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Restricting or Abolishing Cash: An Effective Instrument for Fighting the Shadow Economy, Crime and Terrorism?

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Revised Version

Restricting or Abolishing Cash: An Effective Instrument for Fighting the Shadow Economy, Crime and Terrorism?[*)]

by

Friedrich Schneider**[)]**

Abstract:

This paper has **four** goals: **First**, the use of cash as a possible driving factor of the shadow economy is investigated. **Second**, the use of cash in crime, here especially in corruption, is also econometrically investigated. The influence is somewhat larger than on the shadow economy, but it is certainly not a decisive factor for bribery activities. Some figures about organized crime are also shown; the importance of cash is diminishing. **Third**, some remarks about terrorism are made and here a cash limit doesn't prevent terrorism. **Fourth**, some remarks are made about the restriction or abolishment of cash on civil liberties, with the result that this will extremely limit them. The conclusion of this paper is that cash has a minor influence on the shadow economy, crime and terrorism, but potentially a major influence on civil liberties.

Keywords: cash, cash limit, shadow economy, crime, corruption, transnational crime organizations, financial proceeds, money laundering, illegal cross-border flows, tax fraud figures.

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1 Introduction

In recent years intensive discussion has arisen about restricting or even abolishing the use of cash. I am aware that there is a much longer and more extensive debate about the costs and benefits of phasing out paper currency, which is the title of a paper of Rogoff (2014).[1] But what is new, all of a sudden, is the suggestion that the restriction or even abolition of cash would more or less do miracles: If cash were to be severely restricted or no longer existed, there would be much less crime and the shadow economy would be drastically reduced, because most shadow economy transactions are usually undertaken in cash. Also if cash were not easily available, terrorist attacks would be severely hampered. This paper tries to shed some light on whether cash has such an important influence on the shadow economy, crime and terrorism, but also on the effect which reduced cash would have on civil liberties.

In most countries the dominant means of transfer in paying legally (but also illegally) for goods and services is cash, which has proved to be an efficient means of handling all economic activities. But there is a growing literature claiming that cash supports the shadow economy, crime and terrorism and is risky, old fashioned and unnecessary, especially if one considers the fast increase in electronic payments.[2]

Hence, the goal of this paper is to undertake an empirical econometric investigation about the relations (1) between cash and the shadow economy and (2) between cash and crime, including corruption. Furthermore, some remarks are made about (3) cash and terrorism and (4) cash and civil liberty. To my knowledge a sound econometric investigation has not been undertaken in order to fulfill the ceteris paribus condition for evaluating the relation between

[1] Compare here only some recent references: Sands (2016), Rogoff (2014), Feige (2012), Schneider and Linsbauer (2016), Riccardi and Levi (2017), Imordino and Wussow (2016), Saints (2016) and Rogoff (2014).
[2] Riccardi and Levi (2017), Levi (2016) and Andersen et al. (2013).

cash and the shadow economy and the relation between cash and corruption, e.g. as measured by the Transparency Corruption Perception index.

The paper is organized as follows: In chapter 2 some short remarks about the use of cash are made. Chapter 3 deals with cash versus illegal activities; in subchapters 3.1 cash and shadow economy, 3.2 cash and bribery, 3.3 cash and crime and 3.4 cash and terrorism. In the final chapter 4 some considerations about cash versus civil liberties are undertaken and conclusions are drawn.

2 Some remarks about the use of cash

In this chapter, some short remarks about the use of cash are made. The recent data shows that cash is heavily used in the legal economy. Despite the increasing use of alternative payment methods, such as credit cards, electronic payment systems, or virtual currency, banknotes still represent the preferred means of payment, both in Europe and abroad, including the United States. This is particularly true for small-scale purchases in certain sectors.

There are numerous studies which extensively analyze the use of cash.[3] Bagnall et al. (2014) state that their paper is one of the first that analyzes the cash payment behavior of consumers, using harmonized micro-data from several countries (Australia, Austria, Canada, France, Germany, The Netherlands and the United States). Due to the lack of available data, they argue that relatively little has been known about the use of cash. These authors provide first evidence. They combine data from a regular questionnaire with data from payment diaries, which collect information on individual payments by consumers. This allows them to comprehensively analyze consumers' payment behavior. They come to the surprising result that in spite of what many have predicted so far (that cash is disappearing as a payment

[3] Compare e.g. the papers of Bagnall et al. (2014), Riccardi and Levi (2017), Ardizzi (2015), to mention just a few recent studies.

instrument), their research paper shows, that in all seven countries considered cash is still used extensively, in particular for lower value transactions. In table 2.1 the results for the use of cash are shown. The table is taken from Bagnall et al. (2014). It clearly shows that cash is mostly used in Austria with 82% payment share by volume, followed by Germany with also 82% and then by Australia with 65%. If we look at payment share by value, in Austria cash is still mostly used with 65% followed by Germany with 53% and then by the Netherlands with 34%. This table clearly shows that cash is still quite heavily used.

In table 2.2 the use of Euro banknotes (in circulation estimates) for 2008 and 2014 is shown. One realizes clearly that in 2014 households and non-bank companies used Euro banknotes for 30% of total payments, somewhat less than in 2008 where it was 33%. Also banks' use of cash dropped from 8% to 6%, holdings of cash outside the European monetary union increased from 20% to 23% (2014) and domestic cash hoarding by households and non-bank-companies increased from 39% to 41%.

If we consider other studies, e.g. Drehman et al. (2002), who analyze cash use in several countries, come to the result that it is widespread, especially for low-value transactions, and systematic differences between countries persist. Other related studies include, among others, Amromin and Chakravorti (2009) who find decreasing demand for small denomination currency, even 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, and Evans, Webster, Colgan, and Murray (2013) show increased cash use in European countries from 2000 to 2012. Of course, one should be clear here that the use of cash is vastly different from country to country and is driven by different payment habits.

This can also be seen in table 2.3, where the result of an ECB survey about the use of cash is reported for the year 2011. With the exception of Luxembourg and the Netherlands small Euro amounts (< 20€) are dominantly used for purchases; e.g. 91% in Germany, 90% in Spain and 91% in Italy. If one uses the purchase value 30–100 Euro, the use of cash drops but is still 77% in Italy, 69% in Germany and 64% in Spain. If we consider purchases between 200 and 1000 Euro the use of cash drops heavily but is still 30% in Spain, 31% in Italy and 21% in Germany. If one takes purchases of 1000 Euro and more the figure drops down to below around 6% but in Austria is still 10%. This clearly shows that small sums are dominantly paid in cash.

Finally, in figure 2.1 the average cash ratio (defined as the ratio between the amount of ATM withdrawals (proxy for cash use) and the sum of total payments) over the period 2011–2015 is shown across European Union countries. For the countries of the Euro area it is 46.8%, for the total European Union it is 41.9%. The highest shares are for Greece, Bulgaria and Romania with 88.8%, 88.6% and 84.8%; the lowest are for the United Kingdom. France and Sweden with 27.0%, 25.3% and 23.4%. Again, huge differences!

To summarize, these tables, figures and remarks clearly show that cash was still dominantly used in Europe and in other highly developed OECD countries over the period 2010 to 2015. The percentage of use is vastly different between countries and it all depends on payment habits. But these tables clearly show that cash is an important element and also that cash hoarding increased significantly.

3 Cash versus illegal activities

In this chapter the major research question is “How much does cash stimulate illegal activities?”, starting with the shadow economy, then crime and corruption, and finally considering terrorist financing. It is obvious that cash cannot be easily traced, which makes

cash attractive for transactions related to the shadow economy, bribery, crime and finance of terrorism. But still an important question is: Is cash a major source of the shadow economy, of crime and of terrorism or just one means?

