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The dynamic linkage between insurance and banking activities: An analysis on insurance sector assets

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Highlights

- This article studies the dynamic linkage between insurance and banking activities.
- Insurance sector assets are utilized to proxy for insurance activities.
- Insurance assets have an impulse response to banking and financial system activities.
- Impulse responses of banking activities to insurance assets are mostly insignificant.
- The insurance-banking linkage varies across income levels and legal origins.

Abstract

This article investigates the dynamic linkage between insurance and banking activities from the asset size of the insurance sector in the context of a panel vector autoregression (VAR) framework utilizing data for 73 countries from 1980 to 2014. Panel Granger-causality tests show that a Granger-causal relation generally runs from banking activities to insurance sector assets. Impulse response analyses for the whole sample demonstrate that the size of insurance assets responds positively to a shock to liquid liabilities and deposits of the financial system, but negatively to a shock to deposit money bank assets as well as private credit issued by commercial banks, other financial institutions, and deposit banks. The observations are qualitatively identical for high-income countries, while the results are largely different for middle- and low-income countries. Moreover, we observe a significant

interaction between insurance and banking activities in civil-law countries rather than in common-law ones.

Key words: Insurance activities; Banking activities; Panel Granger causality test; Panel VAR approach.
JEL classification: C23, G21, G22,

Introduction

The banking and insurance sectors, two major branches of the financial industry, exert a substantial influence on an economy's operations. The banking sector contributes to the economy mainly by financial intermediation that channels funds efficiently between savings and investments and thus promotes capital formation. The insurance sector, on the other hand, matters mainly in terms of risk transfer and loss indemnity that could mitigate threats of risk, which could sustain an entity's resistance to risk and thus encourage production activities. Moreover, the insurance sector also exerts a financial intermediary function, because the considerable premiums it collects constitute an important funding source for capital markets.

Academic studies do find evidence that generally supports the relevance of the two sectors by documenting a positive connection between economic growth and banking (Beck et al., 2000; Levine et al., 2000) and insurance activities (Arena, 2008; Han et al., 2010). Although the banking and insurance sectors exert different functions for an economy, some interrelations are present between them. The two sectors cooperate as well as compete in many respects. For instance, risk transfer and loss indemnity provided by the insurance sector, mainly in the non-life insurance sector, alleviate the impact of adverse shocks on production activities and could thus protect banks' loans indirectly, which can encourage more loans and further promote financial intermediary activities of banking. Moreover, banks are an important channel for the sale of insurance products, the so-called bancassurance, in

some countries, and the practice has gradually been adopted in other parts of the world. On the other hand, as financial institutions, the banking and insurance sectors, mainly the life insurance sector, both absorb funds from society and make loans or investments, and therefore some competition for funds between them may be present.

The literature does implicitly or indirectly document a complementary (Webb et al., 2002; Beck and Webb, 2003; Bernoth and Pick, 2011; Lee and Chang, 2015) as well as substitutive (Haiss and Sümegi, 2008; Tennant and Abdulkadri, 2010) relation between the two sectors when exploring the relevance of banking or insurance activities to the economy. Song and Thakor (2010) show that insurance activities and bank credit may be complementary or substitutive under different circumstances. The divergent evidence suggests that the linkage between insurance and banking activities may be so intricate that an investigation from different perspectives is warranted in order to have a deeper realization.

Some studies have been devoted to directly examining the linkage between insurance and banking activities. Liu et al. (2014) look into the long- and short-run relation between insurance activities and banking credit for G-7 countries, finding a long-run complementary relation between the series and that the short-run causal relations between banking credit and insurance activities vary across countries and are not stable. Liu and Zhang (2016) also demonstrate a long-run complementary association between insurance activities and banking credit for an extended sample of 45 countries and that the relation varies with national income levels and across time. The evidence shows that the complement or substitute between the insurance and banking sectors may be time-variant.

The aforementioned divergent evidence motivates this article to explore the linkage between insurance and banking activities from an alternative angle. Prior studies commonly measure insurance activities with insurance density or penetration,

which is directly related to insurance premiums. This article instead focuses on assets of the insurance sector. The asset side could more fully represent entire activities of the insurance sector as it encompasses all aspects of insurance activities, including premiums, investments, and debts such as every kind of reserves. Because investments stand in a dominant position for the accumulation of assets of the insurance industry, the assets may to a large extent reflect the sector's investment activities. Therefore, the assets could reflect all contents of insurance activities such as risk transfer, loss indemnity, and financial intermediation when compared to insurance premiums that merely reflect former two aspects. We investigate the dynamics between insurance and banking activities in the context of a panel vector autoregression (VAR) framework. To explore the issue more deeply, we utilize several indicators that are associated with activities of banking and the whole financial system, including liquid liabilities and deposits of the financial system, deposit money bank assets, and private credit by commercial banks as well as other financial intermediaries and from deposit banks. These indicators represent different dimensions of banking or financial system activities respectively, thus enabling this article to explore the linkage between insurance and banking activities from a more comprehensive perspective.

In empirical analyses we first perform the panel Granger-causality test to check the causal relation and then employ impulse response functions to observe the dynamics between insurance and banking as well as financial system activities. The results show that a Granger-causal relation runs from banking and financial system activities to the size of insurance assets, while the opposite direction is generally not significant, suggesting that it is banking and financial system activities that have a time-leading effect on insurance asset size rather than the other way around. Impulse response analyses reveal that the size of insurance sector assets exhibits a positive response to a shock to liquid liabilities and deposits of the financial system, but

responds negatively to a shock to deposit money bank assets and private credit issued by commercial banks and other financial institutions and from deposit banks. The response of banking activities to a shock to insurance assets is in general insignificant. The results imply that a fluid monetary flow system and sufficient deposit sources could be complementary to the accumulation of assets of the insurance sector, whereas more private credit from the banking sector and an increase in bank assets may be substitutive for this accumulation. Our findings thus suggest that complement or substitute of the insurance and banking sectors may be dimension-specific to different banking activities.

