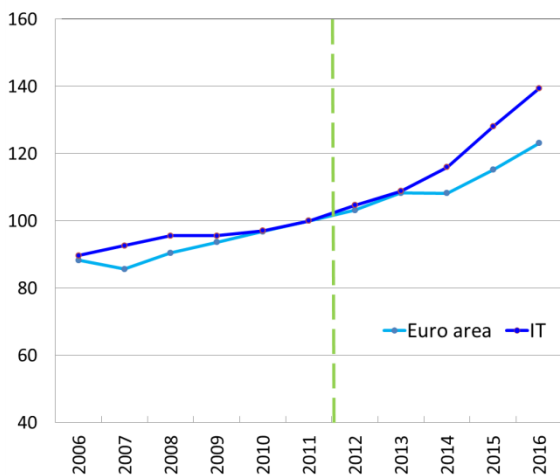
previous ceiling of €2,500), starting in December 2011. This led to a very sharp increase in lodgments of high-value banknotes to the Bank of Italy (€500 and €200 notes) against the reduction to zero of withdrawals of the same notes. Net issuance of the high-value notes collapsed and soon thereafter turned increasingly negative. Lodgments of high-value banknotes were offset only in part by withdrawals of notes of intermediate size (€50 and €20 notes). At the same time, there was an acceleration in the number of payments using non-cash alternatives (Figures 3.a and 3.b). It was not until early 2016, following the fresh increase in the limit on cash payments to €3,000, that the currency in circulation began to increase again (both in absolute terms and as a share of GDP). Demand for high-value notes did not recover, nor was there any slowdown in the growth in new payment instruments.

**Figure 3**

**Currency in circulation and indicators of the usage of non-cash alternatives**

(a) Index numbers; non-cash alternatives per capita  
(base 2011)

(b) Index numbers  
currency in circulation/GDP  
(base 2011)



Sources: Based on ECB, BIS, Banca d'Italia and Istat data.

How should we interpret these phenomena?

In the first place, the emergence of negative values for the issuance of high-value banknotes shows that Italy has been structurally affected by net inflows of such notes from abroad, at least in part connected with tourist inflows. It also seems reasonable to assume that since the changeover from the lira to the euro, a large share of high-value banknotes arriving from abroad, but also those issued in Italy, have been

hoarded by residents; this is probably also related to the use of high denomination notes for illegal transactions within the underground or illegal economies.

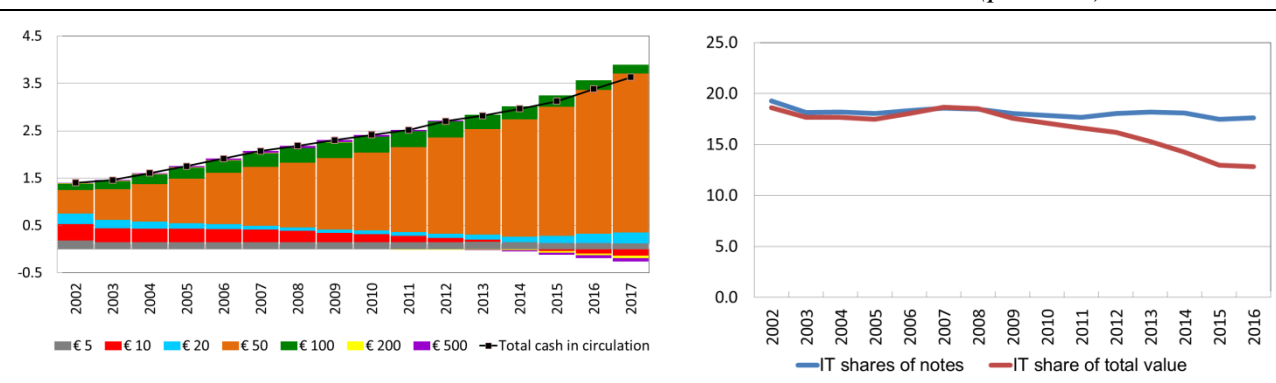
The introduction of a €1,000 limit for payments in cash and the more stringent anti-money laundering controls, covered by the same regulation as the cash payment limits, have discouraged the holding and use of the €500 note, encouraging the return to the Bank of Italy of any notes accumulated in previous years and of new net inflows of notes from abroad. The lowering of the limit to €1,000 for cash payments undoubtedly had negative repercussions on both the use of cash in transactions and, presumably even more so, on the demand for cash reserves. This measure also led to a marked change in the composition of notes in circulation towards the use of lower denomination notes, with a consequent increase in the total number of banknotes in circulation. Between 2002 and 2016 the net result of these changes was that Italy's share of the cash in circulation in the euro area decreased from 18.5 to 13.0 per cent, but its share of the actual number of notes, equal to about 18 per cent, did not decrease (Figures 4a and 4b). In particular, net cumulated issuance in Italy has been increasingly centred on the €50 and the €20 euro notes.

