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## Credit Reporting, Access to Finance and Identification Systems: International Evidence

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# JENA ECONOMIC RESEARCH PAPERS



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by

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# Credit Reporting, Access to Finance and Identification Systems: International Evidence

Caterina GIANNETTI<sup>1</sup> Nicola JENTZSCH<sup>2</sup>

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## Abstract

Credit reporting systems are an important ingredient for financial markets. These systems are based upon the unique identification of borrowers, which is enabled if a compulsory identification system exists in a country. We present evidence derived from difference-in-difference analyses on the impact of the interplay of credit reporting and identification systems on financial access and intermediation in 172 countries during years of 2000 to 2008. Our results suggest that the introduction of an identification system has a positive effect on financial intermediation (bank credit to deposits) and financial access (private credit to GDP), especially in countries where there is also a credit reporting system. This effect exists net of other country characteristics.

**JEL-Classification:** G21; O12; O16.

**Keywords:** Credit markets, information asymmetries, identification.

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## 1 Introduction

Credit reporting, the collection and distribution of financial information on customers, is an important ingredient in financial markets. Although by now a lot is known on their impact on access to finance, little is known about the interplay of credit reporting and critical infrastructure such as a national identification system, which requires issuance of picture-bearing ID cards/numbers to natural persons. Customer identification, however, is needed before a borrower can be reported to a credit reporting agency and this is regulated by legislation.

With the rise of Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT) laws after September 11, 2001, requirements for customer identification in the financial sector have become more restrictive. Since its inception in 1989, the Financial Action Task Force (FATF), an inter-governmental body at the OECD, has issued 40+9 Recommendations designed to counter the use of financial systems by criminals for money laundering and terrorism financing. These guidelines are implemented in industrialized and developing countries. For example, in Recommendation No. 5, FATF demands that financial institutions must conduct Customer Due Diligence (CDD) when establishing business relations with either natural or legal persons. It is required that financial institutions verify a customer's identity based upon reliable documents, data, or information from independent sources, such as the government (this is known as Know-Your-Customer or KYC).

The introduction of a mandatory national identification system for the general public and the distribution of unique ID numbers and cards should facilitate identification procedures and thereby positively contribute to credit reporting and financial access. Moreover, it reduces the costs of account opening by reducing paper-work. This enables monitoring, screening and risk assessment in banks, which are better able to identify agglomerated risk exposure to borrowers with a unique identity. However, there is little research on the impact of identification systems on financial access and intermediation in an economy as well as its interplay with credit reporting.

We present a new panel data set which compiles information on the introduction of compulsory identification systems, credit reporting and financial intermediation and access in 172 countries between 2000 and 2008. We analyze the interplay by using difference-in-difference analyses (DID), while controlling for important factors which also have an impact such as property rights, rule of law and financial freedom. The data is derived from different sources, among them World Bank (Doing Business), International Labor Organization, Heritage Foundation, and Privacy International as well as the U.S. State Department.

Our hypothesis is that the introduction of identification systems has a positive effect on financial access and intermediation. The basic assumption is that identification procedures at financial institutions are less cumbersome and less prone to fraud, if identity cards (with a unique identity number) are used, which in turn enables credit reporting, facilitates access to financial services, and therefore makes financial intermediation more efficient.

Our preliminary results suggest slightly positive effects of the introduction of national identifi-

cation systems on financial intermediation and access to finance, where developed credit reporting systems exist. However, these preliminary results seem to be more pronounced in OECD countries compared to developing countries and require further investigation in future.

We intensively check the robustness of our results, because of potential serial correlation in errors terms, small size of the treatment group, and/or potentially inappropriate control groups. These problems can lead to inaccurate DID estimates. We first use a method developed by Bertrand et al. (2004) and back these results up using a method developed by Conley and Taber (2009), in order to control for the small size of our treatment group. Finally we produce country-level evidence for a limited number of treated countries relying on a method developed by Abadie et al. (2009) in order to create proper control groups. Because of data limitations in the pre-/post-intervention period, this analysis was only possible for nine countries: Chad, Cyprus, El Salvador, Lithuania, the Netherlands, Oman, Portugal, Romania, and the United Arab Emirates.

The remainder of this paper is structured as follows: Section 2 discusses recent research on identification and access to finance, and section 3 presents the international regulations on financial integrity. Section 4 provides a description of the data used in the analyses, and summary statistics; section 5 presents the econometric framework and interpretation of the results. Section 6 concludes.

## 2 Literature Discussion

In banking, it is necessary to determine a customer's identity in order to be able to conduct business, monitor transactions and to assign them to specific persons. Identification creates legal liability and it is a precondition for risk mitigation procedures such as screening and monitoring as well as reputation systems like credit reporting. In fact, the introduction of identification systems is likely to have two effects on financial intermediation, a direct and an indirect one. The first effect is that there exists a direct positive impact on access to bank services, including credit, enabled through unambiguous identification of natural persons. The second effect is that there exists an indirect impact through credit reporting systems, which in turn lead to more efficient financial intermediation. These systems are based upon unambiguous borrower identification. If unambiguous identification exists, data from different sources can be matched more reliably and assigned to a unique individual.

### 2.1 Identification, Monitoring and Reputation

Identification is a precondition for mechanisms that reduce information asymmetries in banking and decrease enforcement risk inherent in contracts. It is typically taken for granted in the economics literature. For example, screening and monitoring plays a critical role in the finance and banking literature, where different authors suggest that banks use devices such as collateral or loan size for inferences about credit risk (Bester (1985)). In Dell'Ariccia (2000), a model is pro-

posed, where banks compete on screening standards for applicant borrowers, who prefer not to be screened. In Gehrig (1998) banks can use creditworthiness tests to generate (imperfect) risk information about borrowers. The author discusses conditions under which screening efforts are reduced by competition and when overall loan portfolio quality may decline due to a lower quality of information produced by banks. We argue that unambiguous identification of customers enables risk assessment by banks and improves the screening abilities. Therefore, it also has an impact on credit reporting and needs to be analyzed together with it.

Jappelli and Pagano (1993) show that credit reporting is positively associated with increases in loan demand, borrower mobility, and a decrease of operational costs of credit registers. In Jappelli and Pagano (2000), bank lending increases with information sharing, whereas credit risk decreases. Identification should have a positive influence on credit reporting systems and these, in turn, contribute positively to financial sector development.

Related to our work are also theoretical works on ambiguous identification and associated problems such as identity theft. For instance, Kahn and Roberds (2008) propose a search model with imperfect identification of borrowers. Such imperfect identification leads to fraud risk, where debts can potentially not be enforced, because the identity of the borrower cannot be ascertained. This differs from credit risk. The authors' focus is on technical identification, where identity is described as a list of attributes or vectors of zeros and ones uniquely attributable to individuals. In their model, different types of identity thefts occur in the equilibrium and these incidences represent the trade-off between costly monitoring and the control of fraud. The economics of identity theft is also discussed in the *Journal of Economic Perspectives* (Anderson et al. (2008)).