3.1 Cash and the shadow economy

Shadow economy refers to business/economic activities off the books, which are legally allowed but not recorded in order to avoid tax and social security payments and to avoid labor market and other regulations.[4] In this subchapter I want to investigate the role cash "plays" as an indicator of the size of the shadow economy. In figure 3.1, the share of cash payments versus the size of the shadow economies of 36 highly developed countries averaged over 2013–2014 are shown. One clearly realizes that the larger the share of cash in total payments the larger the size of the shadow economy. The correlation coefficient between the two variables is 0.50 and is highly statistically significant. Hence, at a first glance, it looks like the higher the share of cash (as a percentage of total payments) the larger the shadow economy. However, if one also looks at figure 3.1 there are some distinct exceptions, for example Germany and Austria are cash-intensive countries with relatively small shadow economies. In Sweden, where cash payments have become rare, the country still has a medium-sized shadow economy.

Given these inconclusive findings and in order to fulfill the ceteris paribus condition an econometric investigation is undertaken. I know that the shadow economy is driven by tax burden, by regulation, by the quality of public institutions, unemployment, tax morale and

[4] There is an extensive literature about the definition of a shadow economy also estimating a shadow economy and its interaction with the official economy. Compare for example Feld and Schneider (2010), Gerxhani (2003), Schneider (2015, 2017), Schneider and Williams (2013) and Williams and Schneider (2016) as well as Sauka, Schneider and Williams (2016). Due to this extensive literature a longer discussion about defining and estimating a shadow economy and its interaction with the official one is not undertaken in this paper.

other factors.[5] But how is it related to the use of cash and/or cash limits?[6] In this paper I choose **three** ways of investigation.

First, using a MIMIC estimation, shadow economy is a constructed figure with various causes, such as tax burden, regulation measures, economic freedom, legal system, tax morale, etc. Indicators, like employment and GDP and cash or cash limits are neither used here as indicator nor as cause variables. These "cash free" shadow economy figures are now regressed on the availability of cash approximately by the share of cash in total payments and by cash limits. The results are shown in table 3.1. The size of the shadow economy in 38 highly developed countries as averaged over the years 2013/2014 is regressed on GDP per capita, share of cash payments and cash limits, which exist in a number of European countries. The results clearly show that the share of cash payments has an influence on the size and development of the shadow economy and is statistically significant; the more cash, the larger the shadow economy, ceteris paribus. However, the estimate coefficient of cash limits which is in place in various European countries (for example Italy, France) has the theoretically expected negative sign, but is not statistically significant.

In table 3.2 some simulation results are undertaken about the importance of the cash figure on the size of the shadow economy. Table 3.2 clearly shows that when GDP decreases by 10%, the shadow economy increases by 18.4%. When the share of cash payments decreases by 10% the shadow economy decreases just by 2%. If we make the assumption that no cash is available anymore, the shadow economy would decrease by 20%. Cash limits have no significant effects.

[5] Compare here for example Feld and Schneider (2010) and Schneider (2015, 2017).

[6] It is obvious, that cash is an important element or indicator of the shadow economy. There is even one method, the currency demand approach, which originally was developed by Vito Tanzi and Gutmann in the 80s, who use the idea that the amount of cash held outside banks is a function of traditional factors like consumption habits, income and interest rates, but also one can include factors which are drivers of the shadow economy, like tax burden and regulation. One can econometrically estimate such a function and can derive value-added figures of the size of the shadow economy. But again, here cash is only an indicator and not the primary reason why people work in the shadow economy.

The **second** way to test how important cash is for the shadow economy, or whether a cash limit would reduce the shadow economy as a causal variable, is investigated by undertaking a MIMIC estimation[7]; the results are presented in table 3.3. We clearly see that the cash limit variable has no statistically significant influence as a causal factor on the size of the shadow economy whereas the tax burden, rule of law index and the inflation rate all have the theoretically expected sign and are highly statistically significant; the only exception is unemployment, which has the expected sign, but is **not** statistically significant. Cash as an indicator of the shadow economy has a statistically significant influence on the size of the shadow economy.

The third way is a first attempt at a micro study. In figure 3.2 some first micro results about the following question are shown. "Imagine there was no cash anymore. What would you have done in the following situations?" The answers are in percent of those persons who said that they paid in cash for services or trades activities because it was anonymous. 33% of the Austrians interviewed (interviews were done from May 24 to June 29, 2016 with 1056 interviewed persons) would still demand the service and would pay cashless. 13% said that they would still have demanded the service but would have paid more attention to correct tax treatment. 13% would not have demanded the service anymore and 41% would have negotiated another anonymous payment method with the other party, such as vouchers or gifts. Hence, even under the extreme assumption that no cash is available, 41% of the people who prefer anonymous payment would still seek an anonymous payment method.[8] To summarize, cash is an important element in the shadow economy. But cash is by no means a causal factor and it has quantitatively limited influence on the development of a shadow economy. Without any cash a shadow economy might be reduced between 10 to 20%.

[7] This estimation procedure is explained in detail in Schneider (2017), Feld and Schneider (2011), and Schneider and Enste (2010).

[8] These are first results on a project of a micro-investigation for Austria about the structure of the shadow economy motivation and why people work in the shadow economy.

3.2 Cash versus illegal activities

3.2.1 The case of corruption

As in subchapter 3.1, the use of cash is often blamed as the main enabler of bribery, corruption and other crime activities. In many countries the simple equation of much cash, much bribery, seems to hold true in media stories. In countries such as Switzerland and Austria, low levels of perceived public-sector corruption and bribery occur alongside a high share of cash in total payments and/or low number of cashless payments per person. Compare here figure 3.3, in which the share of cash payments and the transparency corruption perception index are plotted. We clearly see in this figure that the higher the corruption the lower the transparency corruption index value, and the higher the cash share. Hence, countries like Greece and Bulgaria (which have high corruption) also have a high share of cash payments measured as a percentage of total payments; the correlation coefficient is –0.72 and highly statistically significant. But, as already argued, other countries such as Switzerland, Germany and Austria have a high share of cash payments, but quite low corruption. As in the shadow economy case from this figure, we cannot draw the conclusion that cash is responsible for corruption.

Again, I undertake an econometric investigation, trying to explain corruption. Corruption has considerable impact on economic, political and social factors and is subject to a vast range of institutional, jurisdictional, society and economic conditions. In a survey paper, Dimand and Tosato (2017) provide a comprehensive state of the art survey of the existing literature on corruption and its causal effects. They reach the conclusion that thanks to more convenient and better availability of data, empirical research on corruption has advanced vastly over the last decade. They conclude that from a scholarly perspective the remaining challenge is how to deal with noisy data and they try to capture hidden behavior. Their survey shed light on the development of empirical corruption research and on the non-robustness of older and newer

empirical findings. They show that recent empirical findings on the interrelation between corruption and bureaucracy, press and economic freedom, poverty wages and/or the shadow economy are in line with both theoretical assumptions and older empirical research. They further conclude that the quality of empirical research and corruption is still advancing and needs to settle important issues, such as the right way to measure corruption, before being able to settle debate of conflicting empirical findings. They conclude that more micro-data is required in order to get consistent findings.[9]

Considering these survey results, an attempt is made here to explain corruption. The transparency corruption index (TCI) is used as dependent variable; and indices of rule of law and economic freedom, GDP per capita, share of cash payments and cash limits are used as independent variables [10]. The TCI of 38 highly developed countries over 2014/2015 is used. The results are reported in table 3.4 (note that for the dependent variable the TCI, the higher the value the lower the corruption!). The regression shows that the better the rule of law and the more economic freedom is granted, the lower is corruption. It also shows, the higher GDP per capita is, the lower is corruption. The result also shows that the higher the share of cash payments, the higher is corruption; the estimated coefficient is statistically significant. Finally, the cash limit dummy variable has the wrong sign and is not statistically significant.