**Figure 4**

**Net cumulated net issuance in Italy**

(a) Net cumulated issuance  
(billions of notes)

(b) Italy's share of cash in circulation in  
the euro area  
(per cent)



Sources: Based on ECB and Bank of Italy data.

Although the use of alternative payment instruments has grown and Italy's share of Eurosystem note issuance has decreased, there is still a wide gap between Italy and the euro area, as shown by the Eurosystem's 2016 survey on the use of cash by

households (SUCH).<sup>13</sup> The survey found that 86 per cent of point-of-sale transactions are made in cash in Italy, compared with the euro-area average of 79 per cent; in value terms, the figures are 68 per cent for Italy compared with 54 per cent for the euro area. About two thirds of Italians say that they usually carry more than €20 in cash compared with just under half of Europeans (47 per cent), while only 18 per cent of Italians say they usually pay by card compared with 27 per cent in the euro area.<sup>14</sup>

Is the high propensity to use cash in Italy explained by demand or supply factors? Of course, demand factors, including the previously indicated macro factors, play an important role. At the micro level the Bank of Italy’s Survey on Household Income and Wealth allows us to link a preference for cash with households’ socio-economic characteristics.<sup>15</sup> For all Italian households, between 1993 and 2014, average monthly spending in cash remained basically stable, at around €900, while it decreased slightly in relation to total monthly expenditure (Figure 5.a). However, the propensity to use cash is nonetheless higher for low-income households, for older people and for those with lower educational qualifications, and for residents of the South of Italy. In particular, between 1993 and 2014 the percentage of cash purchases in the Centre and North decreased while in the South it remained basically the same (Figure 5.b).

**Figure 5**

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**Survey on Household Income and Wealth**

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(a) Spending in cash by households that also have payment cards

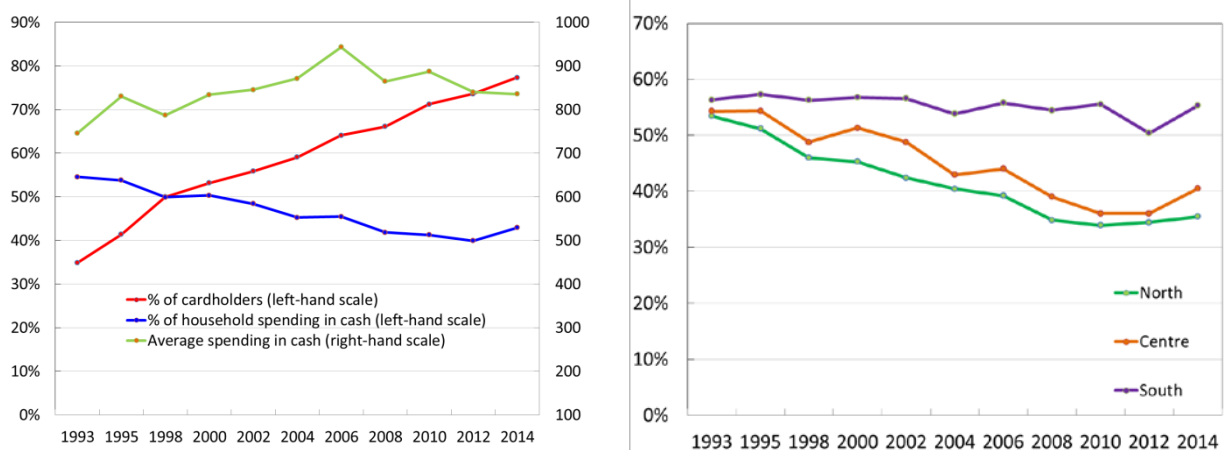
(b) Geographical area: percentage of spending in cash

