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Cashless Payments and Tax Evasion

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Abstract

Cashless payments hinder tax evasion because they build a trail for the underlying transactions. We find empirical evidence supporting this claim for Europe, showing a negative relationship between VAT evasion and the payments with credit and debit cards. We also find that using electronic cards to gather cash at ATMs, by making cash more abundant, fosters VAT evasion. Policies aimed at reducing tax evasion should therefore subsidize the direct use of electronic cards as payments, not their possession.

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1 Introduction

While information technologies and financial markets innovations increasingly made payment systems electronic, they have not been able to make cash disappear. In fact cash use remains heavy, although different across countries (Drehman et al. 2002, Bagnall et al. 2014). In this work we show that those differences in cash use are associated with different levels of VAT evasion.

The general idea is that a crucial, albeit not essential, requirement for tax evasion is the cash settlement of the underlying transaction, which allows the seller to easily conceal it. Any other payment method, being traceable, makes evasion much more complicated.

To check if there is empirical support for this claim, we construct a panel dataset that matches data on VAT evasion in Europe with the Payment Statistics from the European Central Bank. The empirical challenge is that the choice of the payment method is endogenous to tax evasion: the seller might offer a price discount to the buyer in exchange for paying cash (Immordino and Russo 2014), making cash payments more frequent if tax evasion is widespread. To address this problem, we consider two exogenous instruments, the number of automated teller machines (ATMs) per capita and the number of broadband internet connections per capita. The availability of ATMs affects the cost of cash payments and, therefore, their frequency, but it is exogenous to tax evasion because their diffusion is the result of their decreased operative costs (Humphrey et al. 2006) and because their location, which is often the same of the bank branches, is chosen by the bank management for competition reasons. The availability of a broadband internet connection affects the diffusion of e-commerce and, therefore, the frequency of electronic payments, but it depends on the investments of the internet providers.

We find a negative relationship between VAT evasion and the payments with debit and credit cards: electronic payments do make VAT evasion more difficult. However we also find a positive relationship between VAT evasion and cash withdrawals at ATMs. In other words, if credit and debit cards are used to gather cash, rather than paying directly, there will be more cash payments and, therefore, more evasion. The policy implication of these results is that, in order to fight evasion, it is better to foster direct credit and debit card use for payments and not their possession.

Our analysis highlights a rather unexplored determinant of evasion, namely the diffusion of

cash payments[1] and contributes to two separate strands of economic literature, respectively on cash use and VAT evasion.

Concerning the first strand, Drehman et al. (2002) and Bagnall et al. (2014) analyze cash use in several countries, showing that it is widespread, especially for low-value transactions, although systematic differences between countries persist. Other related studies include, among others: Amromin and Chakravorti (2009), that find a decreasing demand for small denomination currency when debit card use increases; Alvarez and Lippi (2009) and Lippi and Secchi (2009), who study the relationship between money demand and innovations in money withdrawal technologies; Evans, Webster, Colgan, and Murray (2013), that document an increased cash use in European countries from 2000 to 2012.

Concerning VAT evasion, Agha and Haughton (1996) find, in a cross-section of 17 OECD countries, a higher VAT non-compliance in countries with higher VAT rates. Berhan and Jenkins (2005) study a refund system conditional on receipts implemented in Northern Cyprus and Bolivia to fight VAT evasion, finding that it is extremely costly. Aizenman and Jinjirak (2008) regress VAT Revenue Ratios (the ratio of actual VAT revenue to the revenue that would be raised if VAT were levied at the standard rate on all consumption with perfect enforcement) on economic and political variables, finding, inter alia, that they are positively associated with the country's openness to trade, which reflects the importance of border controls for VAT enforcement.

This paper is also related to the literature on collaborative tax evasion. Our findings suggest that discouraging cash use helps curbing tax evasion. In a companion paper (Immordino and Russo 2014), we propose a bargaining model of collaborative tax evasion to study the effect of such a policy, a tax on cash withdrawals from ATMs and bank tellers. We find that this tax reduces evasion only at high rates and that its rate must grow with the mass of cash users. Other related studies include Gordon (1990), Boadway, Marceau and Mongrain (2002), Chang and Lai (2004) and Piolatto (2014).