In table 3.5 some simulation results about quantitative importance are presented. One realizes that if the rule of law (economic freedom), increases by 10 percentage points, the TCI increases by 6.1 (5.0%), which means less corruption. If the share of cash payments is decreased by 10 percentage points, the TCI increases only by 1.8%, which means less

[9] A similar conclusion was also reached by Dreher and Schneider (2009), who empirically investigated the interaction between corruption and the shadow economy.
[10] Amazingly, in the survey by Dimand and Tosato (2017), cash as a driving force for corruption is not even mentioned.

corruption. I have here a statistically significant effect of the estimated coefficient of the cash variable, but compared to the other two variables, it is only of minor importance.

Finally, in table 3.6 a robustness test for six different specifications is presented, as Dimand and Tosato (2017) argued in their survey about the instability of the regression results explaining corruption. Table 3.6 clearly shows that the estimated coefficient of cash share is in three cases statistically significant and in three cases not. The estimated coefficient of cash limit is not statistically significant in any the six cases. I must confess that the results are not stable. Hence, I cannot conclude that cash is a driver of corruption.

3.2.2. The case of money laundering

It is obvious that "crime" or dirty money is laundered. This has the purpose of making dirty money appear legal (compare Walker, 1999, 2007).[11] There are many methods of money laundering; table 3.7 briefly explains the 12 most common methods according to Unger (2007) and Schneider (2015). Which of these methods is chosen depends on the type of crime activity and on the institutional arrangements in the country where the criminal money is "earned". For example, in the drug business method 8 "business ownership" is quite often used.[12] In big cities quite reasonable amounts of cash are earned by drug dealers in a lot of different places, which they infiltrate into cash-intensive operations such as restaurants, which are especially well suited for money laundering purposes, by adding the criminal proceeds to the "legal" turnover of the business. Table 3.7 also shows that in 8 out of the 12 methods cash is only or mostly used. Quite obviously, when using cash deposits (method 2), cash smuggling (method 4), business ownership (method 8), credit card advance payments (method 11) and ATM operations (12) for money laundering, more or less only cash is involved in these transactions. Only for wire transfers, the purchase of insurance policies,

[11] Step one is the earning and collection of the crime money. Step two is to become as rich and influential as possible in the underground and legal world.
[12] Compare Schneider (2004) and Masciandaro (2004).

security purchases and the creation of shell corporations is cash of little or no importance. Therefore, cash is quite important for money launderers in traditional criminal activities at the first stage.

Unger (2007) estimates the amount of laundered money for the top 20 destination countries of laundered money. These figures are shown in table 3.8. In this table two estimates are presented, one by Walker (1999, 2007) and one by the IMF. The Walker figure of 2.85 trillion USD is much larger than the IMF figure of 1.50 trillion USD (both figures are for the year 2005). Walker's figures have been criticized as too high, which was one reason why the IMF estimates are shown too.

Table 3.8 clearly demonstrates that two-thirds of worldwide money laundering is ascribed to these 20 countries listed. One should realize that most of these countries are highly developed and have quite sizeable legal/official economies, which makes them highly attractive for re-investing the laundered proceeds. What is also amazing is that there are only a few small countries, offshore countries (OFCs) and/or tax havens among them (Cayman Islands, Vatican City, Bermuda and Liechtenstein).[13] The majority of countries that attract money laundering flows are economically big players. The United States has the largest share in worldwide money laundering at almost 19.0%, followed by the Cayman Islands (4.9%), Russia (4.2%) and Italy (3.7%). However, smaller countries such as Switzerland (2.1% of worldwide money laundering), Liechtenstein (1.7%) and Austria (1.7%) are also attractive. If one takes the lower IMF values for Austria, Switzerland and the United Kingdom, about 5.5% of the total amount is laundered in these three countries, which comes close to roughly 10% of their official GDP. Yet it needs to be emphasized that it is not clear whether this money is "only" laundered in these countries or whether it also remains there. The money may well

[13] Compare also Masciandaro (2005, 2006), Zdanowicz (2009), Truman and Reuter (2004), and Walker and Unger (2009).

leave these countries after the laundering process. In general, table 3.8 demonstrates how substantial the amount of laundered money is and that two-thirds of these funds are concentrated in only 20 countries.

Bagella et al. (2009, p. 881) apply a two-sector dynamic general equilibrium model to measure money laundering for the United States and the EU-15 macro areas over the sample period 2000:01 to 2007:04 on a quarterly basis. Their time series are generated through a fully micro-founded dynamic model, which is appropriately calibrated to replicate selected stochastic properties of the two economies (legal and illegal). Their model has a short run perspective. Bagella et al. get the following results: First their simulations show that money laundering accounts for approximately 19.0% of the measured GDP in the EU-15, while it accounts for 13.0% in the US economy, over the sample 2000:01 to 2007:04. Second, the simulated size of money laundering appears less volatile than the corresponding GDP. As regards the EU-15 macro area, the simulated statistics suggest that money laundering volatility accounts for one-third of GDP volatility. For the US economy, the same statistics produce a figure of two-fifths. Considering these estimates I admit that they are quite high and I have some doubts about how plausible these large figures are.

In another study Walker and Unger (2009, p. 821) again undertake an attempt to measure global money laundering and/or the proceeds from transnational crime. They criticize the traditional and often used methods such as case studies, proxy variables, or models for measuring the crime economy, arguing that they all tend to overestimate money laundering. They present a theoretically orientated gravity model which makes it possible to estimate flows of illicit funds from and to each jurisdiction in the world. This “Walker Model” was first developed in 1994 and was updated in 2008/2009. The authors elaborate that their model belongs to the group of gravity models which has recently become popular in international

trade theory. The authors argue that the original Walker Model estimates are compatible with recent findings on money laundering. Once the scale of money laundering is known, its macroeconomic effects and the impact of crime prevention, regulation and law enforcement as well as the scale of transnational crime can also be measured. Walker and Unger (2009, pp. 849–850) conclude that their model still seems to be the most reliable and robust method to estimate global money laundering, and thereby the important effects of transnational crime on economic, social and political institutions. Rightly they argue that the attractiveness of the distance indicator in the Walker Model is a first approximation, but is still not theoretically satisfactory. A better micro-foundation for the Walker Model is needed. Micro-foundation here means that the behavior of money launderers is analyzed; in particular the reasons that make them send their money to a specific country. Hence, Walker and Unger (2009, p. 850) conclude that an economics of crime micro-foundation for the Walker Model would mean that, similarly to international trade theory, behavioral assumptions about money launderers should be made. Their gravity model can be seen as a reduced form or outcome of a rational calculus of sending money to a certain country and potentially making large profits.

3.2.3. The case of cybercrime

According to Anderson et al. (2013), in the last 10 to 15 years cybercrime has originated from white-collar crimes. In the year 2007 the European Commission defined cybercrime in the following way[14]:

1. traditional forms of crime such as fraud or forgery, though committed over electronic communication, networks and information systems;
2. the publication of illegal content over electronic media; and
3. crimes unique to electronic networks.

[14] This definition is taken from Anderson et al. (2013, pp. 268); compare also Levi and Suddle (1989) as well as Levi (2009 a,b), and Levi (2017).

Today, cybercrime takes on many forms, like online banking fraud (phishing), fake antivirus software, fake computer programs and fake error messages. In a first systematic paper Anderson et al. (2013) try to use a survey to measure the cost of cybercrime and/or the criminal proceeds from some types of cybercrime.[15] Cybercrime is a fairly new development and is certainly becoming more and more important. What type of cybercrime costs can one observe? Anderson et al. (2013, p. 269) state the following four:

1. costs in anticipation of cybercrime, such as antivirus software, insurance and compliance;
2. costs as a consequence of cybercrime in the form of direct losses and indirect costs, such as weakened competitiveness as a result of intellectual property compromise;
3. costs in response to cybercrime, such as compensation payments to victims and fines paid to regulatory bodies; and
4. indirect costs such as reputational damage to firms, loss of confidence in cyber transactions by individuals and businesses, reduced public-sector revenues and the growth of the underground economy.