## 2.2 Access to Finance and Identity Documentation

The literature on access to finance also increasingly focuses on documentation requirements. For example, Beck et al. (2008) analyze barriers such as geography, affordability, eligibility and its impact on the ratio of private credit to GDP and financial services penetration. The latter is measured as the percentage of adults with access to a financial institution. They present data collected from 209 banks in 62 countries. The number of documents needed to open an account is negatively associated with penetration and private credit to GDP. Our approach differs from this research, because we analyze the effects of the introduction of a national identification system on financial access over time, taking into account also credit reporting.

The results of Beck et al. (2008) are included in World Bank (2008), where it is stated that "Financial institutions usually require one or more documents for identification purposes, but in many low-income countries, most people-especially those not employed in the formal sector (who are usually poor)-lack such papers." For example, banks in industrialized countries such as the Czech Republic, Spain, and Sweden demand on average only one document to open a bank account. This contrasts with banks in Bangladesh, Nepal, and Sierra Leone, which require at

least four documents. Even in the U.S., more than one document is needed as the SSN card does not carry all the information needed to open a bank account. Some developing countries, such as Malawi, Uganda and Tanzania have no identification system altogether. Closely related to our paper is World Bank (2009), which finds that burdensome documentary requirements lead to a lower density of accounts in financial institutions, where one additional document required results in 153 fewer accounts per 1,000 persons. Controls used in that analysis are GDP per capita, population, and population density. Burdensome documentation is needed if other means of identification (such as identity cards) either do not exist or are easy to forge, which reduces their value for verification purposes. There is also interesting country-level evidence: Giné et al. (2009) discuss the impact of identification on borrower repayment as identification increases a lender's ability to sanction borrowers. The authors conducted a randomized field experiment in Malawi to examine the impact of fingerprinting on borrowers in rural areas, where no unique identification system exists. They show that fingerprinting led to substantially higher repayment rates for farmers with the highest ex-ante default risk, whereas it had no effect for the rest of farmers. The authors state that one of the reasons for the change in repayment rates were reductions in adverse selection (smaller loan sizes) and lower moral hazard. In Bertrand et al. (2007), the authors study the allocation of driver's licenses in India. They discuss the extra payments that have to be made to agents in order to speed up the procedure of issuance, a kind of indirect corruption. The authors present evidence from a survey, where participants stated that agent use was prevalent in India also for other government services. For example, of 155 participants 54% who got a ration card stated that they used agents, 47% of those obtaining land titles used them, 15% of those getting a passport and 20% of those who obtained a bank account. Driver's licenses, ration cards as well as passports are used by Indian banks for identification purposes. India is introducing an identification system.<sup>1</sup>

Determinants for financial sector depth and outreach, which are also important for our research are discussed in Beck et al. (2008), Beck et al. (2007) and Djankov et al. (2007) all of whom survey cross-country determinants of private credit to GDP. From this literature, we derive other factors to be included in our econometric analysis and which are identified as standard drivers. In Djankov et al. (2007), for example, creditor rights as well as public and private credit registers are included in the analysis. We control for these factors when analyzing the effects of the introduction of identification systems. Credit reporting enables the building of reputation among borrowers, where financial data from different sources are merged to create credit reports. Unique identification numbers improve the efficiency of matching procedures in these data bases.

From this review, we conclude that there is currently no survey either internationally or in a given country of the interplay of the introduction of a national ID system with credit reporting and financial access and intermediation. Furthermore, whereas there is an extensive literature on

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<sup>1</sup>BBC News, India to launch 'ID card' scheme, Page last updated at 15:45 GMT, Thursday, 25 June 2009, [http://news.bbc.co.uk/2/hi/south\\_asia/8119070.stm](http://news.bbc.co.uk/2/hi/south_asia/8119070.stm)

credit risk and mitigating mechanisms (screening, monitoring, and reputation systems) few authors devote attention to problems arising from imperfect identification of clients.

### 3 International Guidelines on Financial Integrity

There are international guidelines on how financial institutions must identify costumers before establishing a business relationship with them. The leading bodies setting the standards on Customer Due Diligence (CDD) are the Financial Action Task Force on Money Laundering (FATF) associated with the OECD and the Basel Committee on Banking Supervision, which is part of the Bank for International Settlements (BIS). FATF has published guidelines which are known as the 40+9 Recommendations (Financial Action Task Force (2004)) - a compilation of standards on the prevention and criminalization of money laundering. The 9 Special Recommendations are aimed at preventing terrorist financing. Although these are not binding, countries not following the 40+9 Recommendations risk being put on the list of Non-cooperative Countries and Territories. This can negatively impinge on international financial flows and investment to the listed countries.

As of August 2010, FATF had 36 member countries and eight FATF Associate Members, which are the FATF-style Regional Bodies (FSRBs).<sup>2</sup> The OECD countries are a member of FATF, whereas developing countries are mostly organized in the various regional bodies. A country can be a member of FATF, but also of a FATF-style Regional Body. In Table (1) the membership of each country is reported.

INSERT Table (1) here.

Due diligence requirements for financial institutions are set out in Recommendations No. 5 to 12 of the 40+9 Recommendations of FATF (Financial Action Task Force 2004). These requirements encompass several aspects. While financial institutions have some discretionary freedom in designing procedural policies, there ought to be: (i) a (tiered) customer acceptance policy; (ii) customer identification mechanisms; (iii) on-going monitoring of activities; and (iv) risk management procedures. In Recommendation No. 5 financial institutions are obliged to verify a customer's identity using reliable documents, data, and information from an 'independent source.'<sup>3</sup>

Banking relationships should not be established until the identity of the new customer is 'satisfactorily verified.' Documents satisfying this standard are 'those most difficult to obtain illicitly and to counterfeit,' such as government-issued IDs. In addition, information regarding the nature of the business relationship must be obtained.

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<sup>2</sup>These are: Asia/Pacific Group on Money Laundering, Caribbean Financial Action Task Force, Eurasian Group, Eastern and Southern Africa Anti-Money Laundering Group, Council of Europe Committee of Experts on the Evaluation of Anti-Money Laundering Measures and the Financing of Terrorism, FATF on Money Laundering in South America, Inter Governmental Action Group against Money Laundering in West Africa, and the Middle East and North Africa Financial Action Task Force.

<sup>3</sup>Essentially this refers to documents issued by the government.



### 3.1 Quality and Costs of Identification Systems

The quality, coverage, and technological level of identification systems differs enormously around the world. In the following, we give some selected examples of the variety associated with identification systems in large developing countries. For example, in Bangladesh and Pakistan new biometric cards are issued to the population whereas in other countries, such as Cameroon, old ID cards are paper-based and new ID cards are introduced only slowly. In Indonesia regional authorities are in charge of issuing the cards and if individuals move from one region to another, they might obtain and hold several ID cards.<sup>4</sup> It is also worth noting that the backbone of a identification system is the population register. Such registers are used to register births and deaths, marriages or changes of names. A civil register provides information on who lives in the country and where they live. They are widely used in conjunction with the issuance of identity cards (Office of National Statistics 2005). In many developing countries, registries are incomplete and of poor quality, a problem that is discussed elsewhere (Mahapatra et al. (2007)). Data on birth registration rates, which we could have used for approximation of coverage of the population with ID cards, is also not available for several years.