The rest of the paper is organized as follows. In the next section we present the data. Section 3 describes the empirical model, presents our empirical results and discusses their robustness. Section 4 concludes.

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[1]Surveys of the literature on tax evasion include Cowell (1990), Andreoni, Erard and Feinstein (1998), Slemroad and Yitzhaki (2002) , Marchese (2004), Slemroad (2007) and Franzoni (2009).

2 Data

We construct a panel merging the European Central Bank payment statistics with the VAT gap estimates from the CASE and CPB report (2014). We have data[2] for 25 out of the 28 countries in the European Union from 2000 to 2012. The VAT gap is defined as the difference between the theoretical VAT liability (VTTL), computed multiplying the GDP by the marginal VAT rate, and the actual VAT revenue collected (VATR). This difference is then standardized either with the GDP or with the VTTL in order to produce a measure in percentage terms.

Vat evasion varies a lot across countries. The (time series) average VAT gap to GDP ratio ranges from the 0.36% of Sweden to the 5.6% of Romania. The overall median is 1.2% and the average 1.7%, due to few countries characterized by high levels of VAT evasion. In greater detail, 17 out of the 25 countries in the sample have an average VAT gap to GDP ratio below 2%, while only 8, including Italy and Greece, have a value above this threshold. The cross sectional variability is also confirmed by a fairly high coefficient of variation, equal to 74%. The VAT gap to VTTL ratio is also significantly volatile in the cross sectional dimension, ranging from the 4% of Sweden to the 42% of Romania, with a 57% coefficient of variation. The median VAT gap to VTTL ratio in the sample is 13% with, again, a bigger average, 17%.

The total number of payments cards per capita averages 2.17 in the sample. This figure includes credit cards, debit cards, pre-paid cards and all other subtypes. Credit cards are far less diffused than other types, making up, on average, for just 10% of the total. The UK and Luxembourg are the countries with the biggest average number of payments cards per capita, respectively 4.1 and 4.8. Romania and Italy are instead the countries with the smallest number, respectively 0.8 and 1.2. The coefficient of variation of the number of cards per capita is 42% and the cross sectional distribution of the averages is almost symmetric.

The possession of a payment card is not, per se, a very interesting indicator of the diffusion of cashless payments. What really matters is their use. Figure 1 gives a graphical idea of the huge cross sectional variability of the (time series) average number of card payments per capita per year. The numbers range from the 144 of Denmark and the 142 of Finland (two payments every 5 days), to the 1.9 per year of Bulgaria (once every 6 months) and the 2.8 per year of Bulgaria

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[2]We also have data for Malta, but we excluded it from the analysis because the VAT gap is very noisy, much more than other countries.

(once every 4 months). The average number of card payments per capita in the sample is 56 per year (roughly one every 6 and a half days), with a standard deviation of 46 that signals huge cross country differences in habits. In general, the number of payments per capita is very large in Nordic countries and very small in Eastern and Southern countries.

The first evidence in favor of our empirical result is that the use of payment cards is negatively correlated with VAT evasion. The correlation in the pooled panel is -0.59 for the VAT gap to GDP ratio and -0.45 for the VAT gap to VTTL ratio. The relationship is much stronger in the cross sectional dimension (considering time series averages), with correlations equal to, respectively, -0.59 and -0.65.

An interesting evidence is that POS terminals are diffused also in the countries with a relatively infrequent use of payment cards. For instance, Greece is country with the biggest average number of POS terminals per 1000 residents, with 31, but it is also the third to last country in the ranking by number of card transactions per capita, with 6. Once again, it is better to look at the use of POS terminals, rather than their number, to gather information on payment habits. Actually the POS transactions data track very closely the card transactions data, with a correlation of 0.98. This is because the difference between the two values is the number of card transactions managed with manual imprinters or with a direct claim on the card number, which make up for a very small percentage of total card transactions.