These types of costs are shown in figure 3.4, where Anderson et al. try to analyze the costs of cybercrime and also some criminal revenues. From figure 3.4 one clearly realizes that criminal revenues or criminal proceeds can be derived from the direct losses of victims due to cybercrime. Direct losses (or proceeds of national or transnational criminal activities) include:

1. money withdrawn from victims' accounts;
2. stolen software; and
3. faked financial transactions.

[15] Compare also Detica and the Office of Cyber Security and Information Assurance (2011), Kanich et al. (2011), Levi (2011), Levi and Burrows (2008), Taylor (2011), Van Eeten and Bauer (2008).

What does one know about the costs (and partly proceeds of criminal activities) in the cybercrime area? Anderson et al. (2013, pp. 294–295) provide an interesting table (table 3.9) showing a first estimation of the costs (and partly proceeds) of the category of cybercrime.[16]

Considering the four cost (proceeds) components (costs of genuine cybercrime, costs of transitional cybercrime, costs of cybercriminal infrastructure, costs of cybercrime against public institutions) in table 3.9 one clearly realizes that component 4 "Cost of crime against public institutions (welfare and tax fraud)" becoming "cyber" is by far the largest part covering 67.5% of all costs of cybercrime, which amounts to a sum of 150.2 billion USD on a global estimate. Turning to global estimates of other components of cybercrime, one realizes that the costs of "genuine cybercrime" on a worldwide basis are 3.5 billion USD or 1.6% of the total costs of cybercrime. The 3.5 billion USD can also be seen as the largest part of the proceeds of genuine cybercrime activities. If one considers component 2 "Costs of transitional cybercrime" one realizes that it amounts to 44.2 billion USD or 19.8% of the total costs of cybercrime. With 24.8 billion USD the costs of cybercriminal infrastructure are quite sizeable as well; they amount to 11.9% of the total costs. As already said, the costs of traditional crimes becoming cyber are with 150.2 billion USD the largest part of the costs of cybercrime. Again this could at least partly be seen as the criminal proceeds from cybercrime activities in these areas, especially for tax fraud. In general table 3.9 clearly demonstrates that the costs and proceeds of cybercrime activities are sizeable. In future they will certainly rise because the use of electronic networks for crime activities is becoming more and more attractive.

[16] In the following table own calculations are added but it originally comes from Anderson et al. (2013, p. 294–295).

3.3 Cash versus terrorist financing

There are quite a number of statements and also papers which draw a connection between the financing of terrorism and cash. Some studies also support the view that cash is used also for terrorism financing.[17] In table 3.10 the costs of terrorist attacks are presented. Table 3.10 clearly shows that not much money is needed in order to undertake terrorist attacks. What is also quite often not known that before the attacks terrorists are unknown as terrorists and they can use their bank accounts and other financial means. Hence, even severe bargain restrictions can easily be bypassed if one goes several times to cash (ATM) machines or asks friends to go several times to do this. In figure 3.5 the costs of terrorist attacks in Europe are shown. Most of them cost less than USD 10,000. This figure clearly shows that even a severe legal cash restriction has minor effects on the financing of terrorists and activists. As shown in table 3.11, terrorist organizations such as ISIS or others have quite sizeable annual budgets and need to finance their operations in order to function as an organization. But even here it is doubtful whether this terrorist organization would diminish if there were no cash available worldwide.

3.4 Summary of the empirical findings

Summarizing subchapters 3.1 to 3.3 I reach the following findings/conclusions:

(i) Figures on crime and criminal cash usage are rare, often contain large errors (problem of double counting) and are difficult to interpret.

(ii) The available evidence suggests that restrictions on cash use will probably reduce profits from crime, but will certainly not eliminate them. Due to my empirical investigation, I reach the following figures: Reduction in cash or introduction of a cash limit: Shadow economy reduction between 2 and 20% (extreme case: no cash);

[17] Compare e.g. Riccardi and Levi (2017), Halliday, Levi and Reuter (2014).

corruption reduction between 1.8 and 18 percentage points (extreme case: no cash); crime reduction between 5 and 10%.

(iii) Other means of storing and transferring illegally obtained assets without leaving many traces are already in use. They include:

a. the transport of physical valuables (e.g. prepaid instruments, precious metals, diamonds),
b. using false identities and fake firms,
c. criminal middlemen and shell companies to facilitate cashless transfers via regulated entities like the banking system, money transmitters or online payment service providers.

(iv) Also, funds can be moved through traditional or new, alternative transfer systems like hawala or private virtual currency schemes.

(v) Finally, technical progress, especially cyber money (bitcoin), and other electronic means are rapidly changing payment habits and hence will be heavily used by criminals, too.

4 Conclusions: Cash and civil liberties

For liberal societies the importance of cash has much deeper aspects than "pure" economic ones. Cash reflects the fundamental relation between citizens or taxpayers and state authorities. Using cash means freedom, independence and personal fulfillment for a citizen who doesn't want a state intervention when using cash. The "voices" calling for the limitation or abolishment of cash argue that tighter and more comprehensive state control over individuals' financial flows and funds will effectively fight crime, shadow economy and terrorism. But in my opinion we have weak empirical evidence.

Of course, anonymous cash makes tax evasion easier, especially for those who cannot afford to shift funds abroad. However, easy cash is clearly not the main reason for tax evasion, though it does facilitate it. Indeed citizens' willingness to pay taxes crucially depends on tax morale.[18] Tax morale has been found to correlate with the relation between citizens and the government. The better the relation the higher the tax morale. A high degree of trust and of political influence (direct democracy) strengthens tax morale and the willingness of the citizens to pay their taxes, so that the state can provide goods and services. Tax authorities should treat taxpayers or citizens with respect and as clients rather than as suspects or servants. Hence, such a fundamental basic contract (developed by Frey and Feld (2002, 2007)) between the tax payer and the state is crucial for the functioning of society.

The abolishment or strict limitation of cash carries the risk of seriously weakening trust in state authorities. Abolishing cash as a simple tool against citizens to enforce state control can easily prove to be counter-productive. Given the real perceived importance of cash for civil liberties, a limitation or abolition could only be justified by sound reasons and large benefits. Only then may trust between citizens and authorities remain intact. As cash is neither the motivation nor the reason for shadow economies, crime or terrorist attacks, its abolition would not lead to large welfare gains. In a democracy the choice between cash and other means of payment should be left to users, who happen to be citizens, taxpayers, consumers and producers at the same time. Hence, my final conclusion is that citizens don't want to be forced by state authorities not to use cash anymore. They should be free to choose which payment instrument they use.

[18] Compare here the work of Feld and Frey (2002, 2007), and Schneider (2015).

5 Tables

Table 2.1 Use of Cash, Years 2010–2012 in seven highly developed OECD countries

Variable	Country						
	AU	AT	CA	FR	DE	NL	US
Payment share by volume							
Cash	0.65	0.82	0.53	0.56	0.82	0.52	0.46
Debit	0.22	0.14	0.25	0.31	0.13	0.41	0.26
Credit	0.09	0.02	0.19	0.01	0.02	0.01	0.19
Total	0.96	0.98	0.97	0.88	0.97	0.95	0.91
Other most important payment instrument (share > 5%)	-	-	-	0.09[a]	-	-	-
Payment share by value							
Cash	0.32	0.65	0.23	0.15	0.53	0.34	0.23
Debit	0.32	0.25	0.30	0.43	0.28	0.60	0.27
Credit	0.18	0.05	0.41	0.03	0.07	0.04	0.28
Total	0.82	0.95	0.94	0.60	0.89	0.97	0.78
Other most important payment instrument (share > 5%)	0.12[b]	-	-	0.30[a]	-	-	0.14[a]

[a] Cheques.
[b] Internet/telephone banking.
Notes: Authors' calculation based on questionnaire and diary surveys. Nominal values are expressed in PPP-adjusted USD. PPP exchange rates are taken from the OECD: http://www.oecd.org/std/pricesandpurchasesingpowerparitiesppp/PPP_OECD.xls.
Source: Bagnall et al. (2014), p. 27.