To see whether the dynamics between insurance and banking activities vary with country characteristics as documented in the literature, we divide sample countries into different groups. First, the results grouped based on income levels show that the dynamics between insurance and banking activities in high-income economies are qualitatively similar to those of the entire sample. However, in middle- and low-income economies private credit from commercial banks and other financial institutions has a significantly positive response to a shock to insurance sector assets, but the response of insurance assets to banking and financial system activities is generally insignificant. The results suggest that the interactions between the insurance and banking sectors vary with the level of economic development. The findings somewhat echo Liu and Zhang's (2016) argument that at the early stage of economic development the insurance sector may promote the development of the banking credit market due to its function in risk compensation and management.

Second, the literature has documented that institutional factors such as legal rules are relevant to financial development (La Porta et al., 1997; La Porta et al., 1998; Levine et al., 2000; Mayer and Sussman, 2001; Beck et al., 2003). Moreover, studies also demonstrate that institution-related variables exert an influence on the development of the insurance sector (Ward and Zurbruegg, 2002; Beck and Webb,

2003; Esho et al., 2004). Therefore, this article also examines if legal origin makes a difference in the dynamics between insurance and banking activities. Empirical results show that the interactions between the two financial sectors are insignificant in common-law countries. In civil-law countries, however, insurance sector assets have a positive response to a shock to liquid liabilities and deposits of the financial system, but respond negatively following a shock to private credit from commercial banks, other financial institutions, and deposit banks, which are qualitatively similar to the results of the whole sample. La Porta et al. (1997) demonstrate that investor protections are relatively stronger in common-law countries than in civil-law countries. Our findings suggest that the legal system favorable to investor protections may not be relevant to the interactions between the insurance and banking sectors.

This article contributes to the literature by demonstrating that complement or substitute of the insurance and banking sectors may depend on the attribute of banking or financial system activities. Our evidence shows that the relation between the two sectors may be substitutive when it comes to the supply of funds for the private sector, and the relation may be complementary when the fund flow of the financial system is fluid. In this regard, our results seem at first glance to be inconsistent with those of Liu et al. (2014) and Liu and Zhang (2016) who find a complementary relation between insurance activities and banking credit. However, this is not the case, because Liu et al. (2014) and Liu and Zhang (2016) measure insurance activities with insurance density that represents insurance premium per capita, which reflects risk transfer and indemnification of insurance. This study instead looks at the asset side of the insurance sector, which contains investments that reflect the financial intermediary function of insurance besides risk transfer and indemnification. Our findings thus suggest that the interactions between the insurance and banking sectors may be more complicated when an extended measure

of insurance activities is applied. As such, our study could complement rather than contradict that of Liu et al. (2014) and Liu and Zhang (2016). Our results that the interactions between the two financial sectors vary with the level of economic development, which are consistent with Liu and Zhang's (2016) findings, suggest that sector-specific policies should be applied depending on the national development level

The article is organized as follows. The next section states the empirical methodology and data. Section 3 presents empirical findings and possible explanations. The final section concludes.

Empirical methodology and data

This article utilizes a panel VAR approach to explore the dynamic relations between the asset size of the insurance sector and banking activities. The panel VAR methodology is suitable for this sake, because it does not assume any a priori direction of feedbacks between variables involved in the model and allows the variables to be a function of past values of each other. We structure our panel VAR model as follows:

$$\begin{aligned} INS_{it} &= \sum_{j=1}^{L} \alpha_j INS_{it-j} + \sum_{j=1}^{L} \beta_j FIN_{it-j} + \varepsilon_{it}^{INS} \\ FIN_{it} &= \sum_{j=1}^{L} \delta_j FIN_{it-j} + \sum_{j=1}^{L} \gamma_j INS_{it-j} + \varepsilon_{it}^{FIN} \end{aligned}, \quad (1)$$

where *INS* represents the ratio of insurance sector assets to GDP, *FIN* denotes indicators that measure different banking activities, ε_{it} is the error term, and *i* and *t* index countries and year, respectively.

We utilize five indicators that could measure financial intermediary activities of the banking sector or the whole financial system: liquid liabilities of the financial system divided by GDP (LLY), deposit money bank assets divided by GDP (DMBA), the ratio of credit issued to the private sector by commercial banks and

other financial intermediaries to GDP (PRY), the ratio of financial system deposits to GDP (FSD), and private credit from deposit banks divided by GDP (BC). Among these measures, LLY and DMBA could reflect the size of the financial intermediary, and PRY, FSD, and BC could represent the level of financial intermediary activities provided to the private sector (Ahmed, 2016). We examine the lead-lag relation between insurance asset size and the five financial intermediary indicators respectively and therefore estimate five pairs of equations. Appendix Table A1 summarizes the variable definitions.

The panel VAR is not plagued by the simultaneity issue, because it estimates variables within the model as functions of their past values. Serial correlation in the error terms could be eliminated by including appropriate lag lengths within each equation. We determine the lag length of each equation based on the Akaike information criteria (AIC). Lag lengths vary across each pair of equations, with three lags for pairs of insurance asset size with LLY, DMBA, PRY and BC, and one lag for the pair of insurance asset size with FSD.

We obtain data on the ratio of insurance assets to GDP from the Global Financial Development database of the World Bank and extract data on banking and financial system activities from the financial structure dataset constructed by Beck et al. (2000, 2009) and Čihák et al. (2012). The data structure is an unbalanced panel due to differences in data availability across countries. We require at least ten-year consecutive observations for countries included in our sample. The final sample consists of 1,143 observations for 73 countries with the period spanning from 1980 to 2014. Appendix Table A2 summarizes the countries included as well as the corresponding period.

Figure 1 displays the ratio of insurance industry assets to GDP for our sample countries from 1980 to 2014. It shows that the ratio of insurance industry assets to GDP exhibits an increasing trend in 1980s and maintains a steady level at nearly

20% of GDP after the 1990s. The stable pattern suggests that the insurance industry may be resistant to economic cycles.