The number of cash withdrawals per capita is also volatile, as evident in figure 1. The overall average number of ATM withdrawals per capita is roughly 22 per year, with a coefficient of variation of 50%. Ireland and the UK are the countries with the biggest number of cash withdrawals per capita, respectively 40 and 43 per year (roughly 3.5 times per month). Italy and Romania, instead, are the countries with the smallest number, with, respectively, 9 and 7 per year (less than once a month). The reason why cash withdrawals can be infrequent both in financially developed countries, like Italy and Luxembourg, and in financially developing countries, like Romania and Bulgaria, is that their number depends both on the diffusion of cash, which is typically low in the former, and on the diffusion of cards, which is typically low in the latter. The number of cash withdrawals might also depend on the diffusion of ATMs, which is also unevenly distributed across countries. In particular, the values range from the 0.3 ATMs per 1000 residents of the Czech Republic and Poland to the 1.3 of Belgium and Portugal. The average number of ATMs per 1000

residents in the sample is 0.6, with a standard deviation of 0.3.

We also consider data on two additional forms of non cash payments, the number of wire transfers per capita, which includes both credit transfers and direct debits, and the number of cheques per capita. For wire transfers, the values range from the 4.4 per capita per year of Greece to the 157 of Germany and the 181 of Austria. The sample average is 72 per year, with a coefficient of variation of 69%. For cheques, the data range from essentially zero per capita in countries such as, among others, Finland and Sweden, to the 29 of the UK and the 59 of France. Interestingly, the number of wire transfers is positively related to the number of card transactions, with a correlation coefficient equal to 0.5. Thus the use of different cashless payments is correlated. Conversely, the use of cheques is only marginally related to the number of card transactions. As for the relationship with VAT evasion, we have a negative correlation for both measures, with coefficients equal to -0.40 for the number of wire transfers and -0.23 for the number of cheques.

There is a marked increase in the use of electronic payments in almost all countries in the sample. Just to give a couple of examples, the number of credit and debit card transactions per capita in France increased from 54 in 2000 to 130 in 2012; in the UK, in the same period, from 67 to 165; in Romania, from less then 0.1 to almost 8. The number of payment cards per capita increased instead from 0.7 to 3.4 in France, from 3.7 to 5 in the UK, and from 0.1 to 1.4 in Romania.

The time series behavior of cash withdrawals from ATMs is instead more heterogeneous. In Finland, Sweden and in the Netherlands, among others, it decreased significantly; in Ireland and in Spain it first increased and then decreased, in the UK and in Italy, among others, it increased. Overall, it looks like the increased number of payment cards per capita drove an increased number of direct transactions only in a subset of countries, which qualifies as a genuine change in payment habits away from cash. Conversely, in some other countries the increased diffusion of cards determined only a different cash withdrawals technology, away from bank tellers in favor of ATM machines.

The availability of ATMs increased in all countries except Denmark and Finland. In general, the growth rate of this variable is smaller for the Euro area and for financially developed countries. As for the availability of POS terminals, we see instead an increase in all countries. Wire transfers are also increasing in all countries, especially in the less financially developed such as Bulgaria and Romania. The number of cheques per capita is instead decreasing everywhere, even in countries

like France and the UK, which are, traditionally, heavy cheque users.

3   Empirical analysis

We run the following regressions:

$$vatgap_{it} = \beta_0 + \beta_1 pay_{it} + X'_{it}\gamma + \eta_i + \delta t + \varepsilon_{it} \tag{1}$$

where $vatgap_{it}$ is the measure of VAT evasion, pay_{it} is the use of cashless payments and X_{it} is a vector of control variables. All regression include fixed country effects η_i and a time trend[3] δt. ε_{it} is a well behaved error term.

The control variables that we consider are: the unemployment rate (from the World Bank Development Indicators - WBDI), to proxy for the business cycle; the ratio of imports to GDP (from the WBDI), since the VAT on imported goods is typically assessed at the border, making VAT evasion more difficult for imports; the VAT rate (from the OECD tax database), since the gains from tax evasion increase with the VAT rate, which should therefore predict more evasion; the fraction of the population between 20 and 30 years old and the fraction of the population older than 80 (from the Eurostat online database), because young and old individuals might have a different attitude towards evasion; the fraction of the population with tertiary education (from the WBDI), because education might be correlated with tax evasion; the rural population as a percentage of total population (from the WBDI), to control for the possible different behavior of individuals living in cities; a dummy equal to 1 if the country is part of the European Union in the given year; a dummy equal to 1 if the country adopts the Euro in the given year.