Table 2.2 Use of euro banknotes in circulation – estimates in 2008 and 2014

Purpose/Variable	User	Year 2008		Year 2014	
		Share of total	EUR bn	Share of total	EUR bn
Domestic transaction balance	Households, non-bank companies	33%	250	***30%*** ↓	305
Banks' vault cash	Euro area banks	8%	60	***6%*** ↓	61
Holdings outside the EMU	No sectoral information	20%	150	***23%*** ↑	230
Domestic cash hoarding	Households, non-bank companies	39%	300	***41%*** ↑	420
Total value of euro banknotes in circulation	All users	100%	763	***100%***	1017

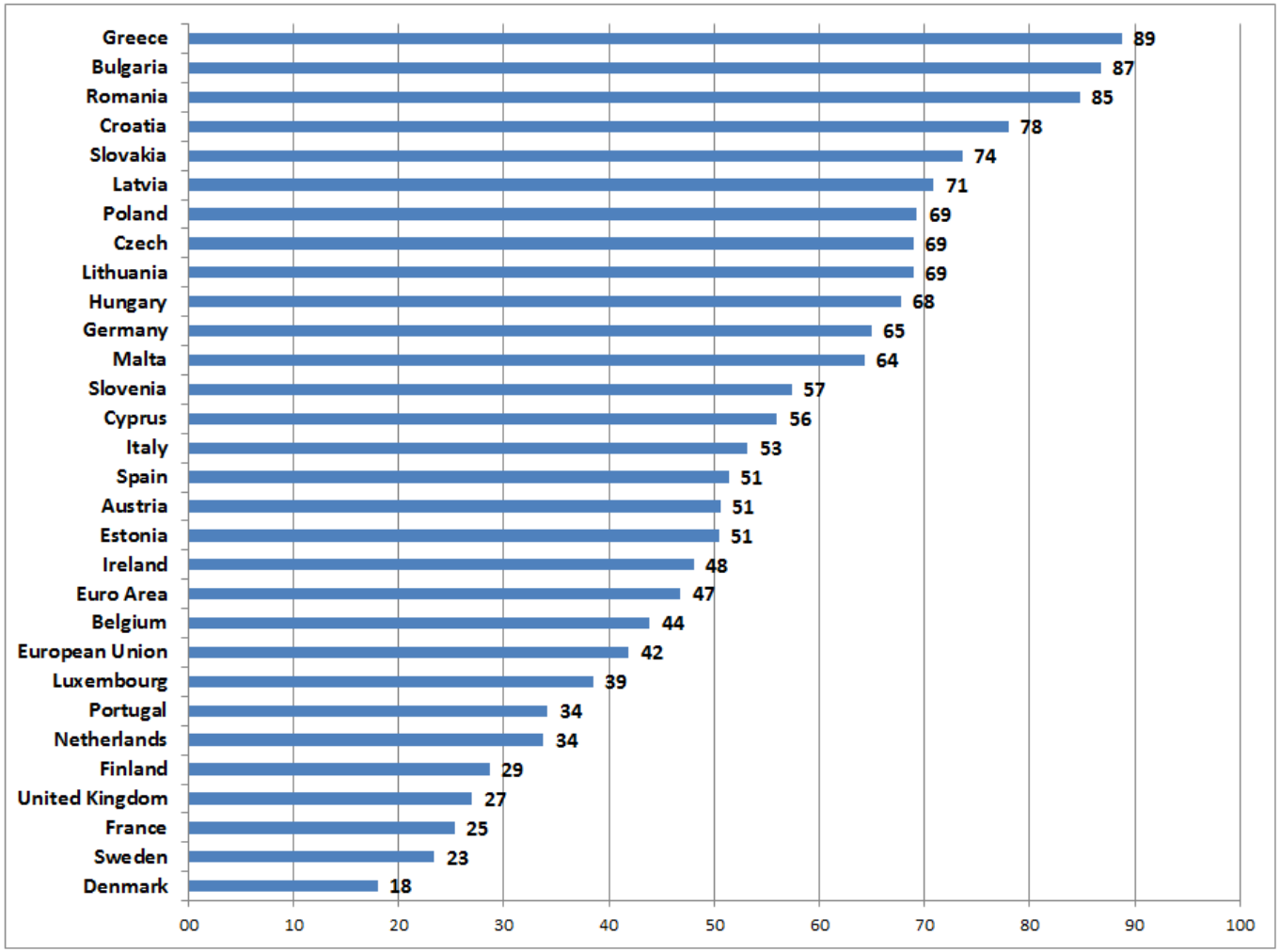
Source: Mai, H. (2016), p.4.

Table 2.3 Percentage of respondents always or often using cash by value of purchase; year 2011; 8 EU-countries

Country	Percent of respondents always of often using cash by value of purchase			
	< 20 euro	**30–100 euro**	**200-1000**	**> 10000 euro**
Belgium	84%	48%	18%	5%
Germany	91%	69%	21%	4%
Spain	90%	64%	30%	6%
France	80%	15%	3%	0%
Italy	91%	77%	31%	4%
Luxembourg	77%	27%	10%	3%
Netherlands	65%	20%	8%	4%
Austria	82%	60%	29%	10%
AVERAGE (8 EU MS)	**87%**	**55%**	**20%**	**4%**

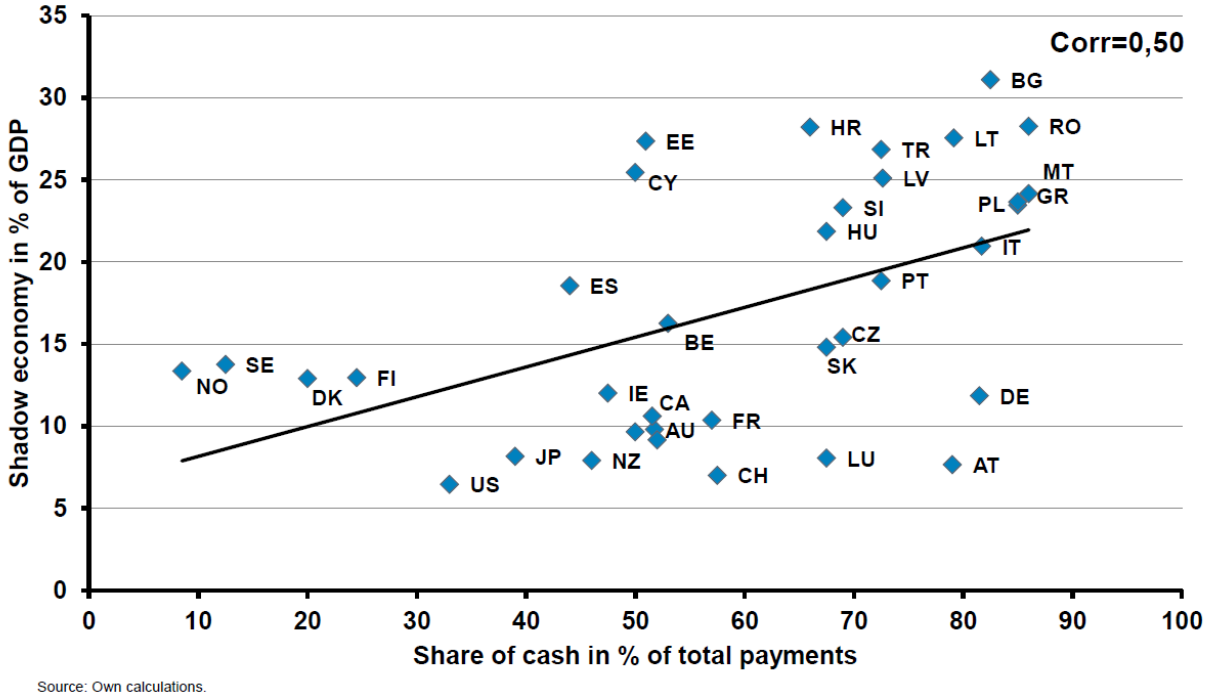
Source: ECB, Frankfurt (2011).