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<sup>13</sup> The ECB conducted the Survey on the use of cash by households - SUCH in the euro-area countries from October to November 2015 and from January to July 2016. The respondents numbered 65,281 consumers who had kept a diary of all the payments they had made in the course of a single day. A subset of 28,000 respondents were invited to complete a questionnaire in order to also collect information on payment habits and the number of transactions made.

<sup>14</sup> Esselink, H., Hernandez, L. (2017). *The use of cash by households in the euro area*. ECB Occasional Paper Series.

<sup>15</sup> For Italy, the Survey on Household Income and Wealth, using data for 1995, 1998 and 2000 allowed us to estimate the share of cash held by households for spending purposes (between 20 and 25 per cent) in relation to the total amount of money in circulation in Italy. In more recent years, the only information we can find in the Survey relates to total cash spent for household consumption (about 50 per cent in 2014).



Source: Based on data from the Survey on Italian Household Income and Wealth (years 1993-2014).

There does not, however, appear to be any general lack of payment card infrastructure, which is in line with the European average,<sup>16</sup> or any lack of alternative payment solutions. In this regard, the fact that today the provision of a POS system is a legal requirement, is helping to resolve the problems previously caused by the fragmentation of their commercial distribution. In addition, in the two-year period 2015-2016, the collection fees of a card payment POS system for merchants have fallen by 20 per cent.<sup>17</sup>

The Italian Payments Committee noted in its Annual Report on 2016 that the initiatives sponsored by the ‘Agency for a Digital Italy’ to promote innovation in the public administration could affect the payment services market. In particular, greater digitization in this sector would be a growth factor for transactions settled by means other than cash.

Looking ahead, digital innovation is a very powerful driver for change in the payments world. The sector could also be affected by the new European rules designed to promote innovation and competition in the provision of payment services. In this context, on the supply side there are incentives for the payments industry to seek new business models to restore profit margins.<sup>18</sup> This last consideration is particularly significant given the drop in profit expectations in relation to lending.

<sup>16</sup> At the end of 2015 there were about 1.98 million POS systems in place in Italy - more than in the leading European countries (Germany has 1.1 million, France has 1.5 million and Spain has 1.4 million).

<sup>17</sup> Report on Operations and Activities of the Bank of Italy for 2016.

<sup>18</sup> Interbank Convention on Automation (CIPA) Report, 2016.

The gradual change in behaviour on the demand side and evolving pressures on the supply side could lead to an acceleration towards using less cash. However it is difficult to estimate to what extent and when exactly this will come about.

### ***The position of the Eurosystem***

The Bank of Italy produces and distributes banknotes according to the rules established at Eurosystem level. This shared framework is based on an overall strategy for all retail payments for banknotes and innovative tools. There is no fragmentation of the policy and a common strategy is needed to allow for a margin of (negative) substitution between cash and innovative retail payments. The Eurosystem lays the foundations for the reliable and efficient delivery of means of payment (cash and alternative instruments). It is up to users to choose which one to use.