[Insert Figure 1 about here]

Table 1 presents summary statistics of the cross-sectional averages of the six variables across sample countries. As can be seen, the size of insurance assets and banking activities relative to GDP varies greatly across the sample countries, in which Chad has the lowest value, on average, in all six variables. France has the highest ratio of insurance industry assets to GDP, Hong Kong has the highest LLY and FSD, Japan has the highest DMBA and PRY, and Iceland has the highest BC. Moreover, the size of insurance industry assets relative to economic output is materially smaller than that of banking activities. This large variation could favor our investigation on the dynamic relationship between the entire activities of the insurance sector and that of the banking sector as well as the whole financial system.

[Insert Table 1 about here]

Empirical results

A requirement of the panel VAR methodology is stationarity of data. As such, we conduct panel unit root tests to check the stationarity of all variables before estimating Equation (1). Because our data structure is an unbalanced panel, we adopt Im et al. (1995; IPS) and Fisher-type panel unit root tests that allow for an unbalanced panel structure and account for panel-specific effects and time trends. The results in Appendix Table A3 show that all variables have a unit root except the insurance variable, and all series are stationary after first differencing. As banking activity variables are non-stationary and to have a parallel structure between the series, we difference all variables for the subsequent panel VAR analyses.

Impulse response functions

In this section we graph impulse response functions (IRFs) to visualize the

dynamic relations between the size of insurance assets and banking as well as financial system activities. We estimate the orthogonalized IRFs based on the Cholesky decomposition in which the orthogonalized IRFs may vary with the order of variables (Abrigo and Love, 2016). Variables that come ahead in the ordering will affect variables that come after contemporaneously, while variables coming later will have a lagged impact of one period on variables coming ahead. For the dynamic relation between insurance and banking activities, intuitively speaking, it is likely that banking activities would be advantageous to insurance activities, because a well-developed financial intermediary system such as depositing or remitting could favor the proceeding of insurance activities, whether for the collection of premium or investments. On the other hand, insurance activities may be beneficial for banking activities as well. For instance, fund flows of the insurance sector such as collection of premium or investment activities could increase liquidity of the banking sector. Therefore, banking activities may exert an instantaneous effect on insurance activities and vice versa. We determine the order of variables based on Granger-causality testing results when performing the panel VAR analysis, i.e., variables are placed first by turns if they have a bidirectional Granger-causal relationship, and a variable will always be put ahead if it Granger-causes another variable, but the opposite direction is not significant.

Table 2 presents the Granger-causality tests between insurance sector assets and the five indicators of banking and financial system activities for the entire sample. The results reveal that all five banking variables Granger-cause the size of insurance sector assets at a high significance level, while the Granger-causal relation from insurance assets to banking activities is in general insignificant except for liquid liabilities of the financial system. The results suggest that it is more likely that banking or financial system activities Granger-cause entire insurance activities.

[Insert Table 2 about here]

Figure 2 presents analyses for the impulse response of insurance assets to a shock to activities in the banking sector and in the financial system over the following ten-year period. The solid line is the estimated response, and the dash lines represent the 95% confidence interval of the estimate. As can be seen, the response of insurance asset size to banking and financial system activities varies across different indices. A positive shock to liquid liabilities of the financial system divided by GDP (row 1 and column 1) and the ratio of financial system deposits to GDP (row 2 and column 2) has a positive impact on the ratio of insurance assets to GDP. The size of insurance assets relative to GDP increases in the first year following a rise in liquid liabilities, although it decreases and the effect turns insignificant from the second year. Moreover, the insurance asset size increases in the first year following a rise in financial system deposits and starts to decrease from the second year, with the effect becoming insignificant after two years. The results suggest that an expansion in liquid liabilities and deposits of the financial system could exert an instant and positive impact on the increase in the size of insurance assets.

[Insert Figure 2 about here]

The size of insurance assets relative to GDP decreases following an increase in deposit money bank assets divided by GDP (row 1 and column 2) and the ratio of credit issued to the private sector by commercial banks and other financial intermediaries to GDP (row 2 and column 1). The impact is, however, insignificant for the first two years and becomes significant in the third and fourth years. The relative size of insurance assets does not show a change in the first year, but decreases in the next two years following a shock to private credit from deposit banks (row 3 and column 1). The impact is significant in the third and fourth years.

Our findings above display that the size of liquid liabilities as well as deposits of the financial system relative to the overall domestic output exerts an instant and

positive impact on the asset size of the insurance sector. As liquid liabilities, representing broad money according to Beck et al. (2000, 2009) and Čihák et al. (2012), cover almost all kinds of currency and deposits within the economic system, this indicator could reflect the scale and flows of funds. Our empirical results thus suggest that a more fluid monetary circulation may help expand the size of insurance assets. A possible explanation is that a fluid monetary flow system could increase efficiency of fund disposition for the insurance sector, eventually favoring accumulation of assets. On the other hand, deposits in the financial system are also advantageous to a rise in insurance asset size. As the indicator reflects available deposit resources for the financial sector's lending activities, the findings here suggest that sufficient usable deposits within the financial sector are beneficial for the insurance industry to enlarge its asset size. Deposits constitute one of insurance firms' many investment instruments and are also a port for insurance firms to temporarily place their funds when awaiting better investment opportunities. This could increase insurance companies' flexibility in fund utilization besides earning interest revenues. Therefore, more available deposit sources in the financial sector may be associated with a subsequent rise of insurance asset size.

The size of insurance assets responds negatively to the remaining three indicators: deposit money bank assets, credit issued to the private sector by commercial banks and other financial institutions, and private credit from deposit banks, all of which are divided by GDP. The results exhibit that the size of insurance assets relative to GDP diminishes when assets of deposit money banks rise, which is expectable, because there is a trade-off relation between the asset size of the banking and insurance sectors under a given asset size of the financial sector. The insurance asset size decreases as well when credit issued to the private sector by deposit money banks and other financial institutions increases. One explanation is that when the real sector gets bank credit for its production activities, it might lower its

demand for funds from the insurance sector whose investments consist of an important fund source of the capital markets. The competition in fund usage suggests that there might be a substitutive effect between the asset sizes of the banking and insurance sectors.