3.1   Instruments

The problem with the above regression is that the choice of the payment method is endogenous to tax evasion: the seller might offer a price discount to the buyer in exchange for paying cash, which facilitates tax evasion. Therefore we should observe more cash payments where

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[3]We included a time trend in the main regression, instead of year dummies, because we do not have enough cross sectional observations each year to estimate the dummies, resulting in large standard errors. We also tried including a quadratic trend, finding the same results, although with higher standard errors.

this form of collaborative tax evasion is more widespread (see Immordino and Russo, 2014). To overcome this endogeneity, we use an instrumental variables strategy. We need a variable with two requirements: it must explain the use of cashless payments without being determined by tax evasion; it must affects VAT evasion only through its effect on cashless payments. We consider two such instruments, the number of ATMs per capita and the number of broadband internet connections per capita.

As documented by Humphrey et al. (2006) the rapid expansion of ATMs in Europe indicates that, for services such as cash withdrawals, account transfers and balance inquiries, ATMs have replaced the traditional bank teller for a large and growing fraction of depositors. The rationale for using the number of ATMs as an instrument is that they influence the relative cost of using cash to settle a transaction and, therefore, the choice of cashless payments. In particular, we should observe less (more) direct card transactions where there are more (less) ATMs because it is easier (more difficult) to get cash. Humphrey et al. (2006) also show that "As the share of electronic payments in 12 European countries rose from 0.43 in 1987 to 0.79 in 1999 and ATMs expanded, [. . .] bank operating costs are \$32 billion lower than they otherwise might have been, saving 0.38% of the 12 nations GDP." In other words, ATMs are powerful cost reducing tools for banks, which means that their adoption and diffusion is mainly due to the development of a technology that reduces their installation and management costs. Therefore we can exclude that the ATMs diffusion is a response to tax evasion. Moreover, we believe that this instrument is exogenous also because the ATMs are typically located where bank branches are, and the location of a branch is chosen by the bank management for competition reasons and most likely not as a response to the level of tax evasion in an area. For identification, we also need to exclude a direct effect of the changes in ATM availability on the changes in VAT evasion other than the one going through the cost of cash withdrawals. We were unable to think of such an effect.

The rationale for using the diffusion of broadband internet connections as an instrument is that they facilitate e-commerce, which hinges on electronic payments, so that more (less) broadband connections should predict a more (less) widespread use of cashless payments. Moreover, a bigger number of broadband connections is also signal of a greater familiarity with digital technologies and, thus, it should be correlated with the use of electronic payments. Exogeneity is granted because broadband connections mostly depend on the availability of the infrastructure in a given area,

which is arguably not the result of tax evasion considerations. Even conditioning on infrastructure availability, the decision to connect to the internet does not depend exclusively on the wish to buy goods online, since there are a lot of additional benefits from a fast connection. Indeed, the key for identification is that we are not using data on the diffusion of e-commerce, which might be endogenous to tax evasion. To illustrate this point, we refer again to the collaborative tax evasion model (Immordino and Russo 2014). In a nutshell, a traditional shop owner might offer a discount to a customer in exchange for a cash transaction, in order to evade with more ease. This discount might actually decrease the price below the on-line price, affecting the volume of on-line purchases. Thus, other things equal, if there is a lot of tax evasion, there might be few e-shopping transactions because there are more possibilities to buy the same goods for less in traditional shops.

For identification, we also need to exclude any direct effect of the changes of broadband internet connections on the changes of tax evasion. This is true if broadband internet connections do not directly allow for a superior or inferior technology to evade taxes or to monitor evaders. Concerning evasion, if there is more e-commerce, fostered by broadband internet connections, it will be more difficult to evade, since e-commerce transactions are difficult to hide. However, the reason why e-commerce transactions are difficult to hide is mostly because they are settled with cashless payments, so the effect goes through the endogenous variable in the regression. As for enforcement, there is no particular reason why the internet should allow an easier monitoring of the sellers. First because online shops are not, a priori, more or less visible than traditional shops. Second because, for VAT evasion, monitoring it's all about missing receipts and the technology to uncover them does not hinge on the availability of a fast internet connection. The only potential problem is that the diffusion of the internet can signal the availability of more opportunities to transfer profits across national borders, looking for the most convenient tax system. In other words, there might be a direct effect of internet diffusion on tax evasion. However, this would be a problem if we considered income tax evasion, but not in case of VAT taxes, that cannot be easily avoided moving the registered office.

