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IN MIDDLE-INCOME COUNTRIES**

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ECONOMIC GROWTH, INSTITUTIONAL QUALITY AND FINANCIAL DEVELOPMENT IN MIDDLE-INCOME COUNTRIES ^(*)

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Abstract

This paper aims to investigate the relationship between economic growth, institutional quality and financial development within a sample of middle-income countries. We generate three hypotheses on the potential relationships between those three dimensions by reviewing the existing literature and test them in the framework of a Panel Vector Autoregressive (PVAR) model. The main results, derived from the Impulse Response Function (IRF) analysis, are two-fold. First, we find a unidirectional positive relationship from economic growth to financial development. Second, institutional quality and economic growth are positively related but the causality direction depends on the nature of the institutional quality proxies. Legal institutional quality has an impact on economic growth while the latter causes an improvement in public sector institutional quality.

Keywords: economic growth, economic convergence, institutional quality, financial development.

JEL classification: O11, O16, O43.

Resumen

En este documento se aborda la relación entre el desarrollo económico, la calidad institucional y el desarrollo financiero en una muestra de países de renta media. Con este objetivo, hemos formulado tres hipótesis sobre las potenciales relaciones entre las citadas dimensiones a partir de una revisión de la literatura existente y las hemos comprobado en el marco de un modelo de panel de Vectores Autorregresivos (PVAR). Los principales resultados, derivados del análisis de las funciones impulso-respuesta, son dos. Primero, encontramos una relación positiva y unidireccional de crecimiento económico a desarrollo financiero. Segundo, constatamos una correlación positiva entre calidad institucional y crecimiento económico, si bien la dirección de causalidad parece depender de la naturaleza del *proxy* que usamos para medir la calidad de las instituciones. En este sentido, la calidad institucional del sistema jurídico tiene un impacto sobre el crecimiento económico, mientras que este último conlleva una mejora de la calidad institucional del sector público.

Palabras clave: crecimiento económico, convergencia económica, calidad institucional, desarrollo financiero.

Códigos JEL: O11, O16, O43.

1 Introduction

Development is a multidimensional and non-linear process product of the interaction between institutional, social and economic aspects. It is a fact that it correlates strongly with economic growth, allowing the differences in the level of development to be faithfully explained by differences in growth rates or GDP per capita. Nonetheless, economic growth interacts with other dimensions of different nature shaping the level of development of a country.

The quality of the institutional framework and the degree of development of the financial system are two of the aspects that interact between them and with economic growth and contribute to explain why some countries have higher living standards than others. Institutions are generally defined as the “constraints that human beings impose on themselves” and set the rules of the game in a society¹. Moreover, linked to the concept of institutions has emerged the notion of governance or institutional quality. The World Bank (1992) defines it as “the manner to which power is exercised in the management of a country’s economic and social resources for development”. For its part, financial development is linked to the concept of financial deepening which refers to the increase in the size or liquidity of the financial markets².

From the last decades of the 20th century, institutions and financial development have come to the fore as key aspects in the development process. Many developing countries embarked transformation of their institutionally and deepened their financial systems following policy recommendations of international organizations during this period³. These policy recommendations have been ground on the premise that improving institutional quality via institutional reforms and deepening the financial systems would lead automatically to higher rates of growth. Nonetheless, the relationship between institutional quality and financial development with economic growth seems to be more complex and potentially endogenous.

In fact, these dimensions can interact in many ways. Sound institutions, particularly a legal framework that can enforce financial contracts, support financial intermediation and reduce transaction costs, would help to develop the financial sector. In turn, efficient institutions contribute positively to economic growth, acting behind the classical determinants of growth (i.e. capital accumulation, technological development, etc.) but could be also the result of society’s demands in the face of a flourishing economic scenario. For its part, deep and efficient financial systems can boost growth by easing the saving-investment process but it can also get developed driven by the demands of economic agents for a wider variety of financing instruments generated by improved economic conditions.

In this work we aim at exploring the potential relationships between those three dimensions by taking into account the different causality linkages exposed in the literature. From the revision of the existing

¹North (1990).

²Sahay et al. (2015)

³The need to deepen financial systems was a central recommendation of international organizations in the 1980s, being an example of it the 1989 World Development Report by the World Bank. In the 1990s, the so-called Second-Generation Reforms of the International Monetary Fund (IMF) put a particular emphasis on institutional reforms for promoting economic growth.

evidence we draw some possible explanations which help us to construct our empirical model. In particular, we develop three hypothesis on the exogeneity of the studied dimensions that we will test on this work:

- 1) Institutional quality \rightarrow Financial development \rightarrow Economic growth.
- 2) Institution quality \rightarrow Economic growth \rightarrow Financial development.
- 3) Economic growth \rightarrow Institutional quality \rightarrow Financial development.

We test the hypothesis within a sample of 50 middle-income countries (MICs). The focus on that group of countries responds to various reasons. First, MICs present a high variability, with successful cases of convergence during our covered period while others remained stagnated. In fact, recent economic literature has point out the prevalence of growth slow-downs in a vast group of MICs, even claiming the existence of a “middle-income trap”⁴, at which has followed an extensive literature on potential growth determinants on those countries⁵. Second, while a major part of literature on the relation between financial development, institutions and growth has tested it empirically within a pool of developed countries or samples of both developed and developing countries together⁶, there is some evidence of differential effect depending on the level of development. In this sense, the focus of our work on MICs could offer a novel contribution and shed some new light on the growth literature on middle-income. Third, MICs usually account for developing financial systems and some kind of formally established institutional framework, unlike many low-income countries, which allows these dimensions to be better evaluated in the relationship between them and with economic growth.

In summary, we explore the direction of causality between economic growth, some proxies of institutional quality and some proxies of financial development within a sample of middle-income countries for the period 1970-2010. Unlike previous research, we tackle the relation of those three dimensions altogether and test three hypothesis developed through the review of the existing empirical evidence. The empirical tool that we employ, a panel vector autoregressive model, allow us to treat the variables as potentially endogenous and test the hypothesis via the Cholesky ordering. The next section gives an overview of the related literature, describing the different directions of causality proposed between the dimensions. Section 3 describes the data and the model specification. Sector 4 presents the results. Sector 5 includes a regional analysis. Finally, Section 6 exposes the conclusions and some policy implications.

2 Literature review

An extensive literature exists on the causal relationship between institutional quality, financial development and economic growth. However, most part of it have concentrated in analyzing the link between two of the dimensions separately and the direction of causality remains a point of discussion as empirical evidence has yielded mixed results.

The emergence of the New Institutional Economics (NIE), and particularly North’s (1990) work, placed the role of institutions at the center of research on the ultimate determinants of economic growth.

⁴Gill and Kharas, 2007; Aiyar et al, 2013; Eichengreen, Park and Shin, 2013.

⁵Izquierdo et al, 2016; Melguizo et al, 2017.

⁶Demetriades and Law, 2006; Ahlin and Pang, 2008; Compton and Giedeman, 2010.

In contrast to those authors who pointed to geographical or demographic factors as the ultimate causes of growth, the NIE focused on the role that the institutional framework plays for explaining economic performance. From this stream, good institutions able to ensure contract enforcement and the security of property rights, and proving checks against potential expropriation by the government or other power groups, were highlighted as the ideal to reach by developing countries so to make them able to promote sustainable growth. Since then, the study of this relationship has been one of the most discussed topics in the economic literature of the last decades⁷. An extensive empirical literature that has modeled a relationship from institutional variables to economic growth has contributed to generate a broad consensus that a good institutional framework causes economic growth⁸.

On the contrary, we find a group of authors who question the causal relationship between institutional quality and economic growth, especially emphasizing its potentially endogenous nature. Some traces of this position can already be found in Lipset (1959), who hypothesized that prosperity stimulates democracy, but it was not until the end of the 20th century that this proposition started to capture more attention. Theoretically, proponents of that position argue that economic development creates greater demand for quality institutions while enables countries to afford them. From a historical perspective, Chang (2011) points out that today's developed countries acquired "good institutions" (democracy, modern bureaucracy, property rights) after being rich, not before. Moreover, some authors add that institutions' form and functioning are dependent on the conditions under which they are created and developed⁹. The empirical literature that has tested this relationship had to struggle with the potential endogeneity between economic and institutional quality. Among the first works that consider the potential endogenous character of the dimensions is the one by Acemoglu, Johnson and Robinson (2001). In their work, they used the rates of mortality among colonial settlers during colonial time as an instrument for institutional quality¹⁰. More recent studies such as the ones by Chong and Calderon (2000) and Glaeser et al (2004) also tried to disentangle that relationship and found evidence of bi-directionality.

Financial development has traditionally been considered to play a central role for economic performance. It is a fact that those countries accounting for the most developed financial systems have also the highest per capita income. The theoretical roots of the relationship between financial development and growth can be traced back to the work of Schumpeter (1912), who argues that financial intermediaries are key agents in the process of technological innovation, mobilizing household savings to innovative companies and thus boosting growth. After Schumpeter, a vast strand of economists supported his ideas a modelled a positive causal relation from financial development to economic growth¹¹. A contrary view was first postulated by Robinson (1952) who argued that demand for financial services is simply a consequence of economic growth. From this view, the emerging of financial services responds to new economic and institutional scenarios and further demands of economic agents generated from improved economic conditions¹². Lewis (1955) also supported Robinson view postulating financial development follows real

⁷Ugur (2010) and Lee and Lloyd (2016) can provide a comprehensive literature review of this topic.

⁸Knack and Keefer (1995), Hall and Jones (1999), Easterly and Levine (2003), and many others.

⁹Pzeworski (2004).

¹⁰The use of instrumental variables became very popular since then. Pande and Udry (2005) compile a list of instruments used in the literature.

¹¹Mckinnon (1973), Shaw (1973) and King and Levine (1993).

¹²Demetriades and Hussein (1996) and Zang and Kim (2007) support empirically this hypothesis.

economic growth and serves as a mean for risk reduction and liquidity acquisition which eventually feeds back economic growth.

Patrick (1966) adds to the question of causality another dimension postulating that the stage of development of the country could shape the relation between financial development and economic growth. He argues that this relation is not linear and changes within the development process¹³. In an early stage of development, the relation would work from finance to growth while in a more advanced stage the opposite would prevail¹⁴. His theory poses a particularly intriguing scenario for middle-income countries that are halfway between underdeveloped and advanced economies.

The link between institutional quality and financial development seems to be the most well-established in the literature. Evidence suggests that the institutional framework lays the ground for financial development, whose success depends on the quality of the rules of the institutional game¹⁵. The idea behind is that, given the intertemporal character of financial transactions, a financial system can only thrive in an environment with sound institutions (Beck, 2016). With regards to the kind of institutions that are best for promoting financial development, there has been produced an extensive literature that identify the legal ones as the most important¹⁶.

In this work, we consider all the previous mentioned relations exposed in the literature but follow a different approach since we analyze the three dimensions altogether and without assuming a priori causalities¹⁷. In this way we seek to gain a broader perspective on how the three dimensions interact with each other which could provide novel evidence on the subject. Moreover, this broader coverage could be particularly useful for policy formulation.

3 Empirical methodology

Data

Our dataset comprises yearly data for fifty MICs for the period 1970-2010. To build the sample of MICs we follow a relative approach¹⁸. From this approach income status is usually defined as a fixed propor-

¹³This theory would contribute to explain why some authors such as Eichengreen et al (2017) or Ben Naceur et al (2017) find no relation between financial development and economic growth when modelling it linearly.

¹⁴From an empirical approach, Calderon and Liu (2002), Samargandi et al (2015) and Ben Naceur et al (2017) find evidence supporting Patrick's view.

¹⁵La Porta et al. (1998), Levine (2003), Beck and Levine (2004).

¹⁶Beck (2016) offers a recent literature survey on the topic, and highlights the relevance of specific legal measures like “[...] the rights of secured and unsecured creditors, the efficiency of credit registries and bureaus, the quality of court systems and the efficiency of contract enforcement, the existence and quality of collateral registries and accounting standards” (p. 17).

¹⁷There exists a stream of literature that analyses the joint effect of financial development and institutions on growth, examining if those dimensions are substitutes or complementary in their contributions to growth. Main works would be the ones by Demetriades and Law (2006), Ahlin and Pang (2008) and Compton and Giedeman (2010). This approach would differ from our as we do analyze all possible causality directions understanding that those dimensions are potentially endogenous.

¹⁸Income classifications can be done by following two different approaches: absolute or relative. An absolute approach consist of establishing a fixed individual or household income per capita threshold for ranking country groups. In particular, most studies usually employ the World Bank classification of countries in function of their GNI per capita. In that classification, for the current 2019 fiscal year, low-income countries are defined as those with a GNI per capita of \$995 or less in 2017; lower middle-income economies are those with a GNI per capita between \$996 and \$3,895; upper middle-income those with a GNI per capita from \$3,896 to \$12,055; and high-income economies are defined as those with a GNI per capita of \$12,056 or above.

tion of mean or median individual or household income per capita of high-income economies or a specific developed country, i.e. the United States. We follow the criteria employed by Woo (2012) and Ozturk (2015), and define a country income status as a proportion of United States GDP per capita as follows: countries with GDP per capita below 20 percent of the U.S. are classified as low-income, countries with GDP per capita above 55 percent are classified as high-income and those between 20 and 55 percent of U.S. are classified as middle-income.