For the response of banking activities to the size of insurance assets, Figure 3 reveals that indicators of banking and financial system activities decrease following a rise in the size of insurance assets. However, the response is in general not statistically significant, because the confidence intervals cover the zero line throughout the whole estimated period. The results somewhat correspond to the Granger causality testing results above and suggest that growth in the size of insurance assets seems not relevant at stimulating activities of the banking sector and of the overall financial system.

[Insert Figure 3 about here]

Difference of economic development level

In this section we explore if different economic development levels make a difference in the lead-lag relation between the size of insurance assets and banking activities. The degree of economic development is determined based on income levels, and sample countries are grouped according to country classifications by the World Bank. As there are only four low-income countries in our sample, we combine them with middle-income countries and divide the sample into two groups: high-income versus middle- and low-income countries. Table 3 presents tests of the Granger-causal relation between insurance asset size and banking activities for the two groups. The results reveal that a significant Granger-causal relation is observed from banking activities to the size of insurance assets for high-income economies, while the relation is not significant for the opposite direction. The results are, however, mixed for the middle- and low-income group. There is a bidirectional Granger-causal relation between insurance asset size and private credit by deposit

money banks as well as other financial institutions at a high significance level. A bidirectional effect is observed as well between insurance asset size and private credit from deposit banks, although the significance in the direction from insurance to banking activities is only marginal. The size of insurance assets Granger-causes liquid liabilities and deposits of the financial system at the 10% significance level, and deposit money bank assets Granger-causes the size of insurance assets at the 5% significance level.

[Insert Table 3 about here]

We also conduct impulse response analyses based on the causal path from the Granger causality tests here. Figure 4 presents the response of insurance asset size to the shock in banking activities for the high-income countries. The results show that the size of insurance assets relative to GDP rises following an increase in liquid liabilities of the financial system (row 1 and column 1) and financial system deposits (row 2 and column 2) in high-income economies. The patterns are similar to those of the whole sample above- that is, insurance asset size rises in the first year following the shock and decreases thereafter. The size of insurance assets responds negatively to the shock in the remaining three indicators. As the results for the high-income group are qualitatively similar to those of the whole sample, the aforementioned explanations are applied here.

[Insert Figure 4 about here]

Figure 5 graphs the impulse response of insurance asset size to a shock in banking activities for middle- and low-income economies. It shows that the size of insurance assets generally displays a decreasing pattern following a shock to banking activities in middle- and low-income countries, and the effects are mostly insignificant. The results here reveal that banking activities seem more relevant to the size of insurance assets in high-income economies than in non-high income ones. This suggests that the rise in the degree of country development may be beneficial

for banking activities to stir the expansion of the insurance sector's asset size.

[Insert Figure 5 about here]

With respect to the impact of insurance asset size on banking activities, Figure 6 shows that the response of banking as well as financial system activities to a shock to insurance asset size is mostly insignificant in high-income countries. For middle- and low-income countries, Figure 7 displays that credit issued to the private sector by commercial banks and other financial institutions (row 2 and column 1) responds positively to the size of insurance assets, and the impact remains statistically significant for five years and is relatively persistent within the first three years and slightly decreases then. Private credit from deposit banks (row 3 and column 1) also has a positive response to the size of insurance assets, but the estimated impulse responses are mostly insignificant. The results imply that the expansion of insurance sector assets could be advantageous for the private sector to acquire financial resources from the financial system when the country is relatively underdeveloped. A possible reason is that fund sources for the private sector may be relatively scarce when the level of economic development is lower, and funds from the insurance sector as one main institutional investor of capital markets could contribute materially to the financial resources.

[Insert Figures 6 and 7 about here]

Influence of legal origin

The literature has documented that institutional factors such as legal rules matter for the development of capital markets including debt and equity markets (La Porta et al., 1997). As the development of capital markets is closely correlated with that of the financial sector, it is not unreasonable to expect that institutions are relevant as well to the development of the banking and insurance sectors. In this sub-section we examine if a country's legal origin makes a difference in the

dynamic relation between insurance asset size and activities of banking as well as the overall financial system. Table 4 presents the Granger causality tests for common- and civil-law countries, showing no significant Granger-causal relation in common-law countries. A significant Granger-causal relation is, however, observed from banking and financial system activities to insurance assets in civic-law countries. The results suggest that banking and financial system activities may exert some influence on the asset size of the insurance sector in civil-law countries.

[Insert Table 4 about here]

We further observe the dynamic relations by graphing impulse response functions. Figures 8 and 9 display the impulse response of insurance assets to a shock to banking and financial system activities for common- and civil-law countries, respectively. As can be seen in Figure 8, the impulse response of insurance assets to a shock to activities of the banking sector and of the financial system is insignificant in common-law countries. On the other hand, Figure 9 exhibits that insurance assets respond positively following a shock to liquid liabilities (row 1 and column 1) and deposits (row 2 and column 2) of the financial system for the first year, and the impact becomes insignificant after two years in civil-law countries. A shock to private credit issued from commercial banks and other financial institutions (row 2 and column 1) and from deposit banks (row 3 and column 1) is followed by a negative response of insurance assets, and the impact is statistically significant in the third year. The response of insurance assets to a shock to remaining financial indicators is mostly insignificant. Figures 10 and 11 exhibit that the impulse response of banking and financial system activities to a shock to insurance assets is generally insignificant for the two legal traditions.

[Insert Figures 8~11 about here]

The results above reveal that an expansion in liquid liabilities and deposits of the financial system may favor the growth of insurance asset size in civil-law

countries. La Porta et al. (1997) find that common-law countries have relatively stronger investor protection and more developed capital markets that include equity and debt markets when compared to civil-law countries. The literature has also shown that institutional factors have some influence on the development of financial intermediation (La Porta et al., 1998; Levine et al., 2000; Mayer and Sussman, 2001; Beck et al., 2003) and that of the insurance sector (Ward and Zurbruegg, 2002; Beck and Webb, 2003; Esho et al., 2004). Our findings imply that legal rules advantageous to investor protections may not be so relevant to the interactions among activities of the insurance sector and those of the banking sector, although they may matter for the development of respective sectors.