Overall, we are more confident about the exclusion restriction for the the number of ATMs per capita, so we use it as our main instrument, resorting to broadband connections mainly to check over-identifying restrictions.

Table 1 reports the first stage regression results for the three main endogenous variables: the

number of card transactions per capita, the number of cash withdrawals from ATMs per capita and the number of wire transfers per capita. All regressions include fixed country effects, a time trend and unemployment. Whenever we use the number of ATMs per capita as an instrument, we exclude Bulgaria, because of the outlier growth rate in this variable, much higher than all other countries in the sample[4].

The instruments are statistically significant determinants of card transactions. The signs of the regression coefficients are in line with the intuition. In particular, more broadband connections are associated with a more frequent card use. Conversely, a bigger number of ATMs predicts a lower number of card transactions, most likely because cash is easier to gather, and more used, if ATMs are readily available. Since both instruments are significant, and highly so, we can meaningfully test for overidentifying restrictions.

The results are weaker for the number of cash withdrawals per capita, which is explained by ATMs but not by broadband connections. Only when the instruments are included together in the regression, we have a significative coefficient on broadband connections, but only at the 10% level. The signs of the coefficients are, once again, in line with the intuition, with more broadband connections associated with less withdrawals and more ATMs associated with more withdrawals. Given these results, we decided, for cash withdrawals, to discuss the results with the significant instrument only.

The last three columns of Table 1 report results for the number of wire transfers per capita. We find a significant coefficient only for the number of ATMs per capita, with a negative sign, as expected. Once again, we discuss the results for the significant instrument only.

3.2   Explaining the VAT gap

In this section we discuss the regression results for the VAT gap over GDP measure of evasion. We obtained similar, but slightly weaker, results for the VAT gap over VTTL measure, mainly because this series is much more volatile in the time series dimension.

Table 2 reports the regression results for the total number of card transactions per capita. We consider three different IV strategies: instrumenting with broadband internet connections (columns

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[4]In greater detail, the number of ATMs starts at a very low, outlier, value in 2001, to then become close to the cross sectional average by the end of the sample, with a spike in the last two years

2 and 3), instrumenting with ATMs (columns 4 and 5) and instrumenting with both (columns 6 and 7). We also report the OLS results for reference (column 1). Overall, we find a negative and significant coefficient for all specifications, regardless of the control variables included. According to the regression coefficients, 10 more card transactions per capita per year reduce the VAT gap over GDP between 0.08 and 0.2 percentage points. Taking the estimates seriously, this means that, in a country like Italy, with an average VAT gap to GDP ratio of 2.15%, it is possible to halve VAT evasion with 51 (according to the upper bound measure) to 133 (according to the lower bound measure) more card transactions per capita per year, or between 4.2 and 11 additional transactions per month. In a country like Greece, halving the average 3% VAT GAP requires, instead, between 6 and 16 more transactions per month. The coefficients are bigger when we use the broadband connections as instruments. Comparing them with the corresponding OLS results, they are three times bigger. In the regressions instrumented with the ATMs, including the specifications with both instruments, they are instead slightly larger than the OLS coefficients. This evidence, together with the bigger first stage F-Stats for the number of ATMs, and with the theoretical justification of the exclusion restriction in section 3.1, leads us to be more confident about the estimates with the ATMs as instrument. Another important piece of evidence is that, in the model with both instruments (columns 6 and 7), we do not reject the over identifying restrictions (Hansen J statistic), confirming our empirical identification strategy.

The coefficient on unemployment is positive and significant in almost all regression specifications. Thus VAT evasion tends to increase in recessions when unemployment is high, in line with the evidence discussed in the CASE and CPB report (2014). Converesely, the ratio of imports to GDP is not significant, differently from Aizenman and Jinjirak (2008). We also tried including, as controls, the fraction of individuals between 20 and 30 years old, the fraction of individuals above 80, the percentage of rural population, the fraction of the population with tertiary education, the Euro dummy and the EU dummy. None of them was significant, and the coefficient on the number of transactions did not change much.