This choice responds to various reasons. First, we avoid the problems and biases derived from a fixed income classification. For instance, as Im and Rosenblatt (2013) mention: “[...] The World Bank’s classification has operational implications in that the low income-middle income threshold determines access to concessional IDA financing.” (p. 19). There is no consensus around the threshold definitions and the most used one, the World Bank’s, might have important operational purposes. Second, a relative approach directly incorporate the concept of convergence which is on the fundamentals of the growth theory.

Data for constructing the GDP per capita relative to the US indicator and build our sample comes from the Maddison Project Database 2013¹⁹, that contains real GDP per capita data, in 1990 international Geary–Khamis dollars (GK\$), for 168 countries. For delimiting our sample we follow the next steps: a) we construct the indicator of relative GDP per capita by following the previous mentioned definition; b) we keep those countries that reached a middle-income status at some point of the period; c) we drop countries with a population of less than one million inhabitants at the beginning of the period; d) we drop countries transiting from low to middle-income in 2000s. After that, we end up with a sample that comprises fifty countries: Argentina, Belarus, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Croatia, Czech Republic, Estonia, Greece, Hong Kong, Hungary, Iran, Iraq, Ireland, Jamaica, Kazakhstan, Latvia, Libya, Lithuania, Macedonia, Malaysia, Mauritius, Mexico, Oman, Namibia, Panama, Peru, Poland, Portugal, Puerto Rico, Romania, Russia, Saudi Arabia, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Syria, Taiwan, Thailand, Trinidad and Tobago, Turkey, Ukraine, Uruguay and Venezuela.

GDP per capita relative to the US is not only the variable employed for building our sample but represents one the main variable we examine in this paper, as a proxy of economic growth²⁰. Therefore, economic growth is understood here in terms of convergence with the advanced economies, in this case taking the U.S. as a benchmark²¹. Mathematically, this is can be represented as:

$$RelativeGDP_{it} = \frac{GDP_{it}}{GDP_{US,t}}$$

Where $RelativeGDP_{it}$ represents the relative GDP per capita of each country i in the period t to the U.S., GDP_{it} corresponds to the GDP per capita of each middle-income country i in the period t and $GDP_{US,t}$ corresponds to the GDP per capita of the U.S. for each period t .

¹⁹For more information see Bolt and van Zanden (2014).

²⁰Throughout the paper we refer to economic growth, irrespective of the proxy variable we use to approach it.

²¹Although this is our preferred specification, we also tested the stability of our findings by using an absolute approach, in this case GDP growth, and results still hold.

MICs are a heterogeneous group that comprise stories of convergence, stagnation and divergence throughout the 1970-2010 period, as can be observed in Figure 1. Successful trajectories of convergence are shown in the Panel A and are mainly starred by the Asian Tigers (Singapore, Hong Kong, South Korea and Taiwan), some of the so-called Tiger Cub Economies (Malaysia and Thailand) and a bunch of European countries (Estonia, Ireland and Spain). The Asian Tigers show particularly rapid trajectories of convergence, and reached high-income status at some point of the period. The cases of South Korea and Taiwan are paradigmatic since they started from a low-income status in the seventies and manage to transit to both middle and subsequently high-income within a couple of decades.

Panel B represents the opposite picture showing those countries that exhibit divergence trends during the four covered decades. Within this group, we find mainly African and Middle-East countries (South Africa, Libya, Syria, Namibia, . . .), some European countries under the Soviet influence area (Romania, Ukraine, Hungary, . . .) and some Latin American (Argentina, Peru and Venezuela). They are worth to mention the cases of Venezuela and Saudi Arabia that suffer from sharp declines of relative GDP per capita within the period, even transiting from high-income to middle-income at some point.

Trajectories of stagnation, slowdown and ambiguous are shown in figure at the bottom. Primarily Latin American followed by European countries appear as the main exponents of this type of trends. These trends seem to define MIC more than other country groups since they are more likely to be found in MIC groups as accounted in the literature (Aiyar et al., 2013; Eichengreen, Park and Shin, 2013). In fact, the idea of stagnation lies behind the fundamentals of the concept of “middle-income trap”, introduced by Gill and Kharas (2007) to account for this growth phenomenon.

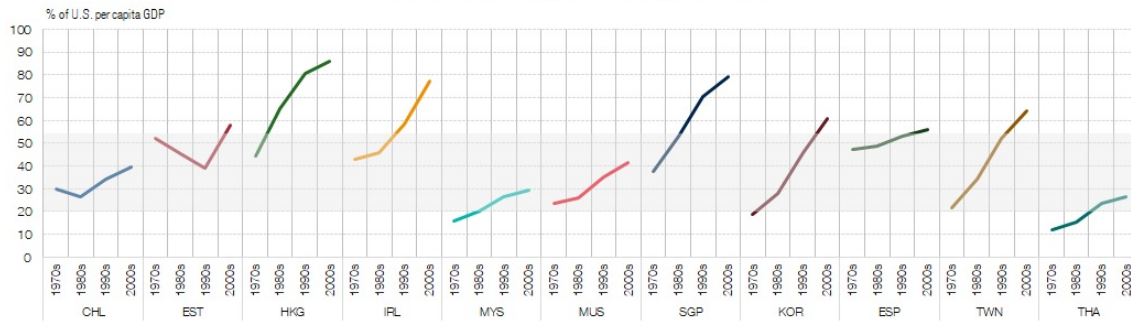
Financial development is the second dimension covered in this paper. Many countries of our sample implemented a series of reform to deepen their financial systems within the period of analysis, particularly from the eighties. This is why we employ measures that cover those aspects of financial development related to the depth of the process. In particular, we use two bank-based indicators collected from the Financial Development and Structure database of the World Bank. The first is the ratio of liquid liabilities to GDP (%), also known as broad money or M3. This is a variable broadly used in the literature that includes currency plus demand and interest-bearing liabilities of banks and other financial intermediaries divided by GDP. It is a powerful measure of the broad coverage of financial intermediation as it includes all financial and non-financial institutions. The second variable is the private credit by deposit money banks and other financial institutions to GDP (%). This variable have been widely used in the literature of finance and the relation between finance and growth²² and is usually cited as the most preferred financial development indicator (Levine et al., 2000). It captures credit allocation in the financial system, excluding the credit issued by the central bank and therefore reflect accurately the saving-investment process in an economy as mentioned in Samargandi et al (2015).

For institutional quality we use two measures that capture two dimensions mentioned in the literature on institutions: the public sector and the legal dimension. The public sector one is captured by the indicator of quality of government of the International Country Risk Guide produced by the PRS Group.

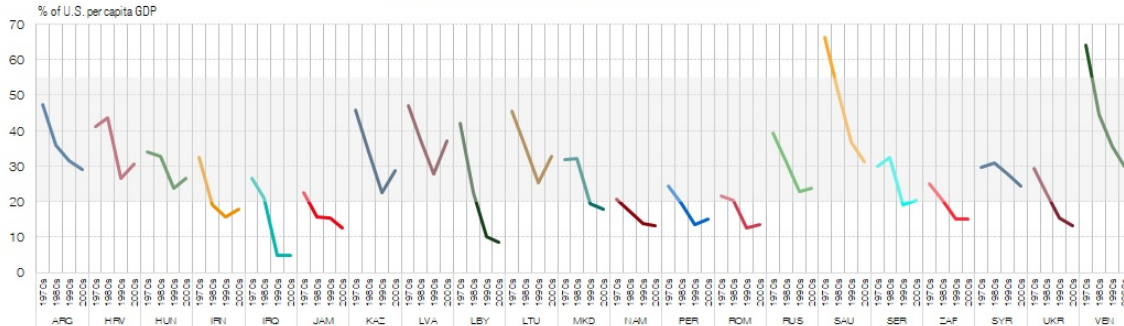
²²King and Levine (1993), Demetriades and Hussein (1996), Levine et al. (2000).

Figure 1: Growth patterns

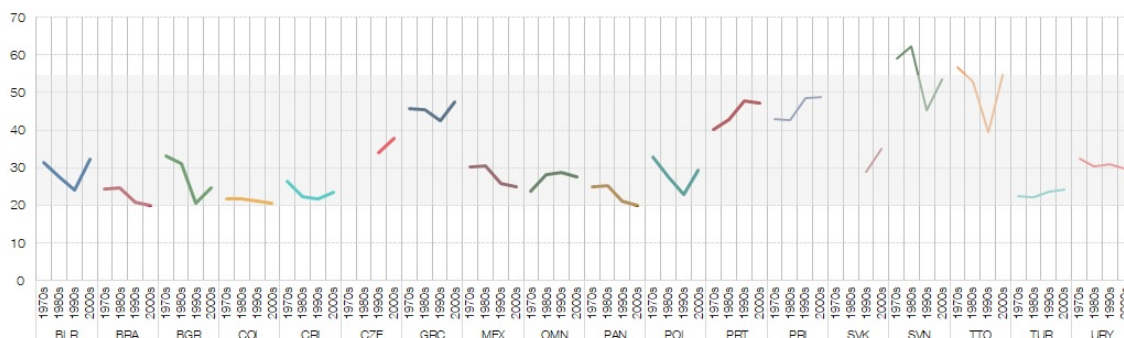
A. Countries with growth convergence trends



B. Countries with growth divergence trends



C. Countries with growth stagnation or ambiguous trends



Source: Own calculations based on Maddison Project Database 2013.

Notes: Line shows the median relative GDP per capita for each decade. The shaded area represents the income bracket in which a country is considered to be middle-income.

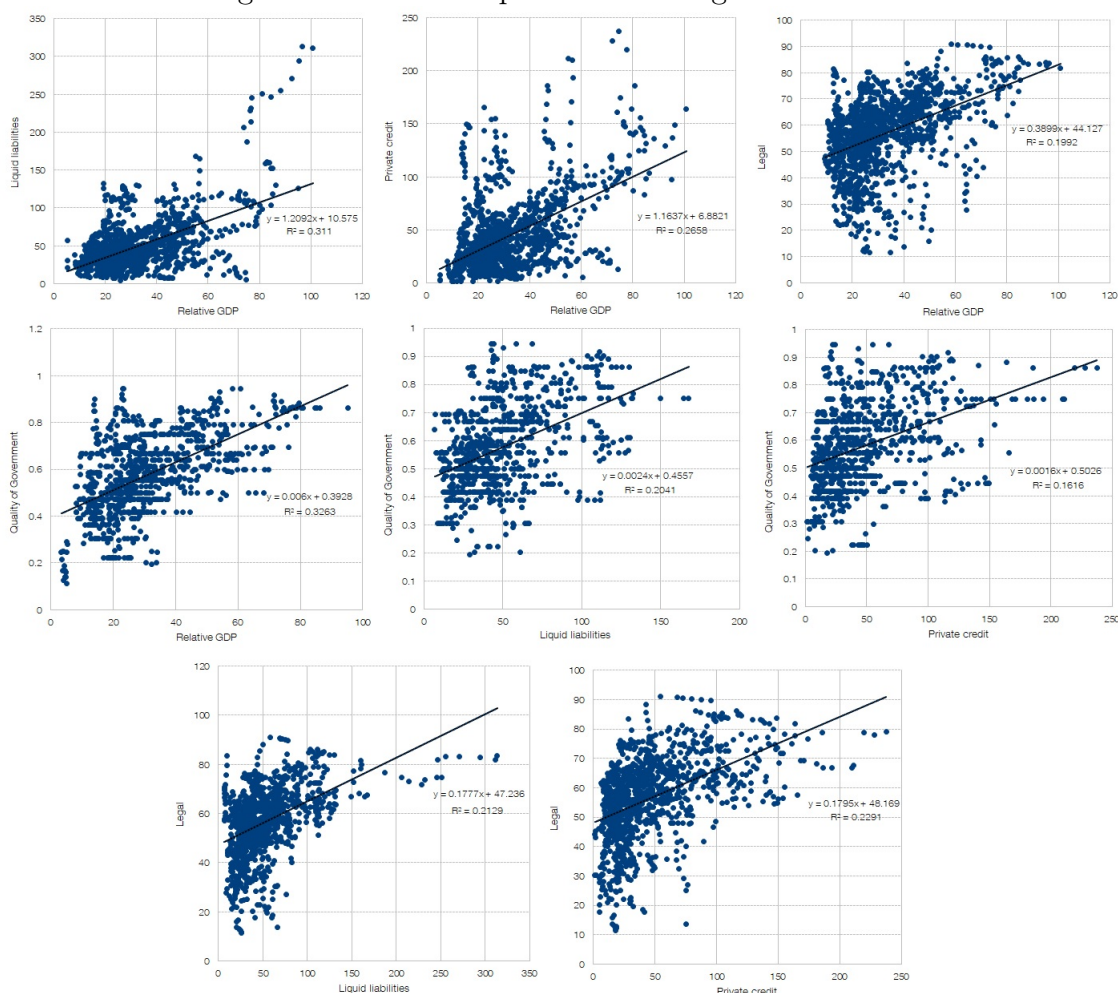
It is a composite index rescaled 0-100 that comprises the mean value of three sub-indices: first assesses the corruption within the political system, second evaluates law and order aspects and third measures institutional strength and quality of the bureaucracy. A higher score represents a better government quality. Although previous index partially captures aspects related to the legal side, we employ a second index focused solely in that dimension of institutional quality so to analyse it separately. The legal dimension have been pointed out in the literature as highly correlated with the development of financial system²³. A legal framework that can enforce financial contracts, support financial intermediation and reduce transaction costs, helps to develop the financial sector. We capture it by using an index of legal system and property rights from the Economic Freedom of the World Index. This is an index that ranges 0-100 and is composed by the following indicators: judicial independence (the judiciary is independent

²³Beck (2016).

and not subject to interference by the government or parties in dispute), impartial courts (a trusted legal framework exists for private businesses to challenge the legality of government actions or regulations), protection of intellectual property, military interference in rule of law and the political process, and integrity of the legal system. It contains data every five years from 1970 to 2000 and from that date it has annual data. We have carried out a quadratic interpolation of the data between 1970 and 2000. Higher scores in this index are synonyms of holding a stronger legal framework.