Figure 2.1: Cash ratio across 28 European countries; average 2011–2015[1)]



1) The ratio is defined as the ratio between the amount of ATM withdrawals (proxy of cash use) and the sum of total payments including those through residents' points of sale (POS).
Source: Piccardi and Levi (2017), who draw on ECB data.

Figure 3.1 Share of cash payments versus the size of the shadow economy (averages over 2013–2014)



Source: Own calculations.

Table 3.1 OLS-Regression with robust standard errors; 38 highly developed countries; average of the shadow economy of the years 2013/2014

Dependent variable: ***Shadow Economy in % of GDP (average over 2013/2014)***	**Coefficients (t/z-value) [beta-value]**	**Independent variables**
	96.490** (6.46)	Constant term
	–7.991** (–6.30) [–0.714]*	log(GDP p.c.) (average over 2013/2014)
Test-Statistics: R^2=0.742 F-value=43.39(0.000) RMSE=4.05 D.F.=32	0.075* (2.06) [0.204]	Share of cash payments in % of all payments (average over 2013/2014)
	–1.450 ***(–1.07)*** [–0.091]	Cash limit (dummy-variable 1=limit, 0=no limit)

Not statist. significant!

Source: Own calculations.

Table 3.2 Static simulation results (no adjustment procedures are assumed!)

Simulations of standardized effects		
Variable	**Effect on shadow economy**	
GDP p.c.	10% decrease	→ Shadow economy ***increases*** by ***18.4%***
Share of cash payments	10% decrease	→ Shadow economy ***decreases*** by ***2.01%***
No cash payments, at all	Drops to 0!	→ Shadow economy ***decreases*** by ***20.1%***
Cash limit	[Introduction of cash limit]	***no significant effect***

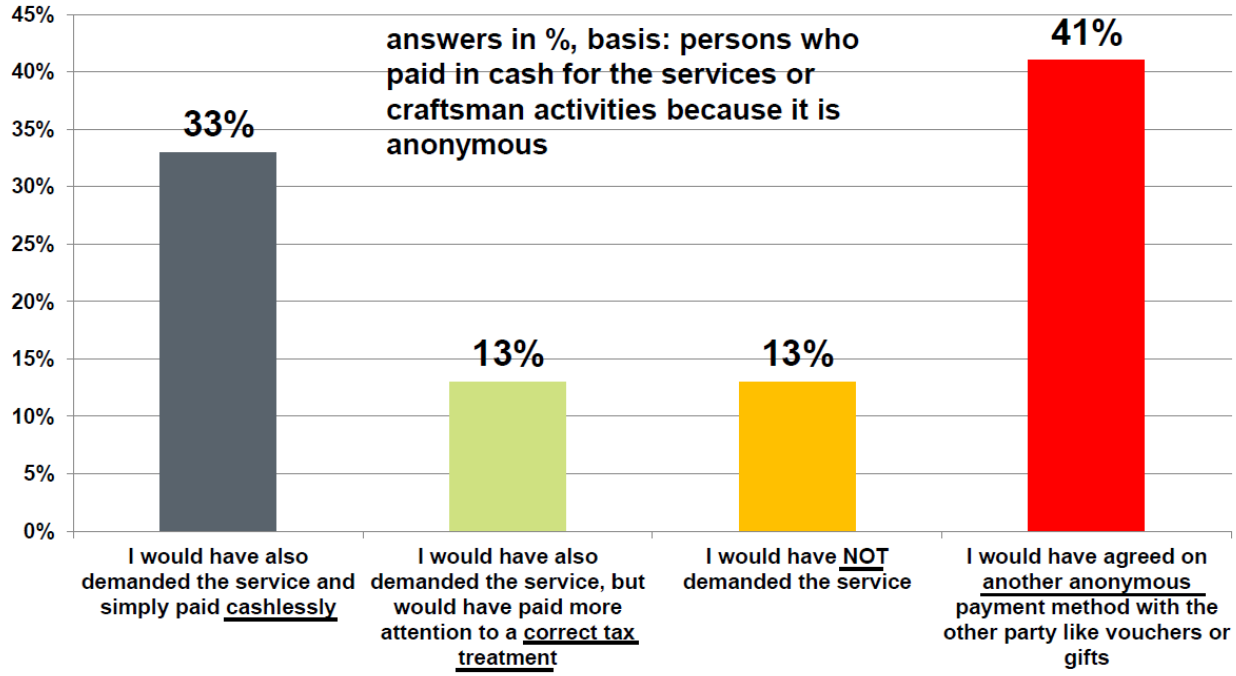
Source: Own calculations.

Table 3.3 MIMIC estimation, latent variables: shadow economy of 36 highly developed countries; years 2012 to 2014

MIMIC Estimates	
Causal variables	**Est. Coeff.**
Cash limit (dummy-variable: 1=limit, 0=no limit)	1.889 (0.56)
Tax burden in % of GDP	0.174** (2.10)
Rule of law index (the better, the higher)	–2.995*** (–3.28)
Inflation rate	2.824*** (3.50)
Unemployment rate	1.735 (0.60)
Indicator variables	
Cash as share of all payments	1.00 constrained
Labor force participation rate	–0.431***(–3.44)
Chi-Square RMSA Coefficient of determination	6.14 (0.188) 0.122 0.908
Observations	36

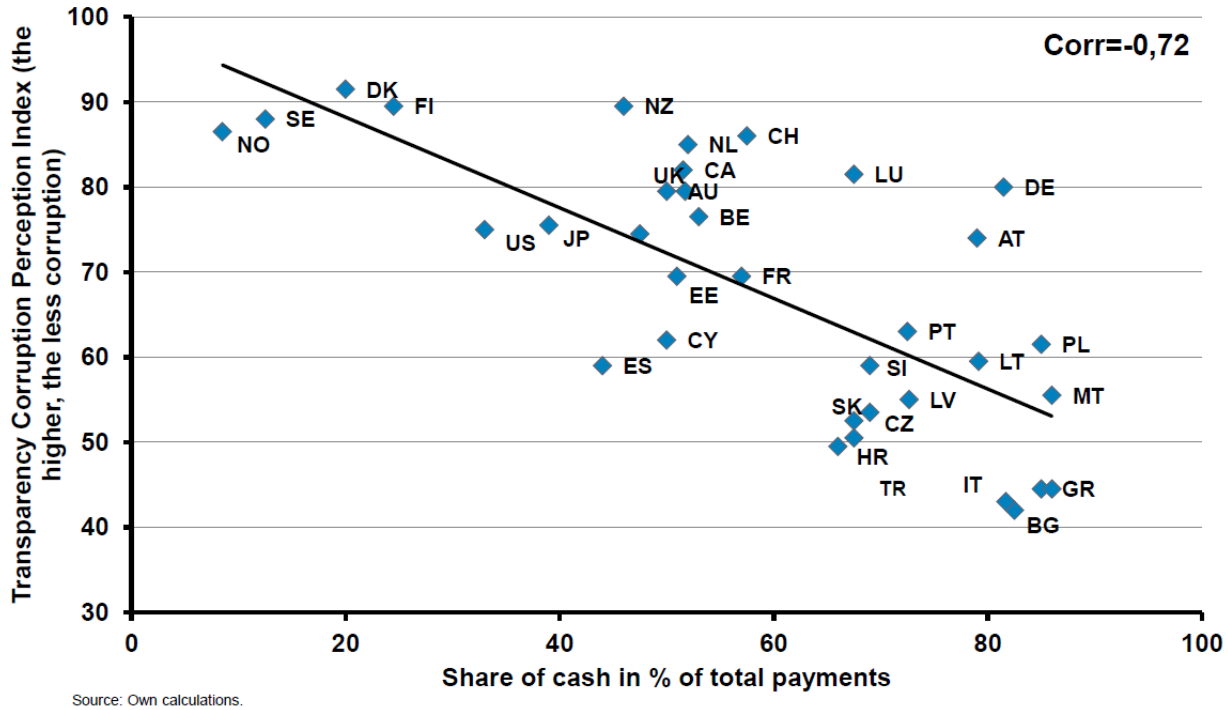
Source: Own calculations.