To further investigate, we tried running the regressions separately for credit and debit cards. We found similar results in the regressions with debit cards, but we did not find any statistical relationship in the regressions with credit cards, mainly because there are many missing observations. We also tried regressing VAT evasion on the number of POS transactions per capita,

finding the exact same results, not surprisingly given the high correlation between POS and card transactions.

The next empirical exercise is a regression of VAT evasion on the number of cash withdrawals per capita. The idea is that if credit and debit cards are used to gather cash, rather than paying directly, there is no disincentive effect on tax evasion. Given the first stage regression results, we are forced to run the IV regression using ATMs as instruments only. The results are reported in columns 1 to 3 of Table 3. We find evidence of a positive statistical relationship between cash withdrawals and tax evasion. More specifically, 10 more ATM withdrawals per capita predicts a VAT gap reduction between 0.21 and 0.43 percentage points. Unemployment is always positive and significant in these regression, which confirms the counter cyclical nature of VAT gap. The coefficient on the imports to GDP ratio is instead not significant.

Overall, comparing the results in table 2 and 3 we find support to our main conclusion, namely that cash facilitates tax evasion, while card payments hinder it. Moreover, we also conclude that it is not the diffusion of cards per se that matters for evasion, but their use. If credit and debit cards are used to withdraw money from ATMs, they actually foster tax evasion, since they make cash more readily available. The clear policy implication is that, to fight tax evasion, it is better to subsidy card use for actual payments, and not their mere possession.

The results in table 2 and 3 confirm also that the number of ATMs per capita is indeed a valid instrument, excluding, in particular, the possibility of a direct effect on tax evasion. The reason is that, in the regression with the number of cash withdrawals, the coefficients in the IV regression are bigger than the coefficients in the OLS regression while, in the regression with card transactions, they are actually smaller. If there was a direct effect of the number of ATMs on evasion, we should have observed a similar pattern in both cases.

The last exercise entails a regression of tax evasion on a different form of cashless payments, the number of wire transfers per capita, which includes both direct debits and money transfers. Given the first stage results, we used only the ATMs as instruments. The results are reported in columns 4 to 6 of Table 3. The coefficient is negative, as expected, but it is significant only at the 10% level. This evidence, combined with the weak instrument problem, lead us to conclude that there is no evidence of a relationship between the number of wire transfers and VAT evasion.

3.3 Robustness

To control for cross county differentials in the tax rates, we included the VAT rate in the regressions[5]. The coefficient on this variable is positive and significant, in line with Agha and Haughton (1996). The problem with this regression is that the VAT rate can be itself endogenous to the VAT gap, for instance because of a Laffer curve type of argument. Therefore we must refrain from a causal interpretation of the coefficient. What matters for our analysis is that, even with this additional control, we still ended up with a similar coefficient on the number of card transactions per capita, reinforcing our main conclusion.

We also also considered an alternative, non electronic, form of cashless payment, the cheques. In particular, we regressed VAT evasion on the number of cheques per capita, instrumenting it with the number of ATMs (details available upon request). We found a non-significant coefficient, but the regression output highlights a weak instrument problem. The most likely explanation of this empirical evidence is that, in most countries, cheques are not typically used for the most frequent every-day transactions, which are either settled in cash or with payment cards, and which make up a great portion of total VAT evasion.

We also regressed VAT evasion on the number of payment cards per capita. Given the previous results, we did not expect to find a significative relationship. The instruments that we used in the previous regressions did not work in this case, but arguably the decision to own a payment card is only marginally influenced by the level of tax evasion, so there should not be a bias in the OLS estimator. Consistently with our intuition, we did not find a significative statistical relationship, which confirms that the mere possession of a card does not matter for evasion.

Lastly, we regressed VAT evasion against the number of credit and debit card transactions per card rather than per capita. We still found a negative and significative coefficient, but with higher standard errors, that make the statistical evidence weaker.

4 Conclusion

Using a dataset that matches information on VAT evasion with the ECB Payment Statistics, we showed that the use of electronic payments such as debit and credit cards reduces VAT tax

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[5]We exclude Luxembourg in this case because of the outlier, and fixed, low value of the VAT rate.

evasion. We also found evidence of a positive statistical relationship between cash withdrawals and tax evasion. Comparing these results, we conclude that cashless payment hinder tax evasion and that it is not the diffusion of payment cards that matters for VAT evasion, but their use: if they are used to gather cash, rather than paying directly, they actually foster tax evasion. This evidence is important for the design of policies aimed at reducing evasion: it is better to subsidy the use of credit and debit cards for payments, not their mere possession.