It is worth noting that we are aware that these two institutional quality variables suffer from some problems that the literature has exposed. First, we are using composite index variables that could be capturing an important component of subjectivity since the choice of components as well as weights are discretionary in most cases. Second, the sample selection, middle-income countries across the period 1970-2010, imposes significant restrictions to the data we can use. Nevertheless, by tackling two different dimensions of institutional quality (public sector and legal), we can explore if distinctive features may account for differential relations with growth and financial development.

Figure 2: Relationship between endogenous variables



Source: Own elaboration.

Scatter plots of the variables are shown in Figure 2. We find the expected positive relations of all variables in line with the literature: economic growth correlates positively with both financial and institutional variables which in turns correlate positively between them. However, the relations show weak in most cases, reaching a R^2 higher than 0.30 in only two cases: liquid liabilities and relative GDP and, quality of government and relative GDP.

Model specification

To examine the relationship between economic growth, institutional quality and financial development, we estimate a panel vector autoregressive model (PVAR), a methodology originally developed by Holtz-Eakin et al (1988) as an extension of the traditional VAR methodology by Sims (1980). This methodology has several advantages for approaching our topic: a) it exploits the panel structure of the data (i.e. temporal and geographic variation), b) it allows to analyse the dynamic relationship between the variables by including lags, and thus to test whether the potential effects are only short-term or last longer and, c) it is specifically designed to consider the inverse causality issue, since all the variables included are treated as potentially endogenous.

The base specification used in this paper has the general structure of a PVAR model, as follows:

$$Y_{it} = A(L)Y_{i,t-1} + BX_{it} + u_{it}$$

Where Y_{it} is the vector of our dependent/endogenous variables (relative GDP per capita, one of our two institutional quality proxies and one of our two financial development proxies), $A(l)$ are the matrices of lagged coefficients, X_{it} is the vector of exogenous control variables (patents, public debt to GDP, percentage of population with tertiary education and terms of trade index), and u_{it} denotes the error term. The model comprises data for fifty economies (i) and 40 years covering the period 1970-2010 (t).

We develop four different model specifications derived from the combination of our two financial and two institutional variables: 1) relative GDP per capita-liquid liabilities-quality of government, 2) relative GDP per capita-liquid liabilities-legal and property rights, 3) relative GDP per capita-private credit-quality of government and, 4) relative GDP per capita-private credit-legal and property rights.

We follow the usual steps that a PVAR analysis involves. The first step of the analysis is to look at the properties of the variables in the specification. For this purpose, we perform four panel unit root tests: one assuming a common unit root process (Levin, Lin and Chu, 2002), and three that consider individual processes: Im, Pesaran and Shin (2003) test, the Augmented Dickey-Fuller (Maddala and Wu, 1999; and Choi, 2001) and Phillips and Perron (1988) test²⁴. We perform each test with the variables in levels and in first differences to decide how each variable enters in the PVAR model (Table 1). We find that the relative GDP to U.S., the two financial variables, public debt to GDP, the percent of population with tertiary education complete and the terms of trade index are integrated of order one, $I(1)$, therefore we

²⁴For further information Pesaran (2012) surveys a significant selection of panel unit root tests and their interpretation within the context of panel data.

introduce them in the models in first differences. The two institutional quality variables and the number of patents are found to be $I(0)$, therefore we include them in levels.

Table 1: Unit root tests

| <i>Variable</i> | | <i>Levels</i> | | | | <i>1st diff.</i> | | | |
|------------------------|----------------------------|---------------|-------|-------|-------|------------------|-------|-------|-------|
| | | LLC | IPS | ADF | PP | LLC | IPS | ADF | PP |
| RELATIVE GDP | Indiv. intercept | 0.096 | 0.509 | 0.082 | 0.990 | 0.000 | 0.000 | 0.000 | 0.000 |
| | Indiv. intercept and trend | 0.998 | 0.803 | 0.221 | 0.982 | 0.000 | 0.000 | 0.000 | 0.000 |
| | None | 1.000 | - | 0.235 | 0.270 | 0.000 | - | 0.000 | 0.000 |
| LIQUID LIAB. | Indiv. intercept | 0.994 | 1.000 | 0.985 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | Indiv. intercept and trend | 0.010 | 0.104 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 |
| | None | - | - | - | - | - | - | - | - |
| PRIVATE CREDIT | Indiv. intercept | 1.000 | 1.000 | 0.097 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | Indiv. intercept and trend | 0.944 | 1.000 | 0.832 | 1.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | None | - | - | - | - | - | - | - | - |
| QUALITY OF GOV. | Indiv. intercept | 0.000 | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 |
| | Indiv. intercept and trend | 0.000 | 0.000 | 0.000 | 0.589 | 0.000 | 0.000 | 0.000 | 0.000 |
| | None | 0.003 | - | 0.960 | 0.904 | 0.000 | - | 0.000 | 0.000 |
| LEGAL | Indiv. intercept | 0.000 | 0.000 | 0.000 | 0.098 | 0.000 | 0.000 | 0.000 | 0.000 |
| | Indiv. intercept and trend | 0.000 | 0.006 | 0.000 | 0.807 | 0.000 | 0.000 | 0.000 | 0.000 |
| | None | - | - | - | - | 0.000 | - | 0.000 | 0.000 |
| PUBLIC DEBT | Indiv. intercept | 0.007 | 0.013 | 0.006 | 0.399 | 0.000 | 0.000 | 0.000 | 0.000 |
| | Indiv. intercept and trend | 0.962 | 0.674 | 0.499 | 0.952 | 0.000 | 0.000 | 0.000 | 0.000 |
| | None | 0.914 | - | 0.472 | 0.728 | 0.000 | - | 0.000 | 0.000 |
| PATENTS | Indiv. intercept | 0.832 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | Indiv. intercept and trend | 0.033 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | None | 0.382 | - | 0.109 | 0.003 | - | - | - | - |
| EDUCATION | Indiv. intercept | 1.000 | 1.000 | 0.999 | 1.000 | 1.000 | 0.158 | 0.003 | 0.917 |
| | Indiv. intercept and trend | 1.000 | 1.000 | 0.503 | 1.000 | 1.000 | 0.000 | 0.000 | 1.000 |
| | None | 1.000 | - | 1.000 | 1.000 | 0.106 | - | 0.406 | 0.018 |
| TERMS OF TRADE | Indiv. intercept | 0.045 | 0.253 | 0.314 | 0.088 | 0.000 | 0.000 | 0.000 | 0.000 |
| | Indiv. intercept and trend | 0.029 | 0.252 | 0.053 | 0.036 | 0.000 | 0.000 | 0.000 | 0.000 |
| | None | 0.568 | - | 0.990 | 0.853 | 0.000 | - | 0.000 | 0.000 |

Note: The probability to accept the null hypothesis of presence of an unit root is presented here.

The second step would be to choose the optimal lag order for the panel VAR specifications. If the model includes few lags we could fail to capture the system's dynamics, but if there are too many there is a loss of degrees of freedom (Boubtane et al, 2013). For deciding the appropriate lag length, there are many information criteria, like the Akaike information criterion (AIC), the Schwarz Bayesian criterion (SC), and the Hannan-Quinn criterion. All of them address the trade-off between fit and loss of degrees of freedom, so the best lag length will be the one that minimise this parameter. In our work, we will use SC, which points to the use of two lags in the four specifications of the PVAR (Table 2).

Table 2: Lag order criterion - SC

| <i>Lag</i> | M1: RELATIVE GDP - LIQUID LIAB. - QUALITY OF GOV. | M2: RELATIVE GDP - LIQUID LIAB. - LEGAL | M3: RELATIVE GDP - PRIVATE CREDIT - QUALITY OF GOV. | M4: RELATIVE GDP - PRIVATE CREDIT - LEGAL |
|------------|--|--|--|--|
| 0 | -5.568587 | -5.526474 | -5.108124 | -5.453489 |
| 1 | -8.668596 | -8.408272 | -8.400635 | -8.797629 |
| 2 | -8.700104* | -8.483680* | -8.422790* | -8.865070* |

After the previous steps, we can estimate PVAR models. For interpreting a PVAR, the most common is to compute impulse response functions (IRFs). They describe the response of an endogenous variable to a shock in another variable in the system over time. The order in which each variable enters into the IRF determines the results and should not be arbitrary. Granger causality tests or intuition and existing economic theory about the relation between the variables can help us to establish the order (Cholesky decomposition). In this paper we test the three main hypothesis extracted from the theoretical and empirical existing evidence by setting three different orders in the Cholesky decomposition. This would allow us to answer some of the main research questions of this work: a) how is the relationship between economic growth, financial development and institutional quality, and b) what is the size of the impact, if any, of each of the dimensions on the rest. Stability of results in IRFs when testing different Cholesky orderings can be interpreted as a confirmation of one hypothesis in detriment of the others.

Finally, after computing IRFs we should check the stability condition of the estimated PVAR specifications. The resulting figure of eigenvalues confirms that the estimates are stable since all the eigenvalues lie inside the unit circle (Figure 1 of the Annex). As a result, the estimated PVAR satisfies the stability condition and we can compute reliable IRFs.

4 Main empirical results

Figure 3 and 4 depict the IRFs for our four model specifications. IRFs show the average responses of endogenous variables to a positive exogenous shock of one standard deviation on another one. The dashed lines represent the confidence bands of ± 2 standard errors, therefore there is a significant impact only when this interval lies above or below the zero line. For the sake of brevity, we report only the results for one of the three possible Cholesky orderings: hypothesis 2²⁵. As we will see later, results remain quite stable across the different orderings.

Panel A shows the results for the first model. We find significant responses to shocks in two cases: in the relationship between institutional quality and economic growth, and between economic performance and financial development. There is a small positive response of the quality of government index to a shock on relative GDP. The effect is not very strong (around 0.01% at its peak) and lasts for 3-4 years, starting in $t+3$ after the shock. Much more significant is the relationship between the relative GDP and the financial variable: a positive shock in economic performance triggers a positive response in the liquid liabilities to GDP. This effect is short-lived. It starts in year $t+2$, reaches a peak of almost 0.2% and

²⁵The rest are available upon request.

then disappears in year $t+4$. The impact in the first year is negative but not significant, and it can be explained due to the relative nature of our financial development variable (it is a ratio to GDP) and how it responds to an economic growth shock (it cannot react in only one year). In both cases the causality direction is one sided, since no effect is found from a shock on quality of government or liquid liabilities to relative GDP.