A number of large developing countries are currently on the verge of introducing or are planning to introduce new ID cards, among them India (Whitley and Hosein (2010)) and Bangladesh.

Another challenge associated with introduction of ID systems are the costs, which are rather high. There were heated debates in the U.S. as well as Great Britain about the introduction of national identity cards. The British Home Office estimated the average cost at 85 million pounds (96 million euros) per year over the first ten years after the introduction of an identification system in the UK. An additional 50 million pounds (57 million Euros) per year would also be necessary over the same time period for verification services.<sup>5</sup> The plans to introduce an identity card were stopped in 2010 by the new British government. According to the LSE Identity Project, there appear to be some significant potential benefits to the UK in adopting a harmonized system of identification. Among the many, benefits "could possibly be connected to financial control and money laundering regulations to provide a means by which the ID system can be used for a much wider range of purposes. This could include operating a bank account, using professional services such as a solicitor or accountant, applying for a permit or license, internal travel, buying property, stocks or shares, applying for credit or using large amounts of cash." However, the LSE Report concludes that these benefits might be limited since the current proposal, because of its size and complexity, miss key opportunities to establish a secure and cost-effective identify system.<sup>6</sup>

<sup>4</sup>A Single Identity Number (Nomor Induk Kependudukan) was introduced by the Administration of People Act in Indonesia. As of 2010, it is illegal to hold multiple identity cards.

<sup>5</sup>Home Office: Identity Card Bill—Regulatory Impact Assessment, [url][www.homeoffice.gov.uk/](http://www.homeoffice.gov.uk/) (March 2010)

<sup>6</sup> <http://identityproject.lse.ac.uk>

## 4 Data Description

Around the world, different types of identification systems evolved, leading to differing practices by financial institutions to identify customers. In the next subsections, we summarize statistics on national identification systems from our international sample and provide a description of the variables used in our analysis. The main advantage of our data set is its cross-sectional time series character with respect to financial variables and national identification systems, which allow us to perform various difference-in-differences analyses. The data for identification systems comes from our own compilation (described below), with the other variables sourced from the World Bank (Doing Business), the International Labor Organization, International Telecommunication Union, and the Heritage Foundation. Table (2) presents the variables used in our econometric analysis. We first describe the financial and economic variables and then present some evidence on the international landscape of identification systems.

INSERT Table (2) here.

### 4.1 Data and Summary Statistics

Our main interest is how the introduction of a compulsory identification system impacts financial intermediation and access and how it interplays with credit reporting. To measure financial intermediation we use the variable bank credit to deposits. This ratio is a proxy of intermediation efficiency and gauges the extent to which banks intermediate society's savings into private sector credit: the higher the loan-deposit ratio, the higher the intermediation efficiency (Beck and Demirgüç-Kunt (2009)). "Access to finance", however, is more difficult to define and measure as it involves multiple dimensions. Broadly, access to financial services - financial inclusion - implies an absence of price/non-price barriers for the use of the formal financial system. As banks are the gateway to most basic financial services we consider financial access as analogous to banking inclusion/exclusion. However, we acknowledge that in developing countries, the informal sector might play an important role in providing financial services. Unfortunately, there are no time-series data on informal sector development, except for a handful of countries in FinScope data.

Honohan (2008) presents a financial access indicator that is a composite measure of the percentage of adults with access to some account in a financial or micro-finance institution. This variable is only available for one year. Christen et al. (2004) and CGAP (2009) also collect data on accounts maintained in financial and micro-finance institutions to measure such access. The problem with these data sources is that they do not exist for several years in a row. Due to the lack of consistent cross-country micro-data on usage of financial services we rely on credit to the private sector to measure access to finance. In general, this indicator is a measure of financial depth and not always a perfect proxy of access to finance, although exhibits a positive, but imperfect, correlation (see World Bank 2007). However, this concern will be properly taken into account when interpreting

the results - especially for the low-income country group. No time-series-cross-country data are available on the importance of different barriers of access to finance. However, using a bank level survey in 80 countries, Beck et al. (2007) shed some light on the drivers of cross-country differences in financial access and use. Indicators of access barriers - affordability, geographical access, and eligibility - are in fact negatively correlated with actual use of financial services, confirming that these barriers can exclude individuals from using bank services.

To take into account barriers of affordability we introduce in our regressions Gross National Income per capita, which is of course only an indirect measure for affordability. Costs of accessing the services is in some countries at least 50% per cent of per capita GDP, but unfortunately these data are just available for one year and cannot be used in our analysis.

To measure different levels of technological development and to proxy of geographical barriers, we introduce the number of fixed-line telephones as a regressor. In fact, although an ideal measure would indicate the density of branches per square kilometer, the number of fixed lines provides an initial, albeit crude indicator for two reasons. First, as some financial institutions allow clients to access services over the phone or via the Internet, greater coverage captures easier technological access to bank services. As reported in World Bank (2008); Beck et al. (2008), a focus on branches and ATMs ignores other, increasingly important, delivery channels. At the same time, this measure, which is highly correlated with mobile and internet subscribers provided by World Bank, can approximate technological advances that ultimately reduce banking costs.

An important aspect in our analysis is the existence of credit registries, which are also associated with lower access barriers. We consider whether a public or private credit register is operating in the country, along with the proportion of population covered by these registers. Due to the limited series of this data, the sample size is inevitably reduced when we introduce credit register coverage into the model.

We also know that creditor rights could play a potential role (Djankov et al. (2007); La Porta et al. (1998)). To account for heterogeneity among country credit markets induced by origin of commercial law, we introduce a country's legal origin when constructing appropriate control groups.

Finally, the macroeconomic variables account for other market features, such as market size (population) and monetary stability (inflation) that might influence the development of the banking system. In order to capture a country's institutional environment, we additionally include an index of economic freedom from the Heritage Foundation. It is composed of ten scored economic freedoms, among them freedom from corruption, financial freedom and property rights protection. We choose to rely on this indicator since it is available for the all years of the analysis, and it is highly correlated with other important indexes already identified in the literature (e.g. 0.80 with rule of law index from World Resources Institute).

Lastly, one of the innovations presented in this paper is our panel data set on the existence of mandatory and voluntary identification systems for the 172 countries included in our survey.

We compiled this data using material from U.S. State Department, Privacy International and the United Nations. If we could not verify the existence of an identification system or its type, we asked the embassies of the respective countries for advice. Altogether, we surveyed the existence and type of identification systems for 172 countries in the time period of 2000-2008, a time frame for which we could find verifiable information. Table (3) and Table (4) present pooled summary statistics and correlation of the main variables used in the econometric analysis.

INSERT Table (3) here.

INSERT Table (4) here.

A number of variables cannot be introduced into the analysis. For example, there are no internationally comparable data on identity theft or fraud in bank services. Therefore, we cannot analyze the interplay of mandatory identification systems with these factors. In addition, there are no time series on the costs of bank services, eligibility requirements or the number of accounts in financial institutions. Unfortunately, there is also no data on the number and types of identification cards and passports issued to the population, let alone how much the introduction of such systems cost, apart from anecdotal evidence. These questions must be left for further research.