Figure 3.2 "Imagine there was no cash anymore. What would you have done in the following situations?"



N=1,056 interviews, representative for the Austrian population.
Source: Friedrich Schneider: Market Linz, May 24 to June 9, 2016.

Figure 3.3 Share of cash payments as an indicator of corruption (averages over 2014–2015)



Source: Own calculations.

Table 3.4 Regression results: Transparency Corruption Index (the higher the value, the lower corruption); 38 highly developed countries; years 2014/2015

Dependent variable: ***Transparency Corruption Index (TCI) (average over 2014/2015)*** ***(The higher the value, the lower corruption)***	**Coefficients (t/z-value) [beta-value]**	**Independent variables**
	–44.725* (–2.48)	Constant term
	0.616** (3.18) [0.424]	Rule of Law Index; the higher, the better
	0.507* (2.59) [0.204]	Economic freedom index; the higher, the better
	4.060(*) (1.65) [0.176]	log(GDP p.c.) (average over 2013/2014)
	–0.176** (–3.30) [–0.233]	Share of cash payments in % of all payments (average over 2013/2014)
Test-Statistics: R^2=0.924 F-value=124.64(0.000) RMSE=4.67 D.F.=32	–2.192 ***(–1.23)*** [–0.066]	Cash limit (dummy-variable 1=limit, 0=no limit)

Wrong sign! → ***(–1.23)***

Not significant!

Source: Own calculations.

Table 3.5 Simulation results on TCI Transparency Corruption Index (the higher the value, the lower corruption)

Standardized effects → Simulations		
Rule of law	+10 percentage points	→ ***Increase*** of ***6.1*** percentage points of the TCI → Less corruption
Economic freedom	+10 percentage points	→ ***Increase*** of ***5.0*** percentage points of the TCI → Less corruption
Share of cash payments	–10 percentage points	→ ***Increase*** of ***1.8*** percentage points of the TCI → Less corruption
Cash limit=1		***Wrong sign!*** ***Not significant!***

Source: Own calculations.

Table 3.6 Problem of stability of the estimated coefficients of the variables "cash share" and "cash limit"

No.	Estimated coefficient of "Cash share"	Estimated coefficient of "Cash limit"	Specification of the regression; depended variable; Transparency Corruption Index
1	***–0.176*** ***(–3.30)***	–2.191 (–1.23)	Log(GDPAV), ECFI av., LAW av.
2	–0.079 (–1.54)	–0.089 (–0.06)	Log(GDPAV), ECFI av., LAW av., Gov. Eff.
3	–0.083 (–1.13)	0.032 (0.02)	Log(GDPAV), ECFI av., Gov. Eff.
4	***–0.195*** ***(–3.38)***	–1.915 (–1.05)	LAW av., EFI av.
5	***–0.109(*)*** ***(–1.82)***	–2.86 (–1.46)	Log(GDPAV), LAW av., BFI av.
6	–0.083 (–1.13)	0.033 (0.02)	Log(GDPAV), ECFI av., Gov. Eff.
GDPAV=GDP average 2013–2014; LAW av.=Rule of Law Index, Gov. Eff.=Gov. Efficiency index, EFI av.=Economic Freedom Index, BFI av.=Business Freedom Index			

Source: Own calculations.

Table 3.7 Methods of money laundering and the use of cash

1)	*Wire transfers* ***(no cash)***	Money launderers move funds around in the banking system all over the world. Often these funds go through several banks and different jurisdictions.
2)	*Cash deposits "Smurfing"* ***(only cash)***	Money launderers deposit cash advances in bank accounts. Due to anti-money-laundering regulations they often "structure" the payments, i.e. break down large to smaller amounts ("smurfing").
3)	*Informal value transfer systems (IVTS)* ***(mostly cash)***	Money launderers on the one side rely on other transfer providers, such as the Hawala or Hindi, and on the other side on IVTS shops (mainly selling groceries, phone cards or other similar items).
4)	*Cash smuggling* ***(only cash)***	Money launderers mail, FedEx or simply carry cash from one region to another.
5)	*Gambling* ***(mostly cash)***	Casinos, horse-races and lotteries are ways of legalizing funds. The money launderer can buy (for "dirty" cash) winning tickets – or in the case of casinos, chips – and redeem the tickets or the chips in a "clean" bank check.
6)	*Insurance policies* ***(no cash)***	Money launderers purchase single premium insurance, redeem early (and pay a penalty) in order to receive clean checks to deposit.
7)	*Securities* ***(no cash)***	Usually used to facilitate fund transfers, where underlying security deals provide cover (and legitimate looking reason) for transfers.
8)	*Business ownership* ***(only cash)***	Money is laundered through legitimate businesses, cash-intensive operations, such as restaurants, are especially well suited for laundering; ***one of the most often used methods!***
9)	*Shell corporations* ***(little cash)***	Money launderers might create "fake" companies exclusively to provide cover for fund moves without legitimate business activities; ***one of the most often used methods!***
10)	*Purchases* ***(mostly cash)***	Real estate or any durable good purchases can be used to launder monies.
11)	*Credit card advance payment* ***(only cash)***	Money launderers pay money in advance with dirty money, and receive clean checks on the balance from the bank.
12)	*ATM operations* ***(only cash)***	Banks might allow other firms to operate their ATMs, i.e. to maintain and fill them with cash. Money launderers fill ATMs with dirty cash, and receive clean checks (for the cash withdrawn) from the bank.
Summary		"no" cash: 4 cases "only" cash: 5 cases "mostly" cash: 3 cases

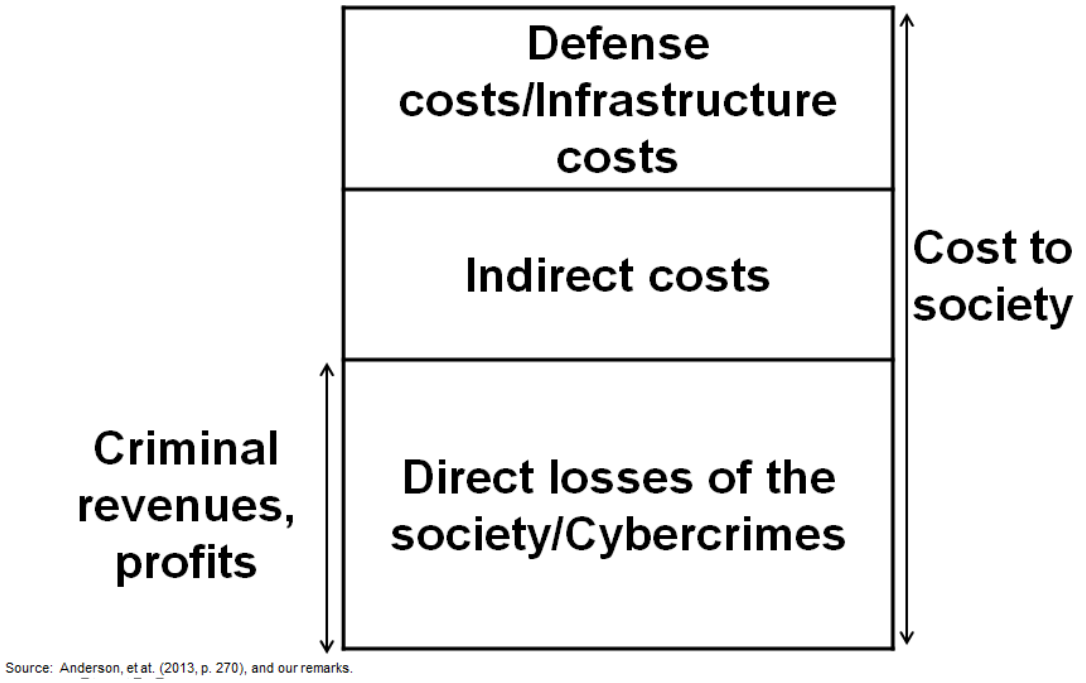
Source: Unger (2007, pp. 195–196) and own remarks.