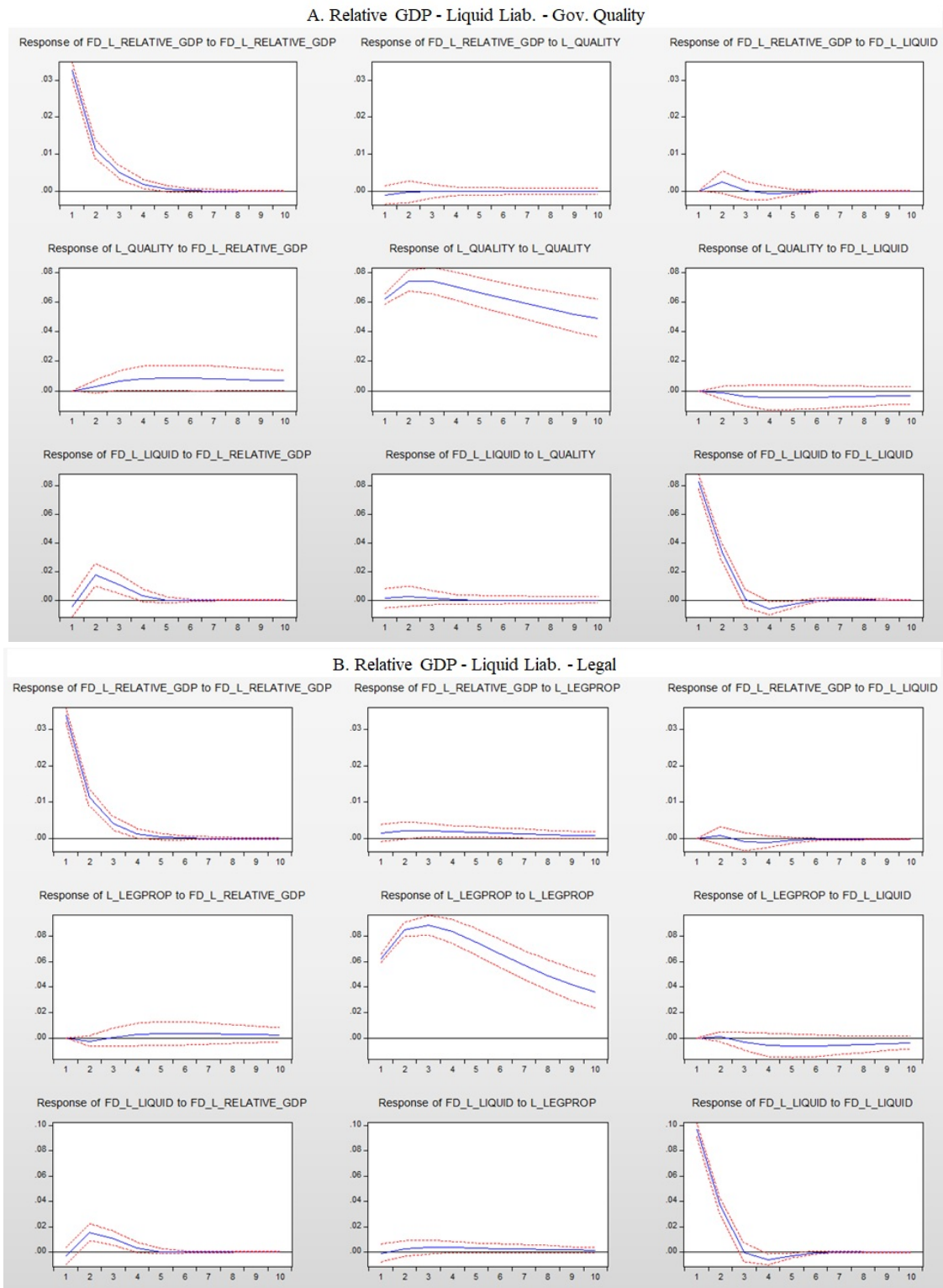
Panel B, which depicts the results of the second model, points to a different conclusion regarding the first relationship mentioned above but supports the finding of the second one. In this model, we find a significant positive response of economic growth to a shock on the legal and property rights index, just the opposite causality direction than before. Here the size of the impact is smaller (only 0.002%), it starts in $t+3$ and remains significant for the three following years. With regards to the relation between economic growth and financial development, the significant effect goes again from relative GDP to liquid liabilities to GDP. The sign, size and temporal horizon of the impact remains very similar to the first model. Again, these are the only significant responses to shocks that IRFs reveal.

Panels C and D of Figure 4 display the results for the third and fourth models, where a different indicator of financial development is used: private credit to GDP. The analysis of IRFs points to support previous findings: the causality direction goes from economic growth to the institutional variable in the case of the quality of government index, and the opposite works for the legal and property rights index; also there are only significant effects from relative GDP to private credit to GDP and not the other way around. Responses have a similar size and pattern to the ones in the first and second models, being the effect of economic growth on the financial variable slightly higher (around 0.03%) and lasting one additional year. A novelty appears in the fourth model: there is a positive response of the financial variable to a shock in the legal and property rights index of about 0.01% in years $t+3$ and $t+4$.

These results remain in general stable across our three different hypothesis. Table 3 shows the paired relationships among the dimensions, and the sign of the effects when they are significant. The aforementioned causality direction from relative GDP to both financial development proxies shows in all the cases, with similar size and temporal pattern. Regarding the institutional variables, their relationships with economic performance and financial development remain regardless the Cholesky ordering, with the exception of the third hypothesis for the quality of government index.

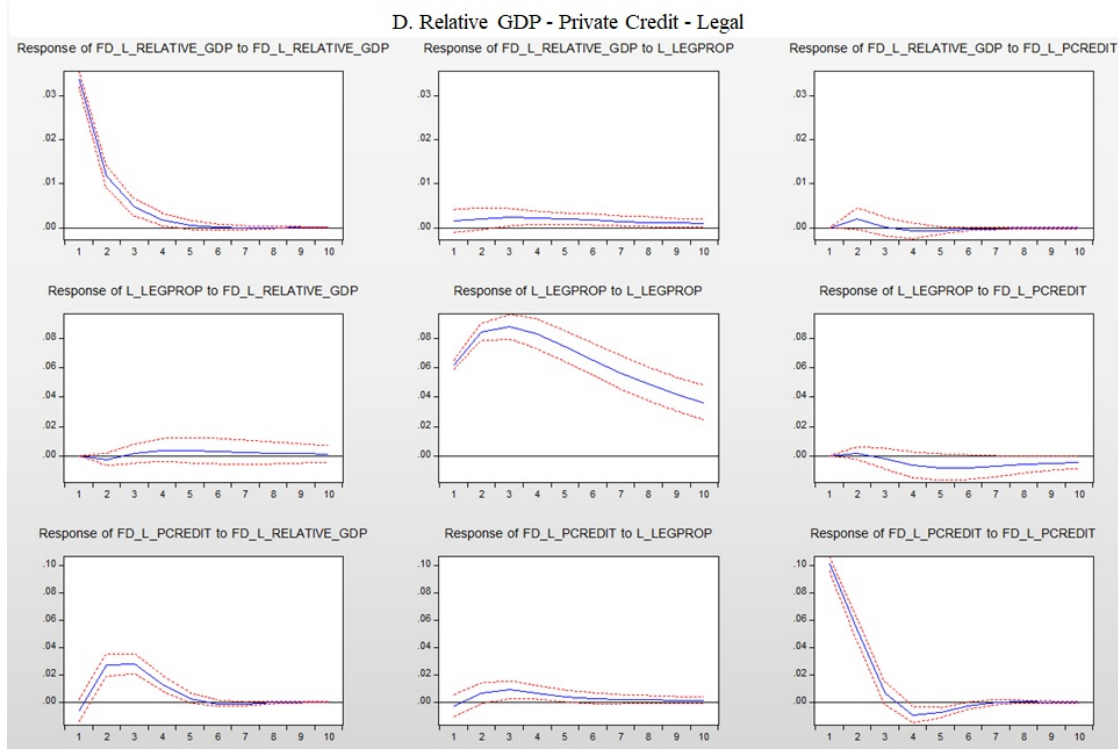
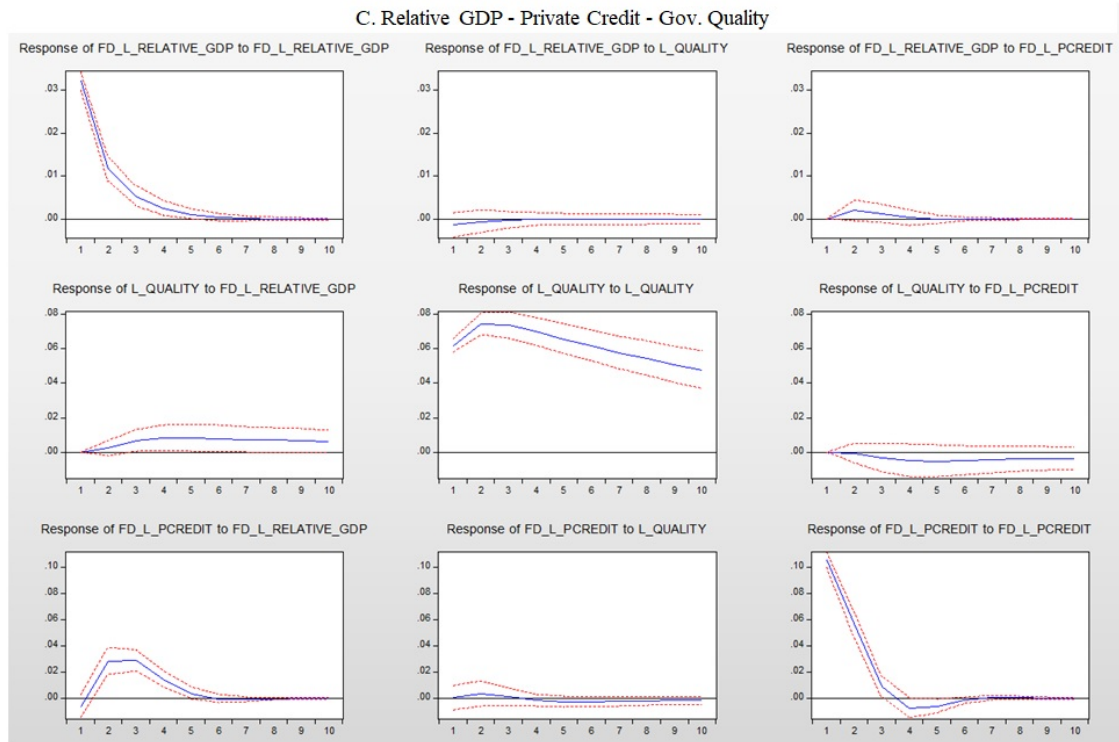
In summary, the IRFs analysis points to two main findings: a) there is a significant, strong and positive response of financial development variables to shocks on relative GDP that does not work the other way around, and b) there is a relationship between institutional quality and economic performance, but the causality direction depends on the nature of institutional quality proxies: legal institutional quality precede economic growth, while the latter causes an improvement in the public sector one. Therefore, these results aim to support not one but two of our hypothesis: hypothesis 2 (Institutional quality \rightarrow Economic growth \rightarrow Financial development) when the institutional quality proxy is the legal and property rights index, and hypothesis 3 (Economic growth \rightarrow Institutional quality \rightarrow Financial development) in the case of the quality of government index.

Figure 3: Impulse-response functions (IRFs) for ten periods



Note: The dashed lines represent the 95% confidence interval using a Monte Carlo procedure with 500 replications.

Figure 4: Impulse-response functions (IRFs) for ten periods



Note: The dashed lines represent the 95% confidence interval using a Monte Carlo procedure with 500 replications.

Table 3: Summary of IRFs

| | H1: INS → FD → GDP | H2: INS → GDP → FD | H3: GDP → INS → FD |
|-------------------------------|--------------------|--------------------|--------------------|
| Relative GDP → Liquid liab. | + | + | + |
| Relative GDP → Private credit | + | + | + |
| Liquid liab. → Relative GDP | | | |
| Private credit → Relative GDP | | | |
| Relative GDP → Gov. quality | + | + | |
| Relative GDP → Legal | | | |
| Gov. quality → Relative GDP | | | |
| Gov. quality → Liquid liab. | | | |
| Gov. quality → Private credit | | | |
| Legal → Relative GDP | + | + | + |
| Legal → Liquid liab. | | | + |
| Legal → Private credit | + | + | + |

Discussion of results

From the empirical results we can draw a potential explanation of the mechanisms that govern the relationship between the three studied dimensions: the institutional framework of a country, particularly the functioning of the legal system, seems in the fundamentals of economic growth. The means by which the legal framework affect economic growth are multiple. The protection of property rights contributes to foster investment and so facilitate innovation, and an independent judicial system helps reduce corruption and bribery practices, supporting agents' confidence on the security of transactions. Moreover, a well-established legal framework sets the ground for the development of the financial system by ensuring the enforcement of financial contracts, supporting financial intermediation and reducing transaction costs as mentioned in Beck (2016). An expansive growth trajectory impact positively the development of the financial system due to increasing demand for financial services. New intermediaries, markets and services emerge contributing to deeper financial development. This buoyant economic scenario also generates demands for new and better institutions which translates into an enhancement of institutional quality. Reduced or eliminated corruption and bribery, eased rules for establishing new business, and simplified bureaucratic processes are some of the aspects behind improved institutional quality²⁶.

With regards to how our results are linked to the existing literature, the relationship between financial development and economic growth, and between financial development and institutional quality appears to be unidirectional in both cases. With respect to the first, our results are in line with the authors that postulate a positive relation from economic growth to financial development (Robinson, 1952; Lewis, 1955). In the second case, we can only add one more piece of evidence to the already existing that places institutional quality as a driver of financial development (La Porta et al, 1998; Levine, 2003; among others.).

The link between institutional quality and economic growth is more puzzling as our results cannot support only one causality direction. In general, our results are in line with the main strand of the literature which states that institutional framework precede growth, but we also find evidence of the opposite.

²⁶It is worth noting that there could be more mechanisms involved in the relationship between the three considered dimensions and we are aware of their endogenous nature. We present here a plausible explanation of our findings for a sample of middle-income countries.