## 4.2 International Evidence on Identification Systems

We identified three groups of countries in our sample. The first group comprises 97 countries that have a compulsory national identification system, where the population is required to hold an identity card from a specific age on. The second group, which represents our treated sample, comprises of 17 countries that introduced a compulsory identification system between 2000 and 2008 (see Table (5)). Finally, in 58 countries, which comprises our (restricted) pool of control countries, no compulsory ID system exists.

INSERT Table (5) here.

However, these countries might have a voluntary ID card system, where the population can apply for an identity card, if needed. In some countries substitutes are used, such as passports, driver's licenses, or other government-issued documents. In developing countries, personal documents might not be available to the general population, especially not to the poor. As a substitute salary slips and reference letters are used as proof of domicile and for identification (Beck et al. (2008)). Note that in the U.S., there is no identification system as defined in our study. In the U.S., no identification cards are issued to the population which bears a unique number as well as a photo of the individual. While Social Security Numbers are used as substitutes they are not comparable to photo-bearing mandatory ID cards. In addition, some banks may require more documents in order to open a bank account. This is also the case for the U.S., were apart from the SSN card, a picture-bearing ID needs to be presented.<sup>7</sup> In the last section of the paper, where we discuss the

<sup>7</sup>For example, Citibank writes online that one needs a U.S. address, SSN, and a driver's license or state-issued ID (<https://online.citibank.com/US/JRS/pands/detail.do?ID=A0ProductSelection>). An international overview of

results of different estimators, we return to a discussion on alternative identification systems.

Tests for the mean, computed for each year (not reported), suggest that there are no significant differences in the share of private credit to GDP between the treated group and those countries that never introduced an ID-system. However, there are significant differences in the share of bank credit to deposits. Concerning credit reporting systems, significant differences exist across the three groups, when looking at public registers, both in term of existence and coverage; whereas there is less difference when looking at private registers, especially in terms of coverage.

The existence of an identification system does not automatically indicate the legal origin of a country. Table (5) shows that many countries with English legal origin never introduced an ID system, whereas there are much more countries of French and Socialist legal origin that introduced such systems. This feature is taken into account in the matching procedure of Abadie et al. (2007) where we use this variable to construct an appropriate control group.

Above we claim that the introduction of a national identification system should lead to more secure and efficient identification, by requiring just one document for identity verification, in comparison to the requirement of bringing several documents for identity and address verification. This intuition is confirmed by the negative correlation existing between the existence of a compulsory identification system and the number of documents required to open a bank checking account (-0.28, significant at 5% level) as well as the number of documents required to open a saving account (-0.22, although not significant). Unfortunately, this information from the World Bank is only available for 2007 and not the entire survey period.

## 5 Econometric Models

In this section, we study the effects of the introduction of a mandatory identification system on financial access and intermediation relying on a difference-in-difference analysis (DID). The evaluation of the effect of a binary treatment (or program) is an intensively studied problem (see for a review, Imbens and Wooldridge (2009)). To check the robustness of our results, we account for three main problems associated with applying a standard DID analysis to a data set like ours: positive serial correlation in error terms; asymmetric sizes of control and treatment group (with the latter being small); and selection of appropriate control groups. In all these cases, standard DID estimates and associated standard errors may lead to wrong conclusions about the significance levels of the treatment effects. Specifically, in the following, we first apply the methodology suggested by Bertrand et al. (2004), henceforth abbreviated with BDM, we then back up our results using a method developed by Conley and Taber (2009) and by Abadie et al. (2009), henceforth ADH, for different country cases. Unfortunately, in a number of countries, a mandatory identification system was either introduced at the beginning of our period of investigation (2000-2001) or at the

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number/types of documents needed is presented by CGAP (<http://www.cgap.org/gm/document-1.9.38735/FA2009.pdf>)

end (2008). This results in a limited number of observations; too few for the analysis thus leaving only nine countries for which we could apply the estimator derived from Abadie et al. (2007), further explained below. Depending on the control variables we rely on, we have a minimum of 412 (related to the 2004-2008 period) observations and a maximum of 1263 observations (related to all periods).

## 5.1 Difference-in-Difference Analysis

A lot of attention in the literature is devoted to the concern that Ordinary Least Squares (OLS) standard errors for the DID estimator may not be accurate in the presence of correlation between outcomes within groups and between time periods (Bertrand et al. (2004); Wooldridge (2006); Donald and Lang (2007)). This is especially present in cross-country analyses where the regressor of interest (the dummy variable for the treatment) does not vary within clusters (i.e. countries). BDM were concerned with multiple groups and time periods, where there may be correlation in the group/time component errors leading to a multi-period version of the Moulton problem where the failure to account for the presence of common group errors generates biased standard errors. The authors show that ignoring this autocorrelation can have effects on the properties of standard procedure such as OLS and may lead researchers to erroneously conclude that there are effects of policy changes, where there are not. Assume  $S + 1$  time periods (T), and  $K + 1$  countries (G), and let  $I$  be the policy variable (that is, a dummy equal to one after the introduction of an ID-system). The DID model used is

$$Y_{it} = \sum_{s=0}^S \beta_s * 1\{T_i = s\} + \sum_{g=0}^K \gamma_g * 1\{G_i = g\} + \delta_1 * I_i + \epsilon \quad (1)$$

where the coefficient  $\delta$  is the treatment parameter (DID) and  $Y_{it}$  is our variable of interest (i.e. alternatively bank credit to deposit and private credit to GDP).

The error structure BDM suggest is

$$\epsilon = \eta_{G_i, T_i} + v_i \quad (2)$$

allowing for an individual error term  $v_i$ , and a group/time specific component  $\eta_{gt}$ . The simpler method suggested by BDM is to ignore time-series information, when computing standard errors. We first regress  $Y_{it}$  on country fixed-effects, year dummies, and other covariates. We then divide the residuals of the treated countries into two groups: average residuals from years before the introduction of an ID-system, and average residuals from years after the introduction of an ID-system. The estimate of the ID-system effect is obtained from an OLS regression in this panel of length of two (before and after). Results suggest a positive and significant effect of the introduction of a compulsory identification system on financial intermediation (bank credit over deposit) as well

as on the share of access measured as private credit over GDP (see Table (6)). Standard DID analysis (not reported), on the other hand, suggest a positive effect only on bank credit to deposit.

INSERT Table (6) here.

In particular, and consistent with previous studies, these analyses confirm a positive and significant effect of credit reporting systems. Specifically, private register dummy and private coverage are positive and highly significant. Evidence for public registers is less strong, but it should be noted that it is difficult to properly estimate the effect of slowly changing variables in fixed-effect regressions (Plumper and Troeger (2007)).