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Table 1: **Explaining Cashless Payments**

	trans			with			wire		
broad	1.364*** (0.396)		1.355*** (0.387)	-0.116 (0.093)		-0.129* (0.073)	1.036 (0.777)		1.039 (0.769)
atm		-0.098*** (0.026)	-0.096*** (0.026)		0.025*** (0.005)	0.025*** (0.005)		-0.047** (0.021)	-0.044** (0.019)
unemp	0.148 (0.528)	-0.197 (0.679)	-0.204 (0.613)	-0.195 (0.119)	-0.126 (0.106)	-0.108 (0.094)	-0.364 (0.333)	-0.595 (0.358)	-0.571* (0.311)
R^2	0.643	0.707	0.744	0.166	0.488	0.475	0.539	0.548	0.571
obs	306	308	297	288	276	266	299	300	290
F	11.8	13.9	11.6	1.5	25.8	24.3	1.8	5.1	2.7

Notes: trans is the total number of credit and debit card transactions per capita from the ECB payment statistics. with is the number of cash withdrawals from ATMs per capita from the ECB payment statistics. wire is the number of wire transfers per capita from the ECB payment statistics. unemp is the unemployment rate from the IFS (International Financial Statistics) online dataset. broad is the number of broadband internet connections per capita from the WB dataset. atm is the number of ATMs per 1000 inhabitants from the ECB payment statistics. All regression include country fixed effects and a time trend. Robust standard errors clustered at the country level in brackets. F is the F-stat for joint significance of the regressors. *** significant at the 1% level. ** significant at the 5% level * significant at the 10% level.

Table 2: **Card Transactions and VAT Evasion**

|	(1)	(2)	(3)	(4)	(5)	(6)	(7)
trans	-0.0063***	-0.0214***	-0.0211**	-0.0098**	-0.0081**	-0.0127***	-0.0108***
	(0.0022)	(0.0084)	(0.0090)	(0.0045)	(0.0036)	(0.0048)	(0.0039)
unemp	0.055***	0.056***	0.049***	0.052***	0.045***	0.055***	0.048***
	(0.019)	(0.022)	(0.021)	(0.020)	(0.017)	(0.020)	(0.017)
impgdp			-0.012		-0.011		-0.014
			(0.010)		(0.007)		(0.009)
R^2	0.284	0.312	0.313	0.281	0.291	0.235	0.258
obs	306	306	295	308	306	297	295
F		11.8	10.6	13.9	14.6	11.6	12.5
J (p-value)						0.210	0.170

Notes: Dependent variable is the vat gap measure of tax evasion from the CASE/CPB report divided by GDP. trans is the total number of credit and debit card transactions per capita from the ECB payment statistics. unemp is the unemployment rate from the IFS (International Financial Statistics) online dataset. impgdp is the ratio of imports to GDP from the World Bank Development Indicators. All regression include fixed country effects and a time trend. In columns (2) and (3) the the number of transactions per capita is instrumented with the number of broadband internet connections per 100 residents from the world bank development indicators. In columns (4) and (5) the the number of transactions per capita is instrumented with the number of ATMs per 1000 residents from the ECB payment statistics. In columns (6) and (7) the number of transactions per capita is instrumented with both the number of broadband internet connections per 100 residents from the world bank development indicators and with the number of atm machines per 1000 residents from the ECB payment statistics. Robust standard errors clustered at the country level in brackets. F is the first stage F-stat for instrument validity in the first stage regression. J is the p-value of the Hansen test of overidentifying restrictions. *** significant at the 1% level. ** significant at the 5% level * significant at the 10% level.