In this sense, we think that the different nature of the two indexes that we use, which are likely to be measuring different aspects of institutional quality, could explain why each of them points to a different conclusion.

On the one hand, the quality of government index aims at assessing how well the public administrations functions. It is what Jütting (2003) classifies as a “performance indicator” variable²⁷. On the other hand, the legal and property rights index provides information on the legal side of institutions, including on judicial courts, lawyer independence, and the existing legal framework. It is an indicator of the “attributes” of institutions, following Jütting (2003) classification. In a nutshell, this variable measures the setup in which economic activity takes place while the former captures the outcome of that setup. Thus, we would expect the legal and property rights index to be more exogenous to economic growth than the quality of government one. In addition, if this reasoning is right, we would also find more easily a positive causal relationship going from the legal system index to our financial development variables, than in the case of the quality of government index. As we presented before, this is exactly what we obtain.

One way to test this issue would be to analyse the causal relationship between the two institutional quality proxies by using a panel Granger causality test. A variable is meant to Granger-cause another if we can reject the null hypothesis that the coefficients of the lags of the first one in the equation where the other is the dependent variable are all equal to zero²⁸. This is, if we find that legal institutional quality precedes to public sector institutional quality, this could help understanding the differential relationship of those two variables with economic growth. Results of Granger causality test are displayed in Table 4. We observe a bidirectional relationship between the two institutional proxies, but the legal and property rights index shows a stronger Granger-causality to the quality of government index than the other way around, being the latter only significant at the 5% level. Given that, we find an additional piece of evidence of the likely different nature of the two institutional quality proxies which points to the legal index as more exogeneous than the public sector index. This would contribute to explain why in our analysis we find a causal relationship from legal institutional quality to economic growth while public sector institutional quality appears as a consequence of economic growth.

Table 4: Granger causality tests

| <i>Null Hypothesis:</i> | Obs | F-Statistic | Probability |
|--|------------|--------------------|--------------------|
| Quality of Government does not Granger cause Legal | 874 | 3.243 | 0.039 |
| Legal does not Granger cause Quality of Government | | 47.624 | 0.000 |

In the next section, we test if the relationship between economic growth, institutional quality and financial development remain stable when tested on different geographical subsamples of MIC. This exercise could provide some interesting insights on how the relationship could be shaped by geographical, cultural and structural factors that neighbour countries are likely to share.

²⁷Glaeser et al (2004), when discussing different institutional measures, says the following about the ICRG data (the source of the quality of government index): “It is plain that these measures reflect what actually happened in a country rather than some permanent rules of the game” (pag. 9).

²⁸It is worth to mention that we are aware that the concept of Granger-causality is not equivalent to causation, and should be understood as a test of “firstness” as noted by Dawson (2003).

5 Regional subsamples

MICs are a heterogeneous group that present a high variability in terms of their convergence trajectories and show different levels of economic growth, institutional quality and financial development. Among them, countries located geographically close are very likely to share characteristics. This is, neighbour countries could have some similarities in the economic episodes they have experienced and share some institutional and financial features. Moreover, the relationship between our three studied dimensions could be non-linear. In this sense, most authors pointed to the level of development as the explanation for non-linear results, particularly existing differences between developed and developing countries in the way that dimensions interact²⁹. Although heterogeneity should be reduced by limiting our analysis to MICs, nonlinearities could already exist. It is with this idea in mind that we split our sample of countries in four different geographical regions: Europe, Latin America, Asia, and Africa and Middle East.

Table 5: Descriptive statistics by geographical area

| | RELATIVE GDP | GOVERN. QUALITY | LEGAL | LIQUID LIAB. | PRIVATE CREDIT |
|-------------------------------|--------------|-----------------|-------|--------------|----------------|
| <i>EUROPE</i> | | | | | |
| <i>Median</i> | 32.2 | 63.9 | 62.8 | 42.1 | 35.6 |
| <i>Max.</i> | 80.9 | 94.4 | 91.8 | 167.7 | 237.6 |
| <i>Min.</i> | 9.2 | 22.2 | 13.6 | 6.9 | 1.1 |
| <i>Obs.</i> | 727 | 427 | 472 | 488 | 501 |
| <i>LATIN AMERICA</i> | | | | | |
| <i>Median</i> | 26.4 | 50.0 | 50.0 | 29.9 | 23.7 |
| <i>Max.</i> | 71.0 | 77.8 | 72.6 | 86.2 | 97.3 |
| <i>Min.</i> | 11.9 | 19.4 | 9.8 | 4.1 | 4.8 |
| <i>Obs.</i> | 527 | 324 | 442 | 398 | 397 |
| <i>ASIA</i> | | | | | |
| <i>Median</i> | 36.7 | 68.1 | 65.3 | 82.9 | 89.3 |
| <i>Max.</i> | 100.8 | 91.7 | 86.1 | 313.6 | 174.4 |
| <i>Min.</i> | 11.0 | 38.9 | 41.6 | 28.4 | 17.6 |
| <i>Obs.</i> | 246 | 135 | 246 | 182 | 183 |
| <i>AFRICA AND MIDDLE EAST</i> | | | | | |
| <i>Median</i> | 24.1 | 52.8 | 57.8 | 45.2 | 30.5 |
| <i>Max.</i> | 74.8 | 89.8 | 83.2 | 112.8 | 149.8 |
| <i>Min.</i> | 3.5 | 11.1 | 16.8 | 5.4 | 1.4 |
| <i>Obs.</i> | 363 | 209 | 187 | 241 | 239 |

Table 5 presents a summary of the main variables for each of the regions. Asian countries account for the highest median values in every variable: relative per capita GDP (37%), institutional quality (more than 65 points in both indices), and financial development (ratios bigger than 80% of the GDP). In terms of economic convergence, they are followed by European economies (32%), the Latin America region (26%), and finally Africa and Middle East countries, which exhibit the poorest economic performance (24%). With regards to institutional quality, European countries appear again with the second best one (around 60 points on average), followed by African and Middle Eastern countries and Latin America (56 and 50 points on average, respectively). As for financial development, Latin America shows the lowest

²⁹An extensive literature have studied a potential nonlinear relationship between financial development and growth, following Patrick (1966) proposal. Regarding the one between institutional quality and growth, literature is more recent and still developing but some authors such as Lee and Kim (2009), Chang (2011) and Law et al (2013) show evidence of the existence of nonlinearities.

value, below 30% of the GDP on both indicators. Europe and Africa and Middle East would be at a midway point between Asian and Latin American, with values between 30% and 45%, depending on the variable.

For each of the regions we perform the same empirical analysis that we presented before. Figures from 2 to 9 in the Appendix depict the results of the four models for each of the regions. Again, we only present the IRFs corresponding to the Cholesky ordering established in hypothesis 2³⁰.

From the analysis of the IRFs we can indicate that the results generally point in the same direction as those obtained with the full sample: a positive and significant relationship that goes from economic growth to financial development and from institutional quality to financial development. On the relationship between institutional quality and relative GDP per capita results do not dispute the bidirectional causality previously found and allow us to deepen the interpretation of the relationship through new theoretical perspectives.

The positive response of the financial development proxies to a shock in relative GDP per capita shows in every region, with the exception of Africa and Middle East, with similar temporal pattern and size. The impact to relative GDP shocks on liquid liabilities is somewhat stronger in Latin America compared to other regions, while Europe shows the biggest response of relative GDP shocks on the private credit. In the Asian countries there is an initial negative and significant effect on the financial variables in year $t+1$, due to the nature of financial development proxies as a ratio of GDP, but the expected positive sign arises in the following years.

Europe appears as an interesting case since it is the only region which shows a bidirectional causality between financial development and economic growth. A positive shock on liquid liabilities causes a positive response of relative per capita GDP of about 0.005% in year $t+2$, and from then it slowly decreases until disappearing five years after. The effect of private credit on the economic growth proxy shows weaker (reaching a size of 0.004%) and shorter (it lasts for 1-2 years). In general, the size of the responses is smaller than the ones of financial development proxies to economic growth shocks, thus confirming the later direction is most common and significant in MICs.

The relationship between institutional quality and economic development is difficult to find when regional subsamples are examined. As we have seen in the full sample analysis, the size of the responses to shocks between these two dimensions are small, therefore it is no easy to find significant relationships when we reduce the number of observations. However, we get some interesting insights by carrying out this exercise. The relation of causality that goes from the legal and property rights index to relative GDP per capita normally does not appear in our estimations³¹. That could mean that the relationship is not linked to any region in particular, but rather some countries from different parts of the world drive this result. For its part, the effect of an improvement of the economic conditions on the quality of government

³⁰The rest of results are available upon request.

³¹Nonetheless, we need to indicate that we find it for the African and Middle-East region but only when setting the Cholesky ordering that corresponds to the hypothesis 3.

index only shows in the Asian region, pointing at the effect of those countries for the general findings when the full sample is analysed. Moreover, the size of the response in Asian countries is bigger (around 0.03% vs 0.01% in the peak) and lasts longer than the one for the whole sample.

The positive effect of relative GDP on quality of government index in Asia is quite interesting, because allows us to interpret the relationship between economic development and institutional quality in new ways. As mentioned previously, due to the fact that regions differ in their level of income, we could observe some nonlinearities (or threshold effects) that govern the relationship between relative GDP and the quality of government index. The idea behind would be that a certain institution can promote growth in a country with a specific level of development, but maybe hampers it in another with a different economic situation³². There exists a numerous group of authors who considered this issue³³, and conclude that the effect of institutions on growth has decreasing returns, i.e. the richer the country, the weaker the relationship. This is something we can also deduct from our results: the fact that Asia is the most developed region of our sample could explain the absence of causality from institutions to economic growth and the existence of the opposite relation³⁴. This finding would also give support to the idea that higher levels of economic growth generate the necessary resources to create, reform and improve institutions (Justesen, 2008).

6 Concluding remarks

In this paper we analyzed the direction of causality between economic growth, institutional quality and financial development within a sample of 50 middle-income countries for the period 1970-2000. From the revision of existing evidence, we came up with three hypotheses on the relationship between these dimensions. To test them we used a panel VAR methodology, which allowed us to disentangle the endogenous relations between the studied dimensions and capture their dynamic nature. Each of the hypothesis was tested by setting a corresponding Cholesky ordering on each model specification.

Our results point to two main findings: a) a significant, strong and positive response of financial development to economic growth shocks that does not appear the other way around, and b) a significant causal relationship between institutional quality and economic performance, whose direction depends on the nature of institutional quality proxies: the legal institutional framework precedes economic growth, while the latter causes an improvement in the quality of government. Thus, these results support not one but two of our hypothesis: the one that works from institutional quality to economic growth, and from the later to financial development (when the institutional variable is the legal and property rights index), and the one that places economic growth as an engine for both institutional quality and financial development (if we use the quality of government index).

³²As an example, Chang (2011) pointed to the level of protection of intellectual property rights: they can bring benefit to a rich country, but be harmful to a developing one.

³³Chong and Calderón, 2000; Lee and Kim, 2009; Law et al, 2013.

³⁴Moreover, the fact that Africa and Middle-East is the only region showing a significant effect from institutions to relative per capita GDP, being the poorest group in our sample, would also contribute to support that idea.

Based on the results we obtain, we can conclude that for middle-income countries growth is partly driven by an improvement of their institutional framework, particularly of their legal and judicial system, and several other factors beyond our analysis. We find no effect of financial development on economic growth. In fact, the deepening of the financial system appears as a consequence rather than a cause of growth in these economies. Economic development also helps to achieve a better institutional performance, measured by the quality of government index. This bidirectional causality between growth and institutional quality can be explained in more than one way, and here we exposed some possibilities: the different nature of our institutional variables (one measure the framework in which the economy works while the other captures the outcome of this development) and the existence of a threshold effect in this relationship, this is, poorer countries tend to benefit more from improvements in institutions than rich ones, where the relation could be the opposite.

The policy implications of our work are manifold. So to achieve a convergence trend and avoid the “middle-income trap”, MICs should put the focus on multiple dimensions of the development process including the quality of their legal system. The emphasis on deepening the financial system that was a policy recommendation for many MICs from the nineties does not seem to have helped boosting economic growth. In fact, financial development is found here to be a product of the later. Some features of institutional quality, particularly the quality of government, appears also as a consequence of improved economic conditions. Naturally, we should highlight certain particularities at the regional level: Asian countries exhibit the strongest relationship from economic growth to quality of government and Europe shows some effect from financial development to growth. However, in general economic growth appears as a force that triggers both the deepening of financial systems and contributes to improve institutional quality. Policies contributing to guarantee a sustainable path of growth could therefore be key for promoting both financial development and institutional quality.

Further research by employing a more granular approach could help to better understand how the relationships work. For instance, the regional exercise developed in this paper could be expanded using different financial or institutional variables, since data availability is usually better for some countries than for others. Other institutional quality indicators such as corruption indices, political regime measures and cultural values proxies as well as other financial development variables, which tackle other dimensions of financial systems, could offer more insights on the topic.