Conclusions

This article investigates the dynamic relation between insurance and banking activities in the context of a panel VAR approach. Different from previous studies that commonly measure insurance activities from the angle of insurance premiums that reflect the function of risk transfer and loss indemnity of insurance, this article focuses on the asset side of the insurance sector that could reflect more aspects of insurance activities. Using data on 73 countries over 1980 to 2014, this article shows that a Granger-causal relation runs from banking and financial system activities to insurance industry assets rather than the other way around. Analyses of impulse response functions show that insurance industry assets have a positive response to a shock to liquid liabilities as well as deposits of the financial system, but respond negatively to a shock to deposit money bank assets and private credit issued by commercial banks, other financial intermediaries, and deposit banks. The findings imply that a fluid monetary flow system and sufficient deposit resources could benefit the expansion of assets in the insurance sector. The response of banking activities to a shock to insurance assets is generally insignificant.

The results for the whole sample in general apply to high-income countries, but those for middle- and low-income countries are mixed. The responses of insurance asset size to banking activities in middle- and low-income countries are mostly insignificant. Private credit issued by commercial banks and other financial institutions responds positively to insurance asset size for middle- and low-income countries, implying that encouraging activities in the insurance sector such as investments may be beneficial to the private sector due to more fund sources when the level of economic development is relatively underdeveloped. The response of insurance asset size to banking activities is generally insignificant in common-law countries as well. For civil-law countries, the size of insurance assets responds positively to a shock to liquid liabilities and deposits of the financial system, but negatively to a shock to private credit issued from commercial banks, other financial institutions, and deposit banks. The findings suggest that although legal rules advantageous to investor protections, i.e., in common-law origin documented in the literature, exert some effect on the development of the respective financial sector, they may not be relevant to the interactions among different sectors.

Our findings produce some policy implications. A positive response of private credit from the financial sector to insurance asset size in middle- and low-income countries implies that insurance activities may benefit financial intermediation in these economies. Therefore, policies to encourage insurance activities may increase financial access of the private sector, which could promote capital formation, when the level of economic development is relatively underdeveloped. When the level of economic development enters the developed stage, policies to advance liquidity in the economic system, for instance, by maintaining an effective payment system, may help boost insurance activities.

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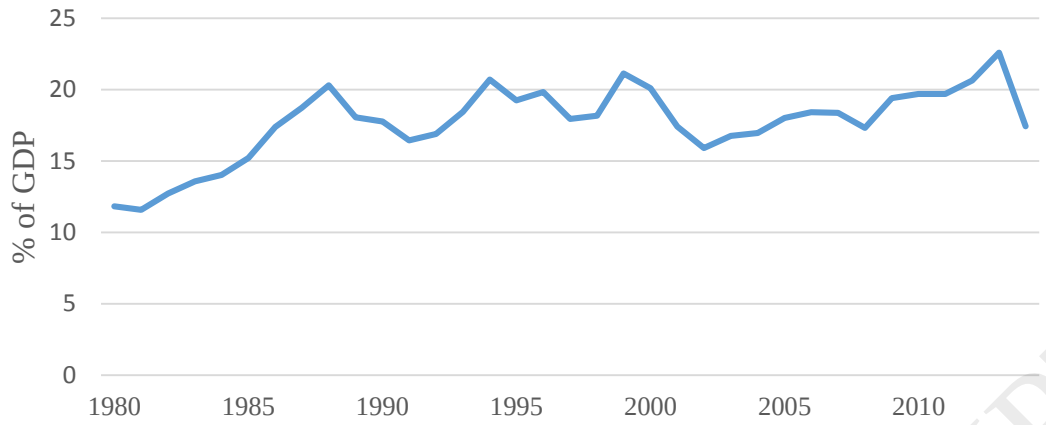