Table 3.8 The amount of laundered money for the top 20 destinations of laundered money, year 2005

Rank	Destination	% of worldwide money laundering	Walker estimate 2.85 trillion USD Amount in billion USD	IMF estimate of 1.5 trillion USD worldwide Amount in billion USD
1	United States	18.9%	538,145	283,500
2	Cayman Islands	4.9%	138,329	73,500
3	Russia	4.2%	120,493	63,000
4	Italy	3.7%	105,688	55,500
5	China	3.3%	94,726	49,500
6	Romania	3.1%	89,595	46,500
7	Canada	3.0%	85,444	45,000
8	Vatican City	2.8%	80,596	42,000
9	Luxembourg	2.8%	78,468	42,000
10	France	2.4%	68,471	36,000
11	Bahamas	2.3%	66,398	34,500
12	Germany	2.2%	61,315	33,000
13	Switzerland	2.1%	58,993	31,500
14	Bermuda	1.9%	52,887	28,500
15	Netherlands	1.7%	49,591	25,500
16	Liechtenstein	1.7%	48,949	25,500
17	Austria	1.7%	48,376	25,500
18	Hong Kong	1.6%	44,519	24,000
19	United Kingdom	1.6%	44,478	24,000
20	Spain	1.2%	35,461	18,000
	SUM	67.1%	1,910,922	1,006,500

Source: Unger (2007, p. 80).

Figure 3.4: Framework for analyzing the costs of cybercrime



Source: Anderson, et at. (2013, p. 270), and our remarks.

Table 3.9 An estimation of the various cost components (for the criminal proceeds) of cybercrime; year 2012

Type of cybercrime (in % of total cost); year 2010–2012	*UK Est. (in bn $)*	*Global Est. (in bn $)*	Ref. period
1. Cost of genuine cybercrime (e.g. online banking fraud) in bn $	*0.164 (0.9%)*	*3.50 (1.6%)*	
2. Cost of transitional cybercrime (e.g. online payment card fraud) in bn $	*3.07 (6.7%)*	*44.20 (19.8%)*	2010
3.Cost of cybercriminal infrastructure (e.g expenditure on antivirus) in bn $	*1.24*	*24.84 (11.9%)*	2012
4. Costs of cybercrime against public institutions			
4.1 Welfare	*1.90*	*20.00*	2011
4.2 Tax fraud	*12.00*	*125.00*	2011
4.3 Tax filing fraud	*--*	*5.20*	2010
SUM of 4 in bn USD (in % of total costs)	*13.90 (75.7%)*	*150.20 (67.5%)*	2011
SUM of 1–4 in bn USD (in % of total costs)	*18.37 (100%)*	*222.70 (100%)*	2011
In percent of total crime proceeds 1,100 bn worldwide (100%)		*20.3%*	

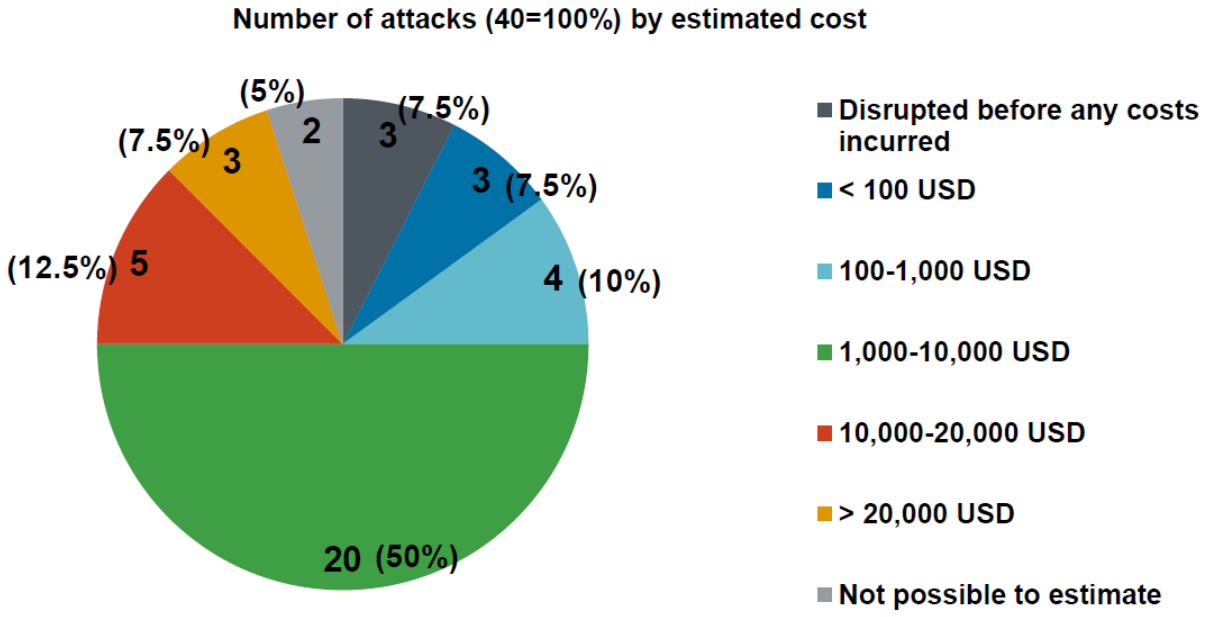
Source: Anderson et al. (2013, pp. 294–295)

Table 3.10 Cost of terrorism – selected examples

Date	Incident	Cost
1993	World Trade Center bombing in New York	US$19,000
2002	Bali bombing	US$25,000
2004	Madrid train bombing	US$10,000
2003	Jemaah Islamiyah operatives captured in Cambodia	Carrying US$50,000
2001	9/11 bombings	13 hijackers received US$10,000 each
2015	Charlie Hebdo attacks in Paris	€6,000

Source: Sands, P. (2016): Making it Harder for the Bad Guys: The Case for Eliminating High Denomination Notes, Weil Hall, p. 25.

Figure 3.5 Costs of terrorist attacks in Europe in past 20 years[1)]



1) An analysis of 40 jihadist attacks in the past 20 years shows that most funding came from delinquents' own funds and 75% of the attacks cost total less than USD 10,000.
Source: Mai, H. (2016).

Table 3.11 The world's 7 "richest" terrorist organizations

Organization	Annual turnover	Main sources
ISIS	US$2bn	Oil trade, kidnapping/ransom, protection, taxes, bank robberies, looting
Hamas	US$1bn	Taxes/fees, financial aid/donations
FARC	US$600m	Drug production/trafficking, kidnapping/ransom, mining, fees/taxes
Hezbollah	US$500m	Financial aid/donations, drug production/trafficking
Taliban	US$400m	Drug production/trafficking, fees/taxes, financial aid/donations
Al Qaeda	US$150m	Financial aid/donations, kidnapping/ransom, drug trafficking
Lashkar-e-taiba (Kashmir)	US$100m	Financial assistance/donations

Source: Sands, P. (2016): Making it Harder for the Bad Guys: The Case for Eliminating High Denomination Notes, Weil Hall, p. 26.

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