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Appendix

Table 1: Variable definition and sources

| Variable | Definition | Coverage | Source |
|----------------------------------|--|--|---|
| Relative GDP | Real GDP per capita in 1990 international US dollars relative to United States (%). | Countries: 50 countries. Years: 1970-2010. | Maddison Project Database 2013 |
| Liquid liabilities to GDP | Liquid liabilities to GDP. Also known as broad money or M3 (%). | Countries: lack of data for Estonia, Puerto Rico and Taiwan. Years: 1970-2010. | Financial Development and Structure Database (World Bank) |
| Private credit to GDP | Private credit by deposit money banks and other financial institutions to GDP (%). | Countries: lack of data for Puerto Rico and Taiwan. Years: 1970-2010. | Financial Development and Structure Database (World Bank) |
| Legal System and Property Rights | Composite index of the following indicators: judicial independence, impartial courts, protection of intellectual property, military interference in rule of law and the political process, integrity of the legal system. It ranges from 0 to 100, with an increase corresponding to an improvement. | Countries: lack of data for Belarus, Iraq, Libya, and Puerto Rico. Years: 1970-2010. | Economic Freedom of the World (Fraser Institute) |
| Quality of Government | Composite index that comprises the mean value of three sub-indices: corruption, law and order, and bureaucracy quality. It ranges from 0 to 100, with an increase corresponding to an improvement. | Countries: lack of data for Macedonia, Mauritius and Puerto Rico. Years: 1984-2010. | International Country Risk Guide (PRS Group) |
| Public debt to GDP | Gross general government debt to GDP (%). | Countries: lack of data for Iraq and Puerto Rico. Years: 1970-2010. | Historical Public Debt Database (IMF) |
| Patents | Patent applications by residents, divided by population between 15-64 (%). | Countries: lack of data for Oman, Puerto Rico and Taiwan. Years: 1970-2010. | World Development Indicators (World Bank) |
| Terms of trade | Ratio between the index of export prices and the index of import prices (Base year 2000=100). | Countries: lack of data for Puerto Rico and Taiwan. Years: 1970-2010. | World Bank / OECD |
| Tertiary education completed | Percentage of population older than 15 with tertiary education as highest level completed (%). | Countries: lack of data for Belarus, Macedonia, Oman and Puerto Rico. Years: 1970-2010. | Barro and Lee Educational Attainment database |

Table 2: Descriptive statistics

| Variable | Obs. | Mean | Std. Dev. | Min. | Max. |
|----------------------------------|------|---------|-----------|--------|---------|
| Relative GDP | 1865 | 32.288 | 15.715 | 3.474 | 100.765 |
| Liquid liabilities to GDP | 1309 | 49.024 | 34.578 | 4.060 | 313.624 |
| Private credit to GDP | 1320 | 44.016 | 35.907 | 1.119 | 237.580 |
| Legal System and Property Rights | 1347 | 56.905 | 14.170 | 11.467 | 90.937 |
| Quality of Government | 1095 | 57.414 | 16.076 | 11.111 | 94.444 |
| Public debt to GDP | 1434 | 45.087 | 31.821 | 0.551 | 289.554 |
| Patents | 1322 | 0.010 | 0.031 | 0 | 0.364 |
| Terms of trade | 1176 | 106.662 | 24.849 | 50.980 | 253.357 |
| Tertiary education completed | 1886 | 5.974 | 4.901 | 0.160 | 30.04 |

Figure 1: Stability tests

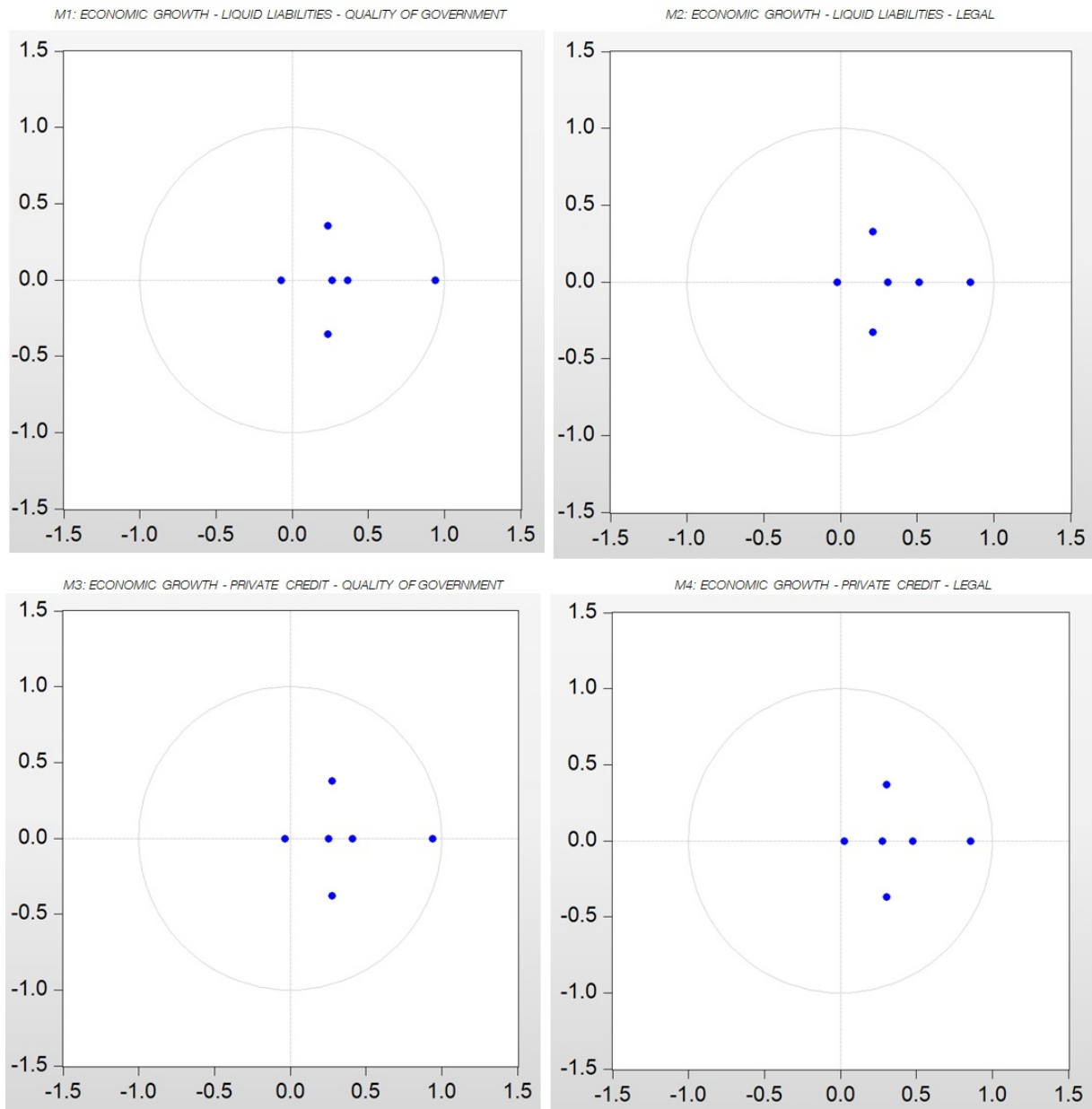
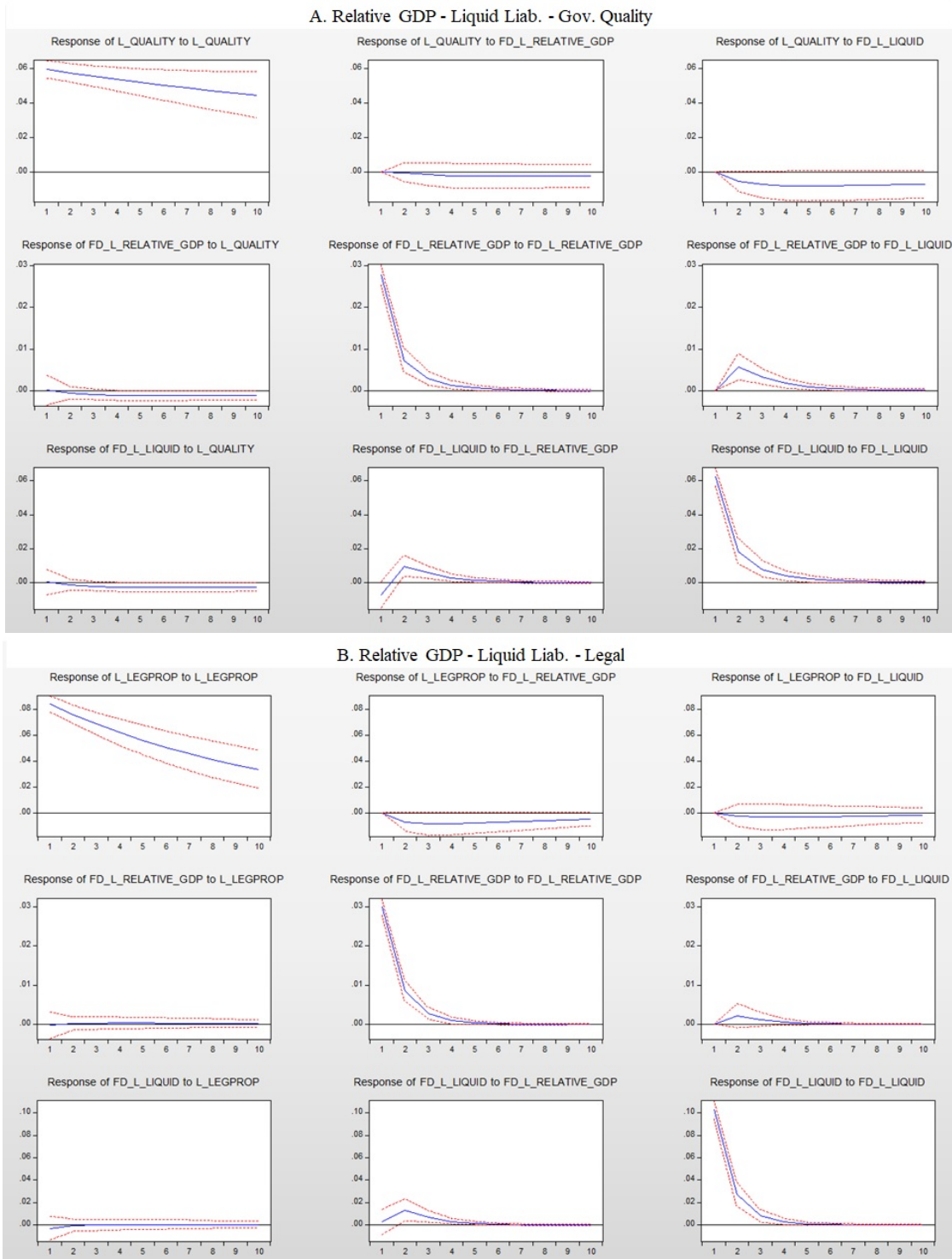
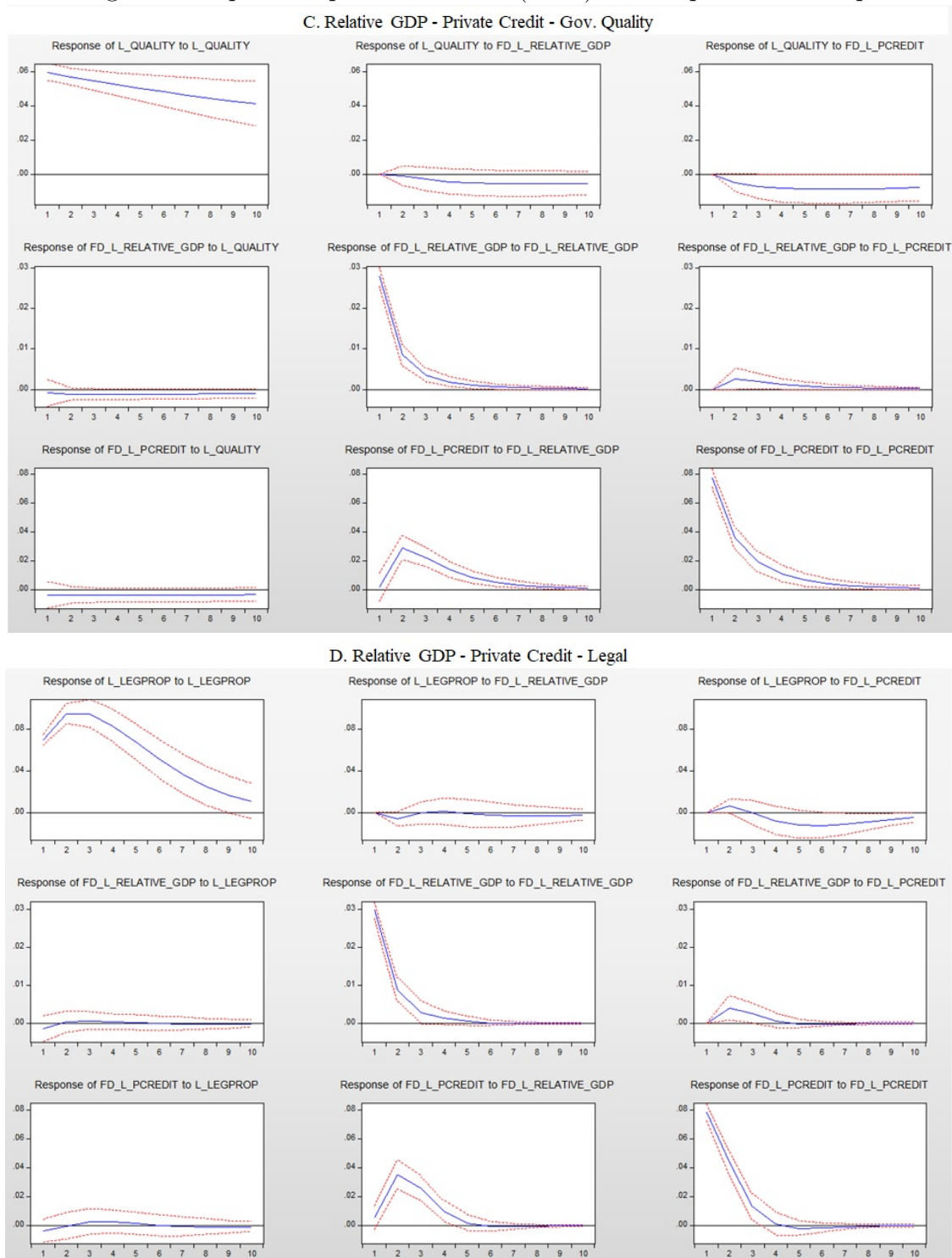