Figure 1 Trends in the ratio of insurance industry assets to GDP

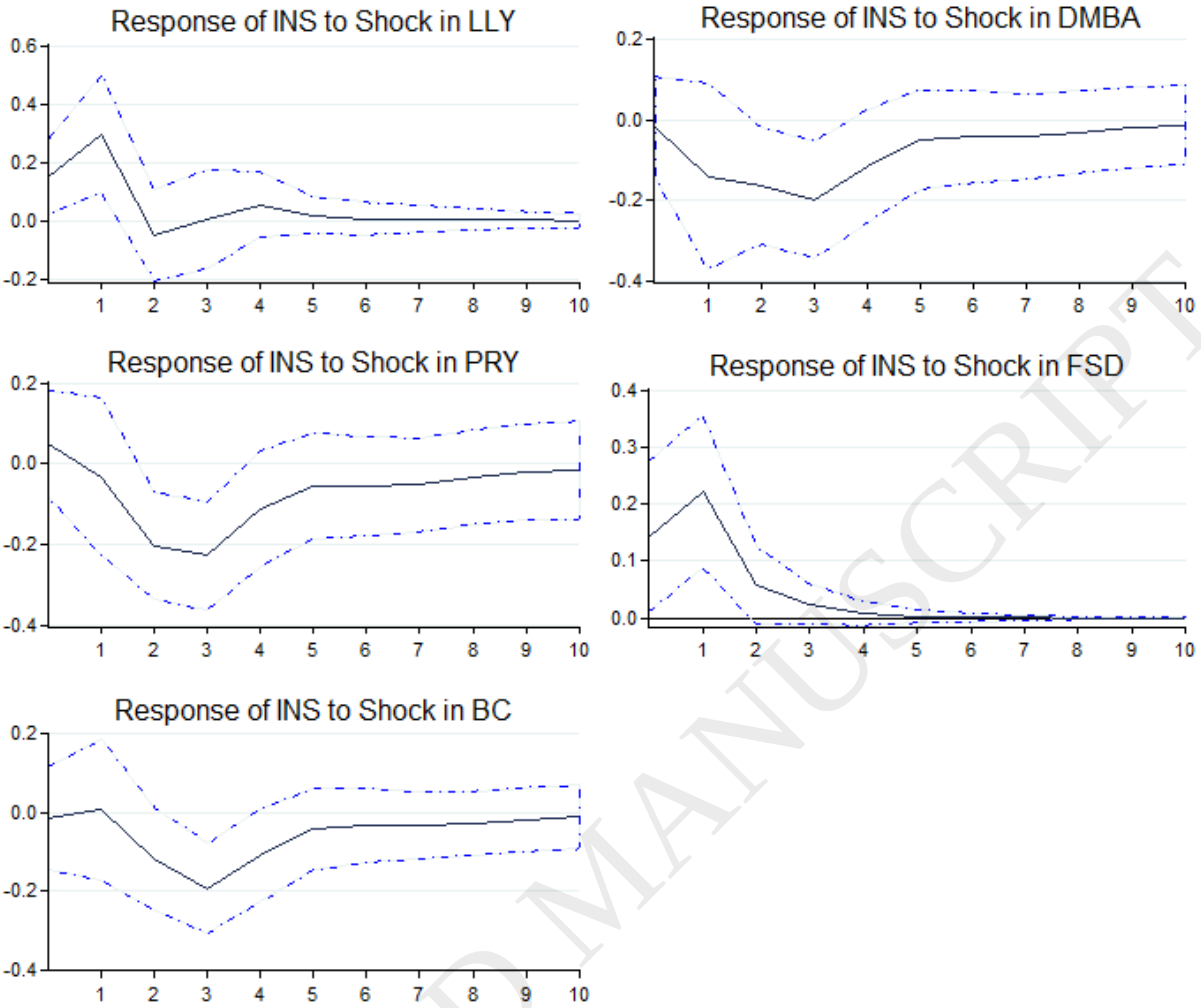

Figure 2 Response of insurance assets to shock in banking activities – The full sample

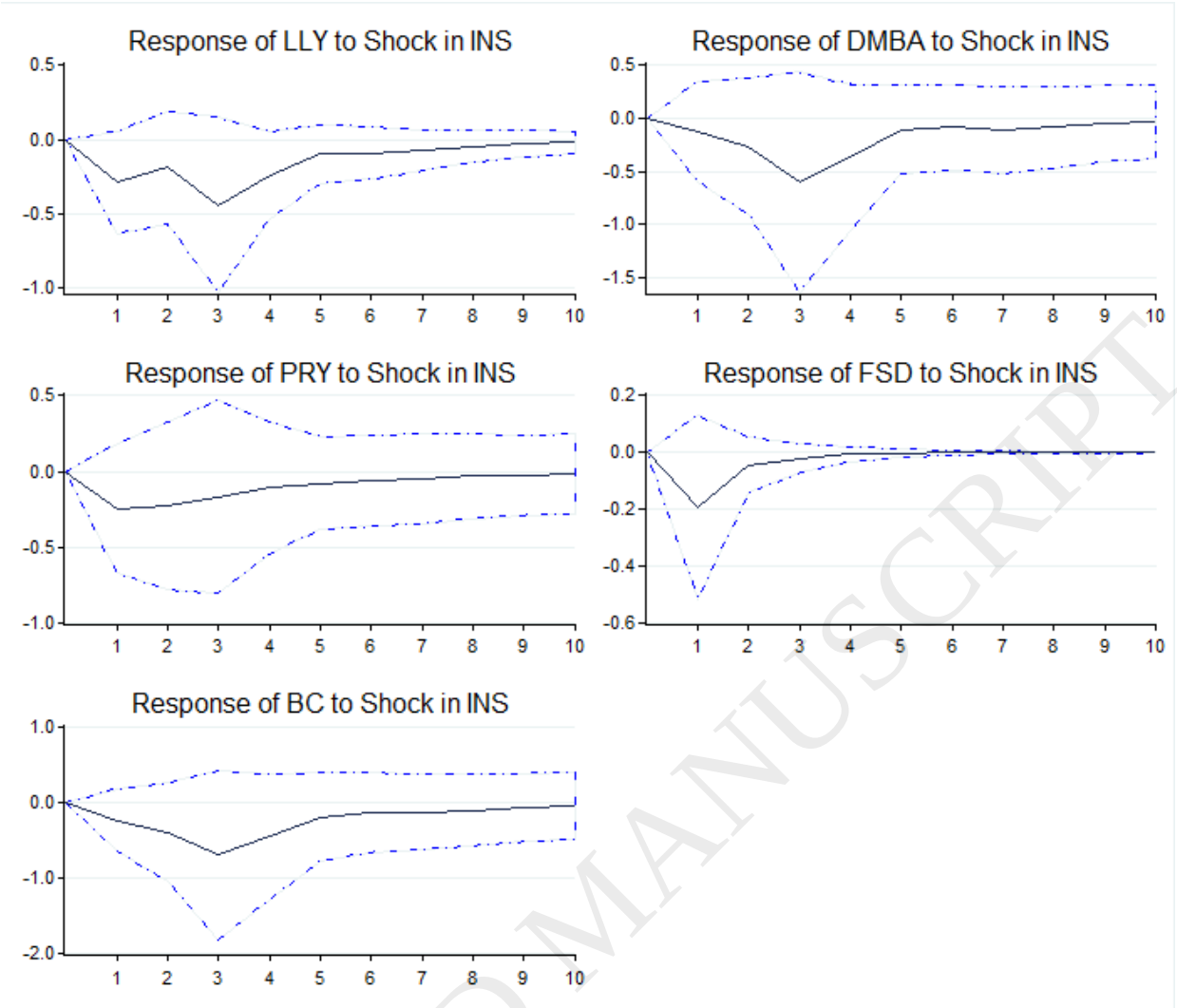

Figure 3 Response of banking activities to shock in insurance assets – The full sample