However, overall these results suggest synergies between the introduction of a national compulsory identification system and credit registers as outlined above. In fact, the treatment effect (i.e. introduction of an ID system) is more significant whenever we introduce the full set of variables accounting for credit reporting among the regressors, which in most cases are jointly significant. In addition, comparisons in column (a) with the size of estimates in column (b) suggest that countries with a credit register and identification system tend to have higher levels of financial intermediation and share of private credit to GDP. The coefficient on the treatment variable is in fact smaller, indicating a positive correlation between the two systems. The change in the sign of the public register dummy is instead due to its negative correlation with the variable accounting for private coverage. As stated above, therefore, the existence of compulsory identification systems may facilitate file matching from different sources in order to unambiguously identify to one single borrower. Importantly, these positive effects are net of other constant country characteristics (e.g. legal origin), which are captured by country-fixed effects, and country institutional environment, which is measured by the economic freedom index (Overall score). Finally, we checked that these results are not driven by country sample selection from (a) to (b). To summarize, these preliminary regressions suggest a slightly positive effect of the introduction of a compulsory identification system, especially in countries where there are credit registers.

## 5.2 Difference-in-Difference with a Small Number of Treated Countries

Conley and Taber (2009) presents a new method of inference for DID estimators in circumstances where only a small number of groups provide information about treatment parameters of interest, that is the number of treated groups is smaller compared to the number of control groups (i.e. countries that do not change their policy). This method is particularly suited for our data, where a small number of countries (that is 17) introduced an identification system during the period under study (see again Table (5)).

The Conley and Taber (2009) approach is based on the hypothesis that the distribution of the error term, which affects inference of the parameter of interest, is the same for treated and control groups. In order to have a common distribution of error terms for treatment and control groups, a sufficient condition is random assignment of treatment conditional on group and time

dummy variables. Consequently, under this assumption, the residuals from control groups can be used to learn about the limiting distribution of the error in the treatment group, and to construct confidence intervals for the treatment-effect parameter using the related empirical distribution. For example, a 95% acceptance region could be estimated as  $[\delta_{lower}, \delta_{upper}]$  with these bounds being the 2.5th and 97.5th of this empirical distribution under the null hypothesis (i.e. the effect of treatment is equal to zero). The null hypothesis that the treatment parameter is zero can then be rejected when it is unlikely according to this distribution. This method can be used when classical model does not apply (e.g. due to non-Normal or serially correlated errors), and accommodate many forms of cross-sectional dependence and heteroskedasticity.

We identify 117 countries that did not change status during the period under investigation and for which it is possible to collect the variables of interest. Table (7) reports 95% confidence intervals for the treatment parameter based on 3000 simulations. We also computed confidence intervals (not reported) only relying on countries that never introduced a compulsory ID-system (with and without time dummies). In both cases results confirm a positive and significant effect by the introduction of an identification system on financial intermediation (bank credit over deposits) and private credit to GDP in the specification accounting for credit registers coverage.

INSERT Table (7) here.

### 5.3 Synthetic Controls Groups: Country Evidence

Abadie et al. (2007) develop a method for constructing a synthetic control group from multiple non-exposed groups, relying on a data-driven procedure. The idea behind the synthetic control group approach is to construct the control as weighted average of the available control units, and that it is a generalization of the usual DID analysis. Assuming that country 1 is exposed to the intervention at time  $t$  the parameter of interest (the treatment effect parameter  $\delta$ ) can be obtained as

$$\delta_{1t} = Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt} \quad (3)$$

where  $\sum_{j=2}^{J+1} w_j^* Y_{jt}$  is an estimator for the outcome that would be observed in country 1 after  $t$  in the absence of intervention,  $Y_{jt}$  are the outcomes for  $j$  control groups, and  $w_j^*$  are the associated weights. The main advantage of this estimator is to allow the presence of unobserved confounders to vary across time (whereas it is assumed to be constant in traditional DID) while making explicit the relative contribution of each control unit to the counterfactual. In Figure (1), we report the synthetic control groups using the bank credit to deposits variable and for the treated countries where it is possible to perform such an analysis, namely Chad, Cyprus, El Salvador, Lithuania, the Netherlands, Oman, Portugal, Romania, and the United Arab Emirates. We focus on this variable as it presents robust evidence across different approaches. Below we discuss results for the private credit to GDP as well. For all other treated countries it is not possible to perform this analysis as



there are not enough observations, either for the variables of interest or in the pre-post intervention period.

INSERT Figure (1) here.

For each treated country, the synthetic control is constructed by estimating the missing counterfactual ( $\sum_{j=2}^{J+1} w_j^* Y_{jt}$ ) as a weighted average of the outcomes of potential comparison countries, where the weights are chosen relying on the same variables used in previous analyses so that the pre-treatment outcome and the covariates of the synthetic control are, on average, very similar. In order to construct a better synthetic control, we additionally introduce country legal origin among the covariates, which was left out in previous regressions as it is a time-invariant variable. Therefore, each country has its own synthetic control, which is unique and comprises different countries from the worldwide pool of control countries according to the matching procedure (weights and country lists of synthetic control groups are available upon request).

Results mainly suggest a positive effect for countries in the upper to high income class such as the Netherlands, while such an effect cannot be observed for developing countries like Chad. These results are consistent with DID analyses, which distinguish the effect for the low-income group (i.e. difference-in-difference-in-differences). We do not report these estimations as the sample size does not always allow the estimation of the coefficient of interest when using credit register coverage among the regressors, as this variable is available for a shorter period of time. However, these results tentatively suggest a positive effect for high-income group of countries, and a negative for the low-income group. The latter result merits further investigation and could be due to several factors, including the weak enforcement of KYC, the limited and slow distribution of new identity cards, a large informal sector in the country, or affordability of banking services, something we could only indirectly account for.

The main limitation of the ADH estimator is that it does not allow us to assess the significance of the results using standard (large-sample) inferential techniques, as the number of units in the control pool and the number of periods covered by the sample are quite small (see also Conley and Taber 2009). However, placebo experiments can be implemented to draw inference, which consist in applying the ADH estimator to control countries as if they introduced an identification system in order to assess whether the estimated effect for the treated country is large relative to the effect for a country chosen at random. That is, in each iteration, we randomly assign the date of the introduction of a compulsory ID system to one of the countries in the restricted control group, one that never introduced an ID-system. If the estimated effect in the treated country is larger than in most of the fictitious cases, it is reasonable to conclude that results are not just driven by chance. For example, in the placebo experiment for the Netherlands, we proceed as if each country in the donor pool introduced a compulsory ID-system in 2005. We then compute the estimated effect associated with each placebo run in order to have a distribution of estimated gaps with respect to the countries in which no intervention took place. If the placebo experiment shows that the gap

estimated for the Netherlands is unusually large, relative to the gaps for the countries that did not introduce an ID-system, we interpret that our analysis provides significant evidence of the effect of the introduction of such a system.

Figure (2) reports such an experiment for the bank credit over deposit variable. The gray lines represent the gap for each placebo experiment, that is the difference in the share of bank credit to deposit between each country and its respective synthetic version. For example, the black and red lines in the upper-left panel represent the estimated gap for the Netherlands and Romania, which are reported on the same graph as if the date of the intervention is the same (2005) for both countries, and the placebo group is consequently the same. Out of the possible controls, we identify 34 control states that never introduced an identification system over the period under analysis.<sup>8</sup>

INSERT Figure (2) here.