Figure 2: Impulse-response functions (IRFs) for ten periods - Europe



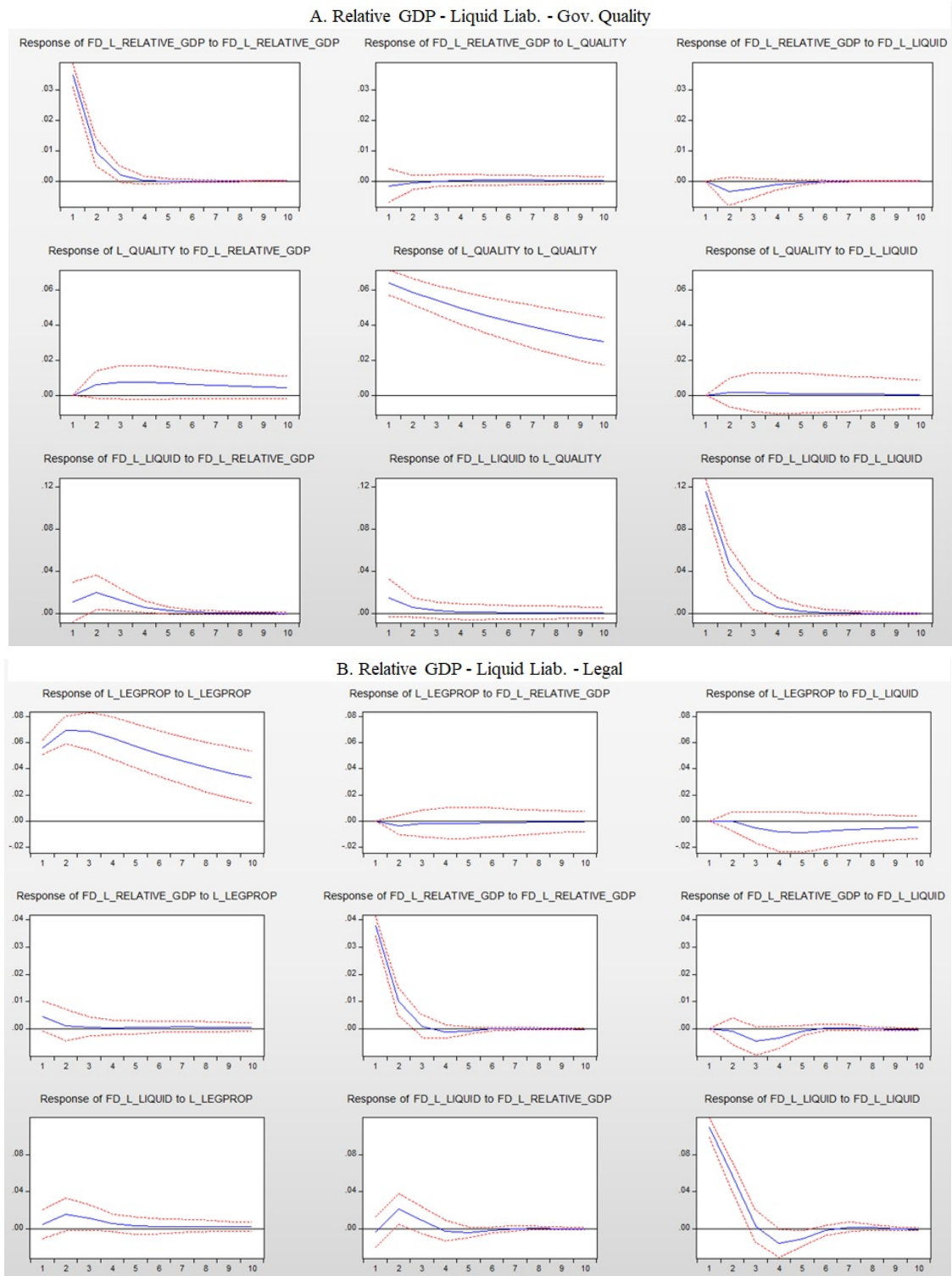
Note: The dashed lines represent the 95% confidence interval using a Monte Carlo procedure with 500 replications.

Figure 3: Impulse-response functions (IRFs) for ten periods - Europe



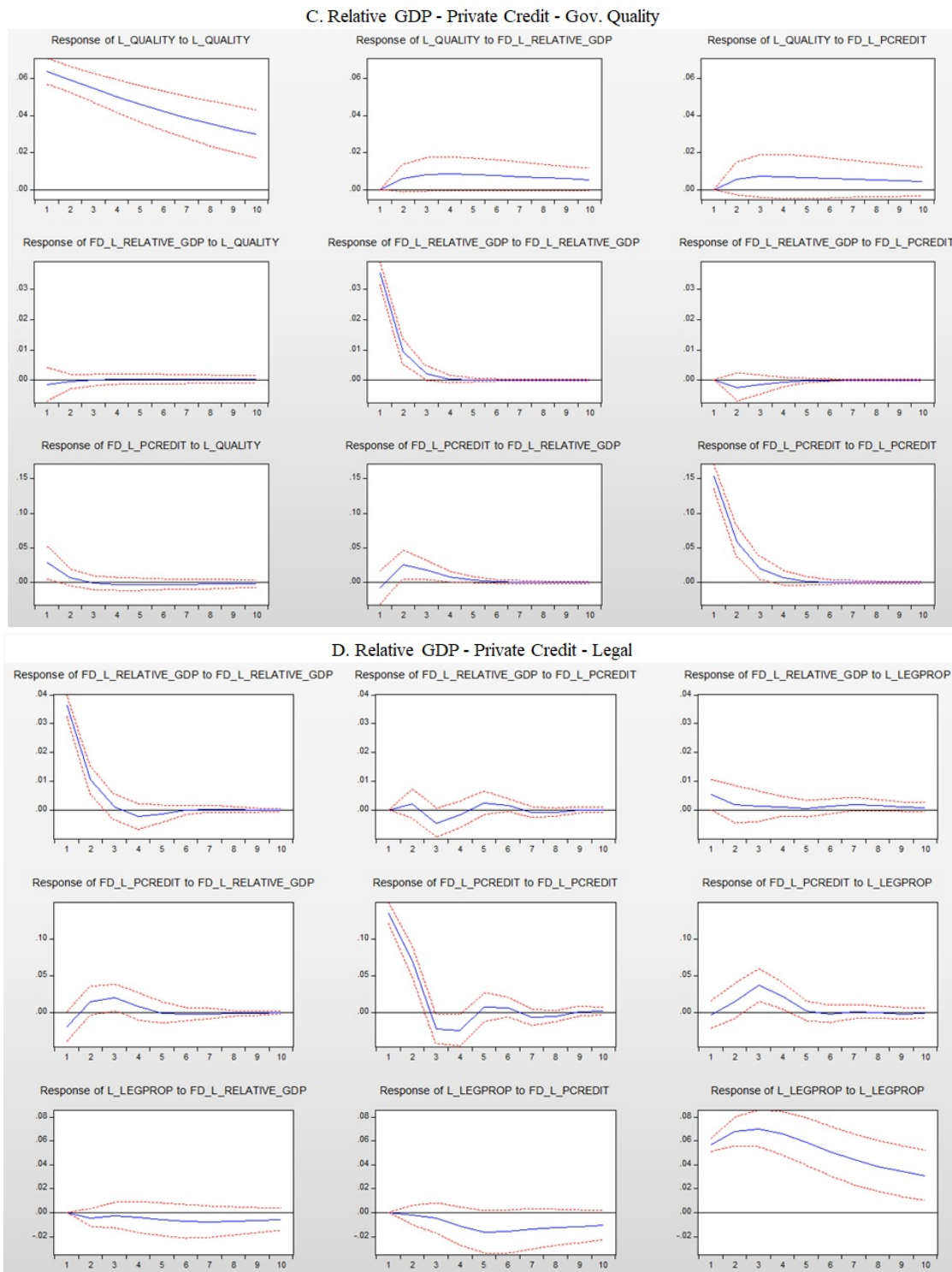
Note: The dashed lines represent the 95% confidence interval using a Monte Carlo procedure with 500 replications.

Figure 4: Impulse-response functions (IRFs) for ten periods - Latin America



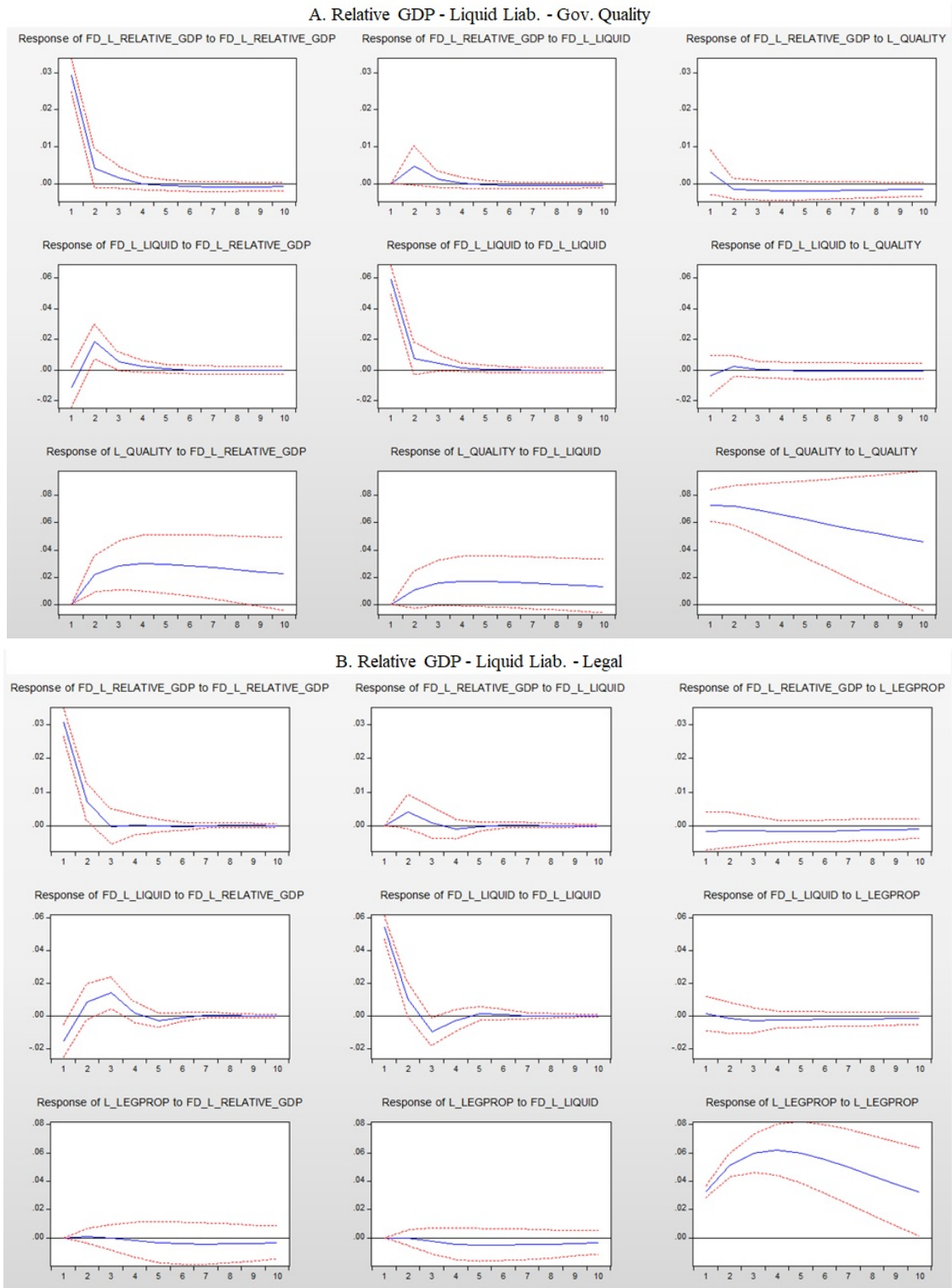
Note: The dashed lines represent the 95% confidence interval using a Monte Carlo procedure with 500 replications.