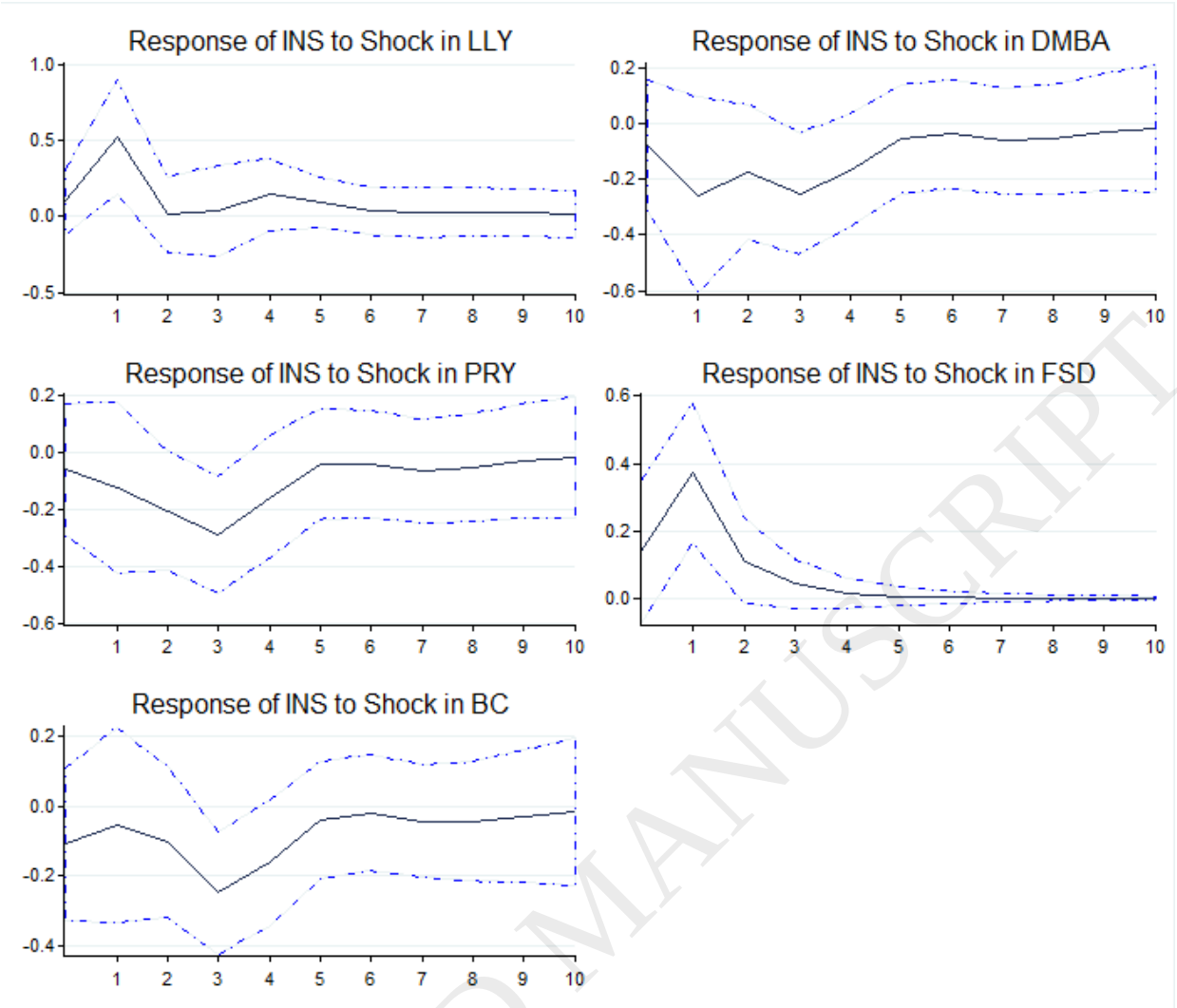

Figure 4 Response of insurance assets to shock in banking activities – High-income countries