In a recent criticism of the positions (different in nature and motivation, held by the Zero Lower Bound Alchemists, the Law and Order Camp and the Fintech Camp) that want to abolish cash, especially through legislation, Yves Mersch of the ECB's Executive Board summarized the Eurosystem policy on retail payments as follows:<sup>19</sup>

*'The ECB will continue to provide banknotes. We will also facilitate the further development of an integrated, innovative, and competitive market for retail payment solutions in the eurozone. If, one day, cash is replaced by electronic means of payments, that decision should reflect the will of the people, not the force of lobby groups'.*

Paying attention to efficiency takes into account not only private costs but also those incurred by the community. For cash, specifically, these costs are barely perceived but nonetheless not negligible. A Eurosystem survey in 2012 highlighted that:

- the overall social costs connected with using the various payment means were about 1 per cent of GDP (both for Italy and the euro area); the cost of cash amounted to 0.4 per cent of GDP in the euro area and to 0.52 per cent for Italy;
- comparing the social costs to the number of cash transactions showed that cash is the most economical means of payment, but in comparison with the value of those transactions, it is the most expensive solution;
- variable costs prevail for cash while for debit and credit cards, the fixed costs of card issue and infrastructure management are greater; therefore, cards offer the greatest possibilities of exploiting ample economies of scale.

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<sup>19</sup> Mersch, Y. (2017), *Why Europe still needs cash*, Contribution for Project Syndicate.

So cash has a high ‘social’ cost that users are unaware of, but it can be advantageous to use cash for low-value retail transactions. Furthermore, development and innovation in the field of alternative instruments, mainly thanks to economies of scale, progressively lowers the threshold below which cash is the better option.

The role played by the central banks is therefore geared towards encouraging the (private) provision to retailers of a broad range of competing alternative instruments. Today cash must still be among the options because:

- it remains the best instrument for low-value transactions and is universally accepted in face-to-face dealings; the acceptance of alternative payment means depends on conditions such as having a bank account, installing special terminals or owning a smartphone and signing up for services offered by specific financial intermediaries. In this sense, cash is the instrument that also guarantees financial inclusion for people without bank accounts, those who are not digitally educated, or those who in any case have less confidence in the reliability of these new instruments;
- it sets service standards (ease of use, immediate payment finality, no user charges) that the various alternative schemes (instant payment services, for example) attempt to emulate, thus increasing the level of competition in the payment services market to the benefit of users;
- it can be used as an instrument of last resort to respond to the operational risks the new means of payment are exposed to because they rely on the internet and new digital instruments;
- it does not expose the holder to credit risks; economic operators must be able to use cash in phases of uncertainty.

The Eurosystem is therefore committed, both under normal conditions and in times of crisis, to meeting the demand for banknotes produced and distributed using efficient and reliable operating processes, and the relative costs must be in line with market costs.

Euro banknotes must score highly in terms of quality and security, incorporating increasingly sophisticated technological features. The objectives of quality and security are also pursued through a detailed set of checks on the processes employed by banks and companies specializing in cash handling and also through periodic surveys of the quality of the banknotes in circulation in the various countries. The fight against counterfeiting is carried out through training and information campaigns aimed at the general public, professional operators and by means of advanced IT

monitoring systems, in collaboration with the other national and supranational institutions involved.

To sum up, the Eurosystem's policy is neutral with respect to the different means of payment; consumers may choose independently according to which they consider is best for them. Therefore, demand will determine the proportions of the various instruments used, with values that may even be null for some of them. On the supply side, the authorities do not directly provide alternative payment methods to cash. Instead they intervene to ensure that: competitive prices are offered for the different means; the market is transparent and integrated, including across borders; and that no disruptions occur.

It goes without saying that one of the objectives of the Eurosystem is to combat the illicit use of cash for money-laundering purposes. For this reason, it has recently been decided to discontinue the issue of the €500 note towards the end of 2018.