Figure 5: Impulse-response functions (IRFs) for ten periods - Latin America



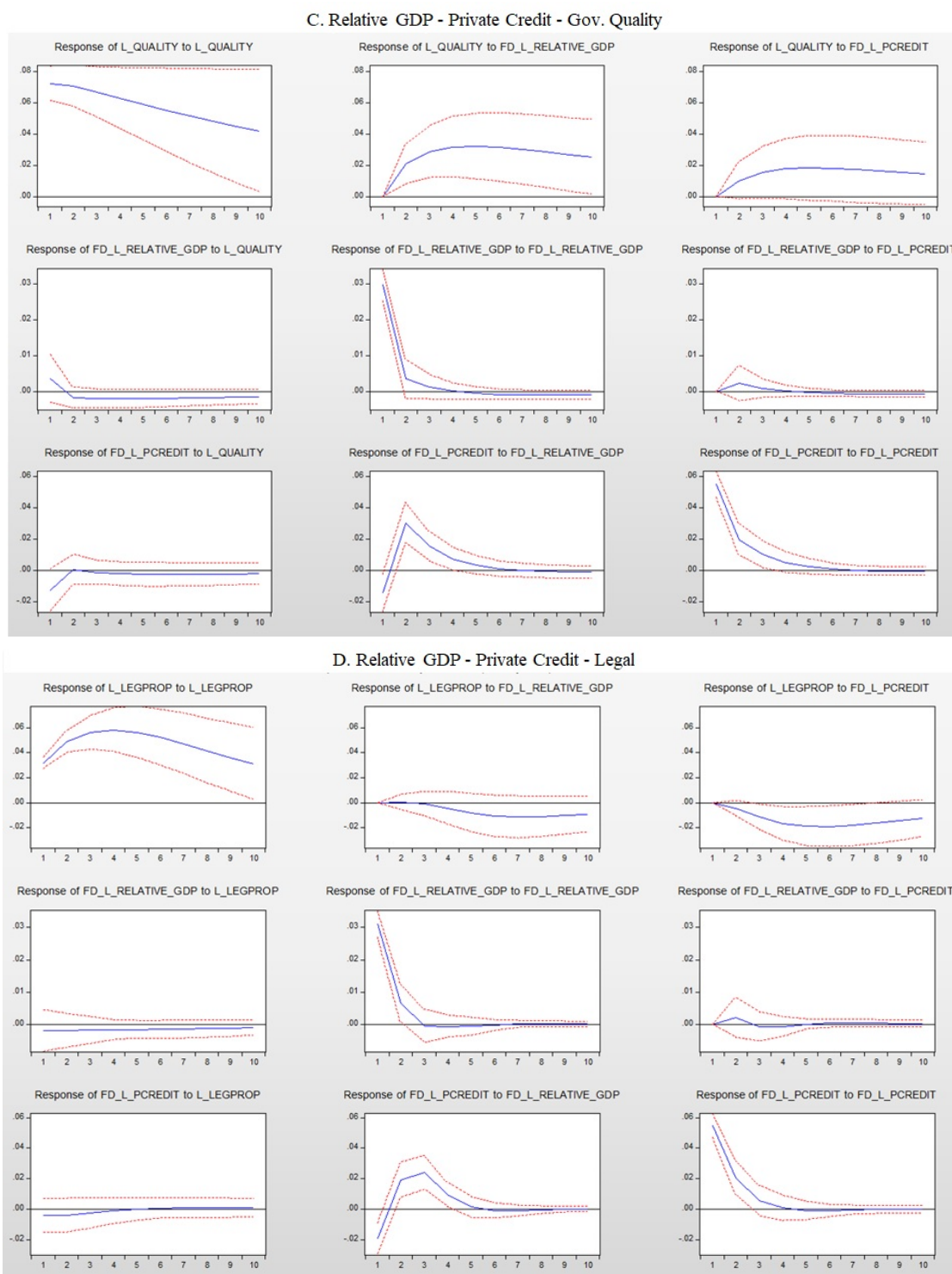
Note: The dashed lines represent the 95% confidence interval using a Monte Carlo procedure with 500 replications.

Figure 6: Impulse-response functions (IRFs) for ten periods - Asia



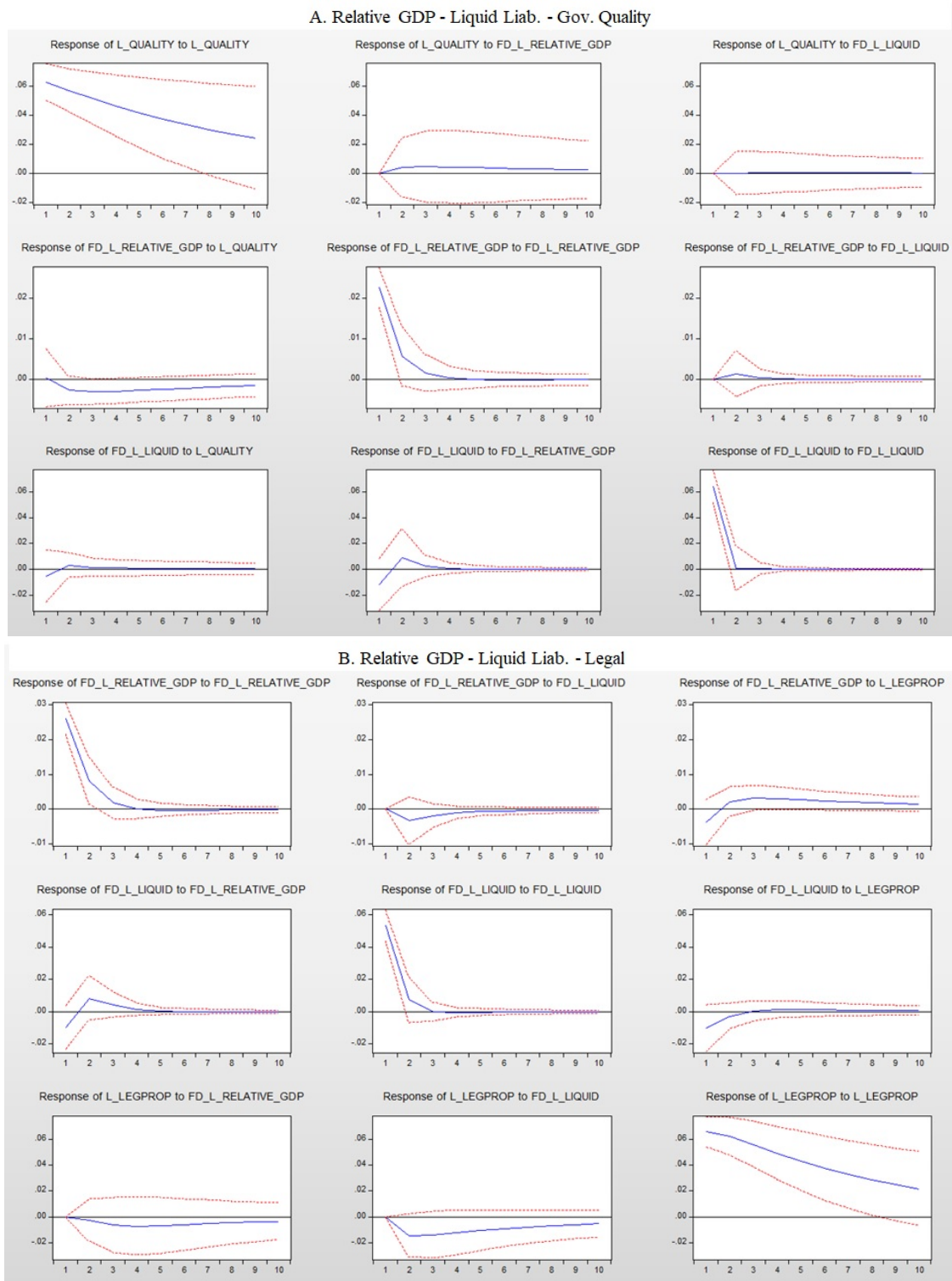
Note: The dashed lines represent the 95% confidence interval using a Monte Carlo procedure with 500 replications.

Figure 7: Impulse-response functions (IRFs) for ten periods - Asia



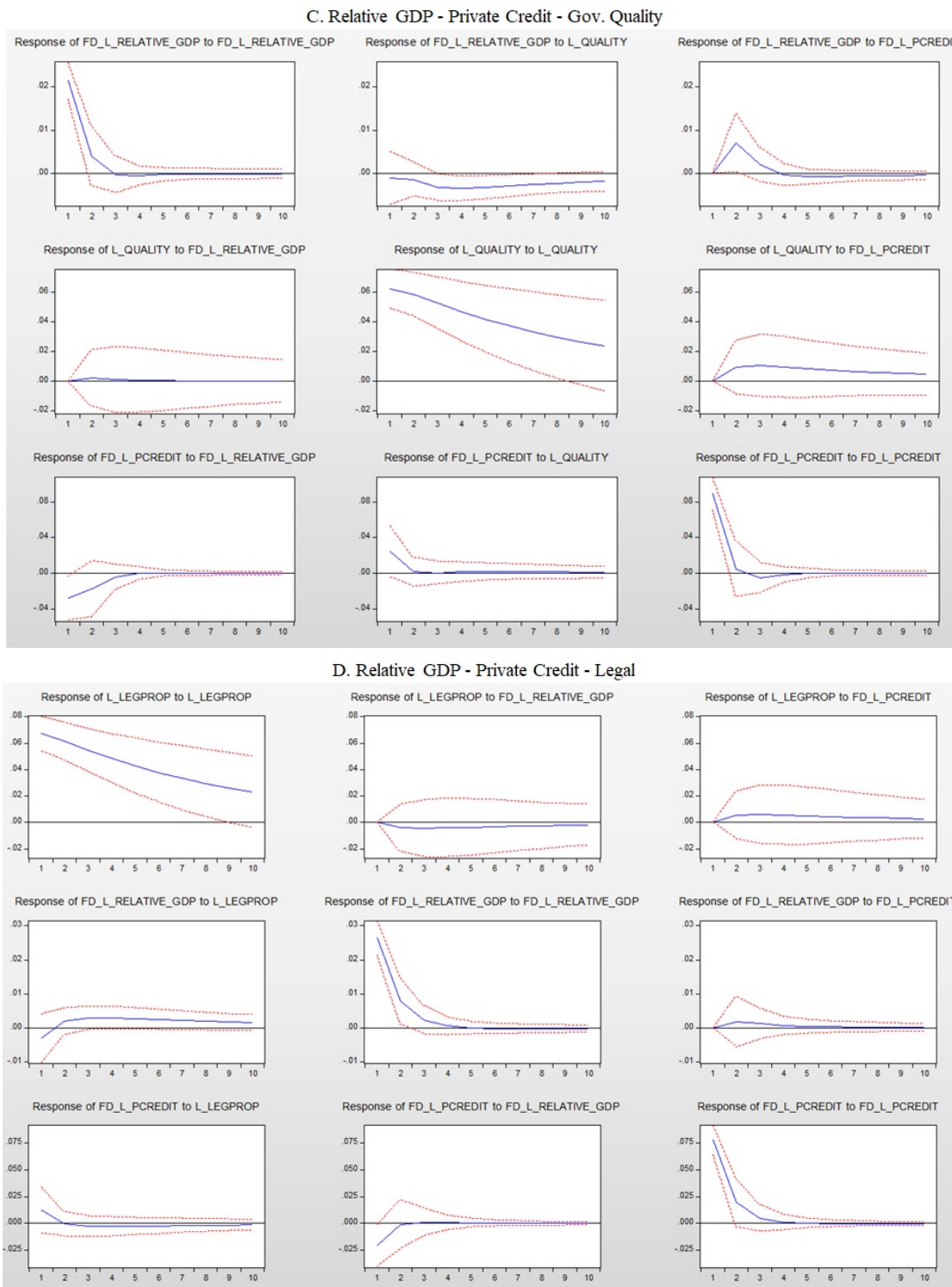
Note: The dashed lines represent the 95% confidence interval using a Monte Carlo procedure with 500 replications.

Figure 8: Impulse-response functions (IRFs) for ten periods - Africa and Middle East



Note: The dashed lines represent the 95% confidence interval using a Monte Carlo procedure with 500 replications.

Figure 9: Impulse-response functions (IRFs) for ten periods - Africa and Middle East



Note: The dashed lines represent the 95% confidence interval using a Monte Carlo procedure with 500 replications.

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