Overall, these results suggest a sharp and positive effect for the Netherlands, Romania, Portugal and Lithuania, a mild effect for the United Arab Emirates, whereas the effect is not significant for El Salvador, Cyprus, Chad, and Oman. In line with the BDM analysis, results (not reported, but available upon request) are substantially analogous, when looking at the share of private credit to GDP. The only exception is a stronger positive effect for Cyprus.

## 5.4 Discussion

The evidence from these different methods indicates that the introduction of an identification system has a slightly positive effect on financial access and intermediation. Some remarks, however, are needed. We will first discuss some of the econometric issues and then some other issues, which may affect the interpretation of our results.

*Magnitude of benefits:* First of all, we cannot say anything about the magnitude of these benefits in relation to the cost of the introduction of an identification system. As noted above, the cost of the introduction of such a system is high, and merits further analysis in order to obtain insights on the net benefits. There are no international statistics on these costs, which is rather surprising given the importance of these systems.

*Omitted variable bias and the parameter of interest:* The comparison of the identification coefficient across specifications suggests that countries with both a credit register and identification system tend to have higher levels of financial intermediation and greater shares of private credit to GDP. In fact the coefficient is always smaller and significant, whenever we introduce credit coverage variables, indicating a positive correlation between the two systems. It is important to notice that these positive effects are net of other constant country characteristics (e.g. legal origin), and country institutional drivers already identified in the literature (e.g. rule of law).

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<sup>8</sup>In the figures, we include only countries that do not have extreme pre-treatment measurement errors (i.e., countries with a small gap in the pre-treatment period).

*Effects interplaying with credit bureau existence/coverage:* The interplay of the introduction of a mandatory national identification system and credit registers is rather intuitive. The effect of such a system particularly unfolds if there is an institution which can generate scale effects by using the national identifier for its activity. In the case of credit bureaus this leads to a more efficient consolidation of information on borrowers, for example, improving financial intermediation in downstream banking and reducing costs of banking.

*Comparison with voluntary ID systems:* We cannot compare the benefits of the introduction of a compulsory identification system with any voluntary ID system. For example, such a system exists in Austria, Finland and France. However, we can clearly identify the effect of the introduction of compulsory identification system for the group of switchers introducing such a system (17 countries).

*Classification of the U.S. as not having a compulsory system:* As stated the U.S. has not a compulsory ID system. There is no law in the U.S. that mandates that persons must be issued an ID card and a single identification number. The SSN card does not contain a picture ID and must latest be issued at the first job as it is related to social security taxes. At a bank a person must present SSN card as well as a driver's license or passport for the reason that SSN does not show the picture of the person. Capturing the additional document increases the costs of banking.

*Re-classification of the U.S.:* Even if we would reclassify the U.S. and similar countries such as Canada and Ireland as having a compulsory systems - this does would not affect our results. This holds for the Conley Taber's estimator as long as the Anglo-Saxon countries are not switchers in the period of the analysis. Moreover, the way we current classify them reduces the size of the effect of the introduction in BDM estimations, because we are using countries with the most efficient financial markets as a control group. In summary, results are robust and suggest a slightly positive effect. However, we admit that further information on such systems should be sought to get a complete picture about the costs and benefits of different identification systems.

## 6 Conclusions

We present preliminary evidence on the interplay of credit reporting and identification systems on financial access and intermediation. Although we used a number of robustness checks, our results should not be over-interpreted. The evidence is only preliminary and can only be seen as a first step towards better understanding of unambiguous identification of customers and access to finance. We show that the positive impact of the introduction of a mandatory identification system exists independent from other factors that could potentially influence financial access and intermediation. The positive impact exists if there are institutions such as credit registers, which indicates a stronger indirect effect of mandatory identification systems, which primarily unfolds through credit reporting.

We base our research on empirical work regarding access to finance as well as the theoretical work on information asymmetries and risk-mitigating mechanisms such as screening and monitoring. Whereas the empirical literature acknowledges cumbersome documentation as an obstacle to access to finance, it remains silent on the issue of national identification systems.

By relying on a new international dataset, we used different econometric techniques to account for problems arising from difference-in-difference analyses in our setting. One of technique adopted allows us also to provide additional country-level evidence for a limited number of countries (Chad, Cyprus, El Salvador, Lithuania, the Netherlands, Oman, Portugal, Romania, and the United Arab Emirates). The selection of these countries was based on a data-driven procedure, as they introduced the mandatory identification systems during the middle of the observation period.

We acknowledge that many open questions remain for future research: For example, the estimations revealed that the establishment of a national identification system does not have pronounced effects in low-income countries. This merits further investigation. Possible explanations are that FATF guidelines are not well implemented and/or identity cards are not widely distributed. Limited geographical outreach of traditional banking services also plays a role. Moreover, even a roll-out of new cards in a developing country could have incomplete population coverage, as the provision of cards might be a costly and lengthy process. Another reason could be the unchanged demand for bank services, where the population might be too poor to afford such services. Further, informal sectors might play an important role, but there is a lack of international time series information on the subject matter.

In addition, we currently face a number of limitations with regards to the information available for further investigation of the effects of identification systems. For example, there are no time-series on access to finance variables, other than those that we use. As noted, we also lack internationally comparable data on the distribution of identity cards as well as whether countries have introduced biometric cards. We regard this lack of information as a further field of action by policy makers and international institutions.

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Table 1: FATF Members and FSRB Members (2010)

<b>FATF Members</b>	<b>Country</b>
<i>FATF Members</i>	Argentina,* Australia, Austria, Belgium, Brazil, Canada, China, Denmark, Finland, France, Germany, Greece, Hong Kong, China, Iceland, India, Ireland, Italy, Japan, Korea, South, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Portugal, Russia, Singapore, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States
<b>FSRB Members</b>	<b>Country</b>
<i>Asia/Pacific Group on Money Laundering (APG)</i>	Bangladesh, Australia, Canada, Hong Kong, China, India, Japan, Korea, South, New Zealand, Singapore, United States, Afghanistan, Brunei Darussalam, Cambodia, Fiji, Indonesia, Lao PDR, Malaysia, Maldives, Mongolia, Nepal, Pakistan, Palau, Papua New Guinea, Philippines, Samoa, Sri Lanka, Taiwan, China, Thailand, Tonga, Vanuatu and Vietnam
<i>Caribbean Financial Action Task Force (CFATF)</i>	El Salvador, Guyana, Jamaica, Antigua and Barbuda, Belize, Dominica, Dominican Republic, Grenada, Guatemala, Haiti, Honduras, Nicaragua, Suriname, Trinidad and Tobago and Venezuela
<i>Eurasian Group (EAG)</i>	China, Belarus, Kazakhstan, Kyrgyz Republic, Russia, Tajikistan and Uzbekistan
<i>Eastern and Southern Africa Anti-Money Laundering Group (ESAAMLG)</i>	South Africa, Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia Seychelles, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe
<i>Financial Action Task Force on Money Laundering in South America (GAFISUD)</i>	Argentina, Brazil, Mexico, Bolivia, Chile, Colombia, Costa Rica, Ecuador, Panama, Paraguay, Peru and Uruguay
<i>Council of Europe Committee of Experts on the Evaluation of Anti-Money Laundering Measures and the Financing of Terrorism (MONEYVAL)</i>	Bosnia and Herzegovina, Cyprus, Lithuania, Montenegro, Romania, Albania, Armenia, Azerbaijan, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Latria, Macedonia, FYR, Moldova, Poland, Russia, Serbia, Slovakia, Slovenia and Ukraine
<i>Middle East and North Africa Financial Action Task Force (MENAFATF)</i>	Oman, United Arab Emirates, Algeria, Egypt, Jordan, Kuwait, Lebanon, Mauritania, Morocco, Saudi Arabia, Sudan, Syria, Tunisia and Yemen
<i>Inter Governmental Action Group against Money Laundering in West Africa (GIABA)</i>	Nigeria, Sierra Leone, Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea-Bissau, Liberia, Mali, Niger, Senegal and Togo

Notes: \* Countries can be part of FATF and regional bodies, e.g. Argentina is member of FATF and of GAFISUD. Countries not quoted herein are not part of FATF or any FSRB (e.g. Zimbabwe and Angola).