Table 3: **Cash Withdrawals, Wire Transfers and VAT Evasion**

	(1)	(2)	(3)	(4)	(5)	(6)
with	0.027** (0.011)	0.037* (0.021)	0.031** (0.016)			
wire				-0.005* (0.002)	-0.022* (0.014)	-0.027 (0.023)
unemp	0.061*** (0.022)	0.062*** (0.022)	0.056*** (0.019)	0.048** (0.019)	0.041** (0.021)	0.044** (0.023)
impgdp			-0.011 (0.007)			0.017 (0.029)
R^2	0.319	0.314	0.315	0.278	0.031	0.031
obs	276	276	274	300	300	298
F		25.8	28.3		5.1	2.5

Notes: Dependent variable is the vat gap measure of tax evasion from the CASE/CPB report divided by GDP. with is the number of cash withdrawals from ATMs per capita from the ECB payment statistics. wire is the number of wire transfers per capita from the ECB payment statistics. unemp is the unemployment rate from the IFS (International Financial Statistics) online dataset. impgdp is the ratio of imports to GDP from the World Bank Development Indicators.. All regression include fixed country effects and a time trend. In columns (2) and (3) the the number of cash withdrawals per capita is instrumented with the number of ATMs per 1000 residents from the ECB payment statistics. In columns (5) and (6) the number of wire transfers per capita is instrumented with the number of atm machines per 1000 residents from the ECB payment statistics. Robust standard errors clustered at the country level in brackets. F is the first stage F-stat for instrument validity in the first stage regression. *** significant at the 1% level. ** significant at the 5% level * significant at the 10% level.

Figure 1: **Card Payments and ATM Withdrawals**
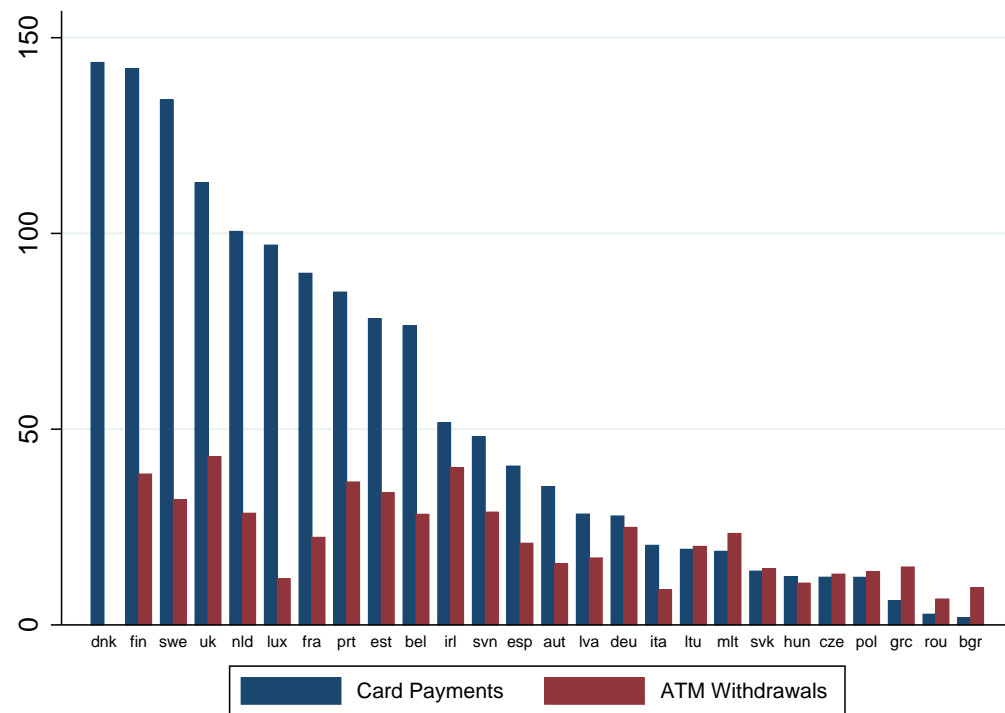
Notes: Average number of card payments per capita per year and average number of cash withdrawals from ATMs per capita per year from the ECB Payment Statistics from 2000 to 2012. The countries included are: Austria (aut), Belgium (bel), Bulgaria (bgr), Czech Republic (cze), Denmark (den), Estonia (est), Finland (fin), France (fra), Germany (deu), Greece (grc), Hungary (hun), Ireland (ire), Italy (ita), Latvia (lva), Lithuania (ltu), Luxembourg (lux), Malta (mlt), the Netherlands (nld), Poland (pol), Portugal (prt), Romania (rou), Slovakia (svk), Slovenia (slo), Spain (spa), Sweden (swe) and the United Kingdom (uk)