Source: Own compilation.

Table 2: Variable Description and Data Sources

Variable	Description & Source
<b>Bank credit_deposit</b>	Ratio of bank credit over bank deposits, expressed as a percentage. <i>Source:</i> World Bank.
<b>Financial system_gdp</b>	Ratio of financial system over GDP, expressed as a percentage. <i>Source:</i> World Bank.
<b>Fixedlines</b>	The variable measure the number of fixed lines. A fixed line is an active line connecting the subscriber's terminal equipment to the public-switch telephone network. This include the active number of analog fixed telephone lines, ISDN channels, fixed wireless, public payphones and VoIP subscriptions. <i>Source:</i> ITU.
<b>Gdp_deflator</b>	Inflation as measured by the annual growth rate of the GDP implicit deflator. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency. <i>Source:</i> World Development Indicators. <i>Source:</i> World Development Indicators.
<b>Gni_pcap</b>	GNI per capita based on purchasing power parity (PPP). PPP-GNI is Gross National Income (GNI) converted to international dollars using PPP rates. <i>Source:</i> World Development Indicators.
<b>Identification</b>	The variable indicates the existence of a compulsory identification system between 2000 and 2010. It equals 1 in case there is a national compulsory identification system, 0 otherwise. <i>Source:</i> U.S. State Department, Privacy International and United Nations.
<b>Income class</b>	A dummy variable that indicates the income class of each country (which might be either a high income OECD country, high income non-OECD, upper middle country, low middle, or a low Income country). <i>Source:</i> Djankov et al. 2007 and the CIA World Factbook 2008.
<b>Legal origin</b>	A dummy variable that indicates the origin of each country's company law or commercial code, which may be of English, French, German, Scandinavian or Socialist origin. <i>Source:</i> Djankov et al. 2007 and the CIA World Factbook 2008.
<b>Overall score</b>	It is the average of 10 scored economic freedoms: business freedom, trade freedom, fiscal freedom, government size, monetary freedom, investment freedom, financial freedom, property rights freedom from corruption, labor freedom (covers 2000-2010). <i>Source:</i> Heritage Foundation.
<b>Private coverage</b>	The variable indicates the extent of population covered by a private credit bureau between 2004 and 2008. It assumes value 0 if there is no population coverage, value 1 if at most 10% of the population is covered, value 2 if at most 25% is covered, value 3 if at most 50% is covered, and value 4 is a share greater than 50% is covered. <i>Source:</i> World Bank Doing Business.
<b>Private credit_gdp</b>	Ratio of credit from deposit taking financial institutions to the private sector in relation to GDP, expressed as a percentage. <i>Source:</i> World Bank.
<b>Private register</b>	The variable indicates the existence of a private credit bureau between 2000 and 2010. It equals 1 in case a private credit bureau is operating, 0 otherwise <i>Source:</i> Own compilation from public sources, World Bank.
<b>Population</b>	Country population. <i>Source:</i> ILO.
<b>Public coverage</b>	The variable indicates the extent of population covered by a public credit register bureau between 2004 and 2008. It assumes value 0 if there is no population coverage, value 1 if at most 10% of the population is covered, value 2 if at most 25% is covered, value 3 if at most 50% is covered, and value 4 is a share greater than 50% is covered. <i>Source:</i> World Bank Doing Business.
<b>Public register</b>	The variable indicates the existence of a public credit register between 2000 and 2010. It equals 1 in case a public credit register is operating, 0 otherwise. <i>Source:</i> Own compilation from public sources, World Bank.



Table 3: SUMMARY STATISTICS

Variable	Mean	Std Between	Std Within	Min	Max	N
<b>Bank credit_deposit</b>	0.91	0.495	0.197	0.107	5.406	1464
<b>Fixedlines</b>	18.592	18.795	2.526	0.01	74.48	1528
<b>Gdp deflator</b>	9.845	19.747	20.45	-13.923	515.776	1495
<b>Gni_pcap</b>	10.197	11.96	2.13	0.2	65.05	1458
<b>Identification</b>	0.609	0.473	0.125	0	1	1548
<b>Population</b>	0.039	0.142	0.004	0	1.337	1377
<b>Private coverage</b>	1.144	1.512	0.383	0	4	616
<b>Private credit_gdp</b>	0.446	0.41	0.116	0.001	2.698	1250
<b>Private register</b>	0.47	0.462	0.194	0	1	1532
<b>Publi coverage</b>	0.629	0.809	0.251	0	4	623
<b>Public register</b>	0.452	0.477	0.148	0	1	1534
<b>Overall score</b>	60.104	10.015	2.771	24.3	90	1308

Data source is reported in Tab (2)

Table 4: CORRELATION AMONG CREDIT-REGISTER VARIABLES

	Identification	Fixedlines	Gni_pcap	Gdp deflator	Private register	Public register	Private coverage	Public coverage	
Identification	1								
Fixedlines	-.01600768	1							
Gni_pcap	-.22350635	.12821688	1						
Gdp_deflator	.04282019	-.09597015	-.3583888	1					
Private register	-.0010098	.16227878	.48191811	-.21828252	1				
Public register	.35838545	-.01053597	-.27059936	-.01568113	-.15378941	1			
Private coverage	-.05677453	.072349	.58774091	-.33354023	.60870253	-.18124277	1		
Public coverage	.35153035	.0720507	-.07074878	-.0610913	.04014108	.69285564	-.0749426	1	
Overall score	-.19918636	.04126629	.75121595	-.40181643	.53611084	-.31118594	.62486722	-.09245811	1

Table 5: ID-System: Country Sample

<b>Summary: Sample of Countries</b>				<b>No</b>
<i>Total number of countries in sample</i>				172
<i>Countries with compulsory identification system</i>				97
<i>Countries without compulsory systems</i>				58
<i>Countries switching status (2000-2008)</i>				17
<b>Compulsory ID-System in 2000-2008 by Legal Origin</b>				
<b>Legal Origin</b>	<b>Never Introduced</b>	<b>Already Introduced</b>	<b>Introduced</b>	
English	32	20	7	
French	13	54	6	
German	4	9	2	
Scandinavian	5	0	0	
Socialist	4	14	2	

Source: Own compilation.

Table 6: Estimation Results: BDM Ignoring Serial Correlation

*In the first-stage regression the dependent variable is regressed on country fixed-effects, year dummies, and other covariates. In the second stage regression, the residuals from the first-stage averaged over two periods - before and after - are regressed on the policy variable (a dummy equal to one) for the treated groups only.*

Dep var	Bank Credit/Deposit		Private Credit/GDP	
<i>Second-stage regression</i>				
Identification ( $\delta_1$ )	0.013 (0.104)	0.100** (0.042)	0.046** (0.019)	0.015** (0.006)
<i>First-stage regression</i>				
	(a)	(b)	(a)	(b)
Population	-0.6439 (1.321)	-3.0321 (3.085)	0.6975 (0.750)	2.1874 (1.440)
Fixedlines	-0.0007 (0.001)	0.0016 (0.004)	0.0088*** (0.002)	0.0061*** (0.002)
Gni_pcap	0.0222*** (0.003)	0.0307*** (0.007)	0.0306*** (0.002)	0.0389*** (0.003)
Gdp deflator	-0.0007* (0.000)	0.0021 (0.002)	0.0000 (0.000)	0.0006 (0.001)
Private register	0.1463*** (0.029)	0.0656 (0.058)	-0.0102 (0.017)	0.0195 (0.026)
Public register	-0.0730* (0.040)	0.1437* (0.078)	-0.0067 (0.026)	0.0564 (0.038)
Private coverage		0.0515*** (0.015)		0.0183** (0.007)
Public coverage		0.0213 (0.025)		-0.0001 (0.012)
Overall score		0.0131*** (0.004)		0.0040* (0.002)
Constant	0.6960*** (0.058)	-0.2532 (0.295)	0.0414 (0.034)	-0.4444*** (0.133)
ll	355.5378	385.6232	947.5975	676.1538
N	1263	453	1109	412

\*p<0.10,\*\* p<0.05, \*\*\*p<0.01  
Note: Robust standard errors in ().

Table 7: Estimation Results: Conley and Taber

Dep var	Bank Credit/Deposit	Private Credit/GDP
Identification	-0.0350 (0.143)	0.0472 (0.031)
Conley & Taber (95% CI)	[-0.124, 0.051]	[-0.034, 0.100]
Population	-1.0688 (1.043)	0.8512 (0.709)
Fixedlines	0.0002 (0.005)	0.0036 (0.004)
Gni_pcap	0.0227*** (0.007)	0.0308*** (0.006)
Gdp deflator	-0.0007 (0.000)	0.0001 (0.000)
Private register	0.1491*** (0.051)	-0.0108 (0.030)
Public register	-0.0786 (0.098)	0.0012 (0.032)
Private coverage	0.0488* (0.025)	0.0184*** (0.009)
Public coverage	0.0174 (0.024)	0.0040 (0.014)
Overall score	0.0132*** (0.006)	0.0040* (0.002)
Constant	0.7034*** (0.137)	0.0126 (0.110)
ll	355.9111	949.3502
N	1263	412

Note: \*p<0.10, \*\* p<0.05, \*\*\*p<0.01. Fixed-effect regressions. Standard errors in ().

Figure 1: ADH Estimator: Bank Credit/Deposit

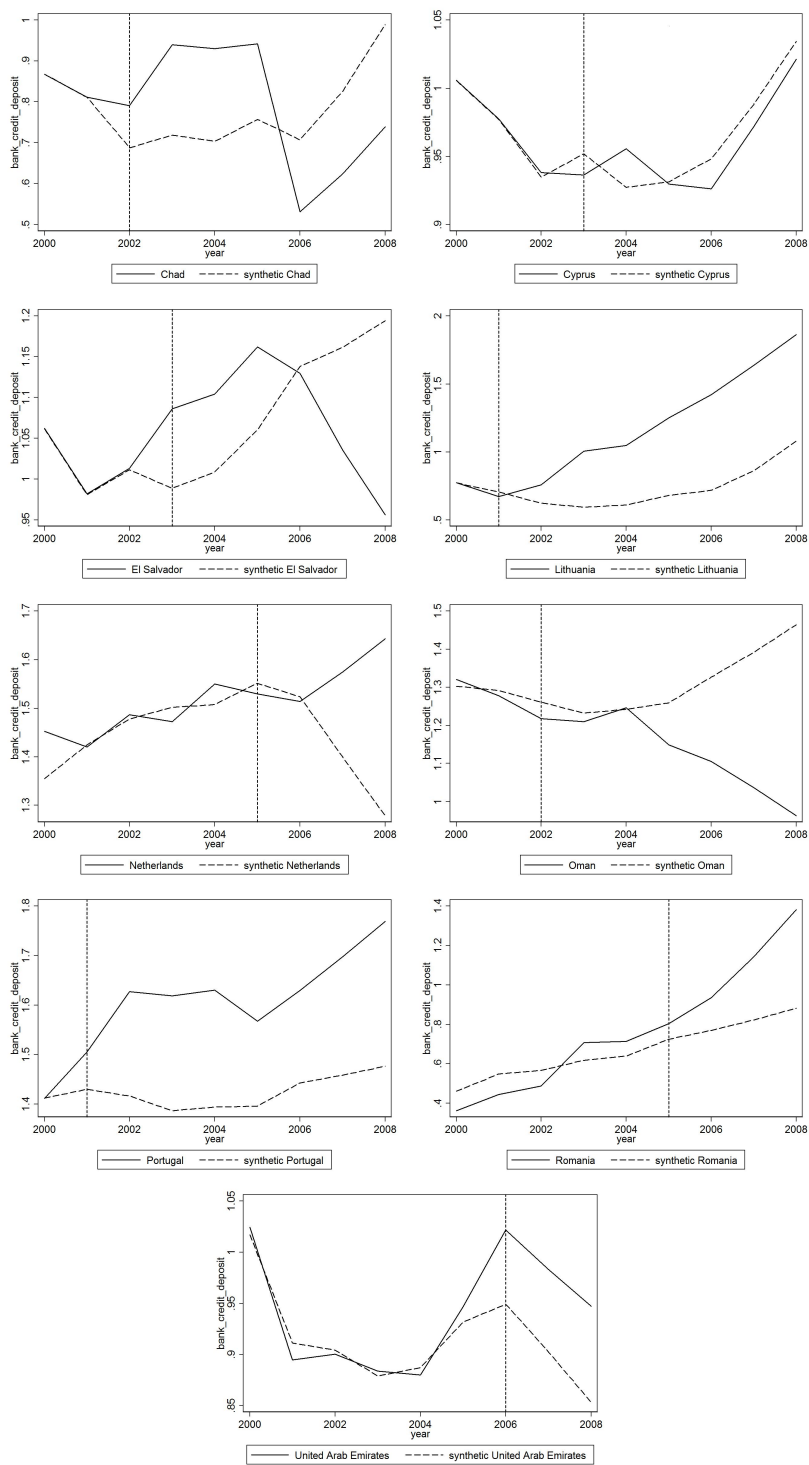


Figure 2: Placebo ADH Estimator: Bank Credit/Deposit