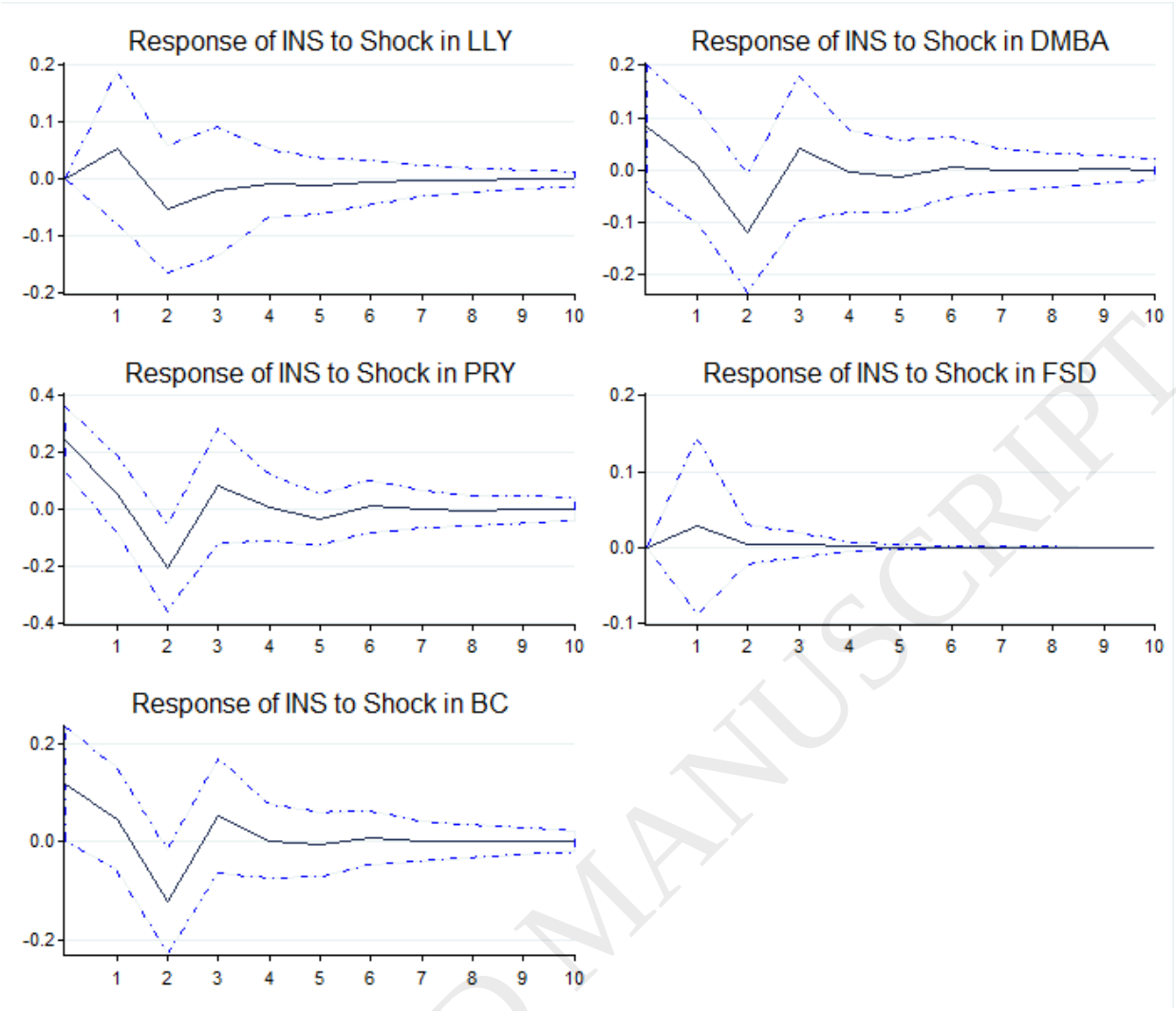

Figure 5 Response of insurance assets to shock in banking activities – Middle- and Low-income countries

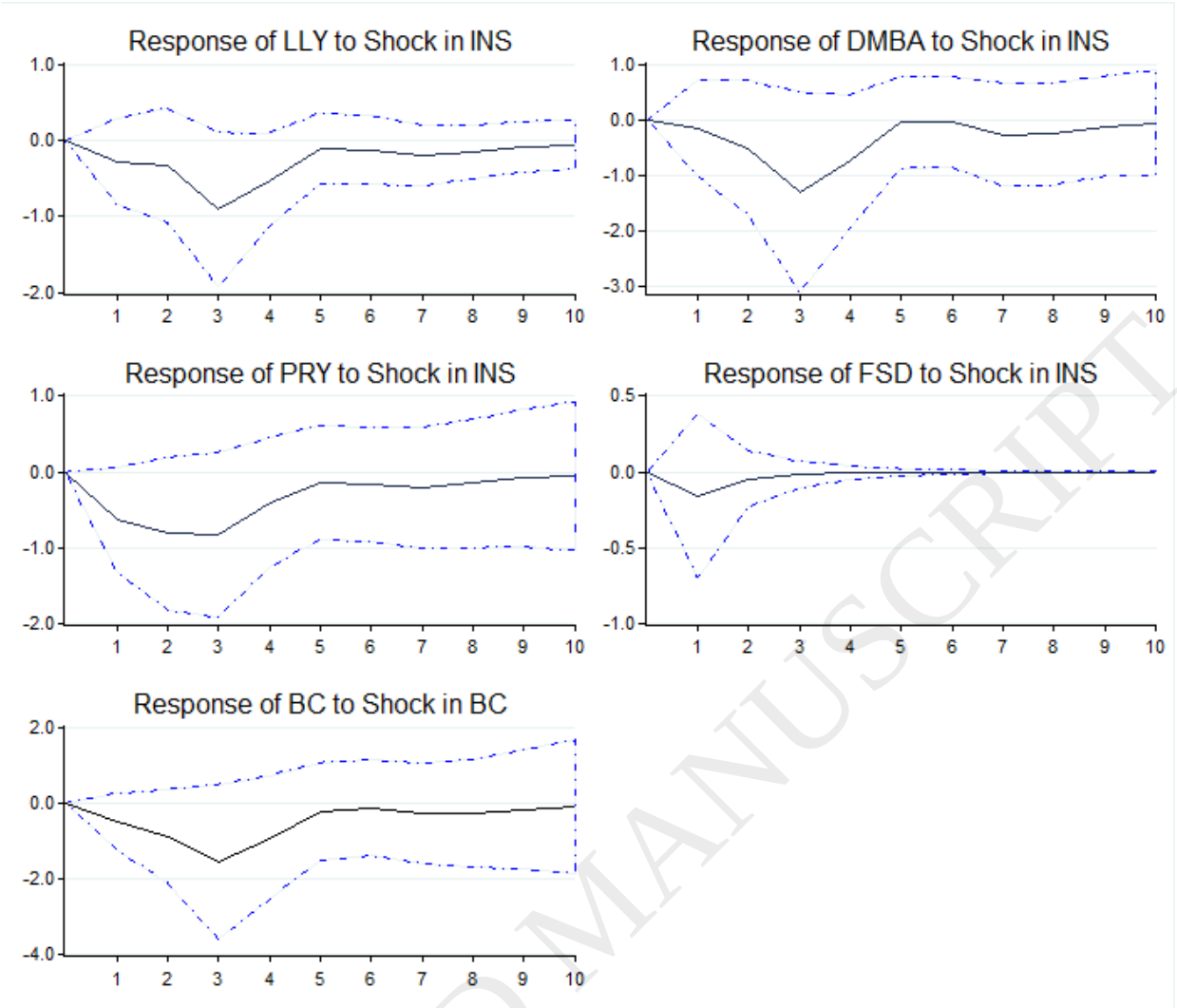

Figure 6 Response of banking activities to shock in insurance assets – High-income countries

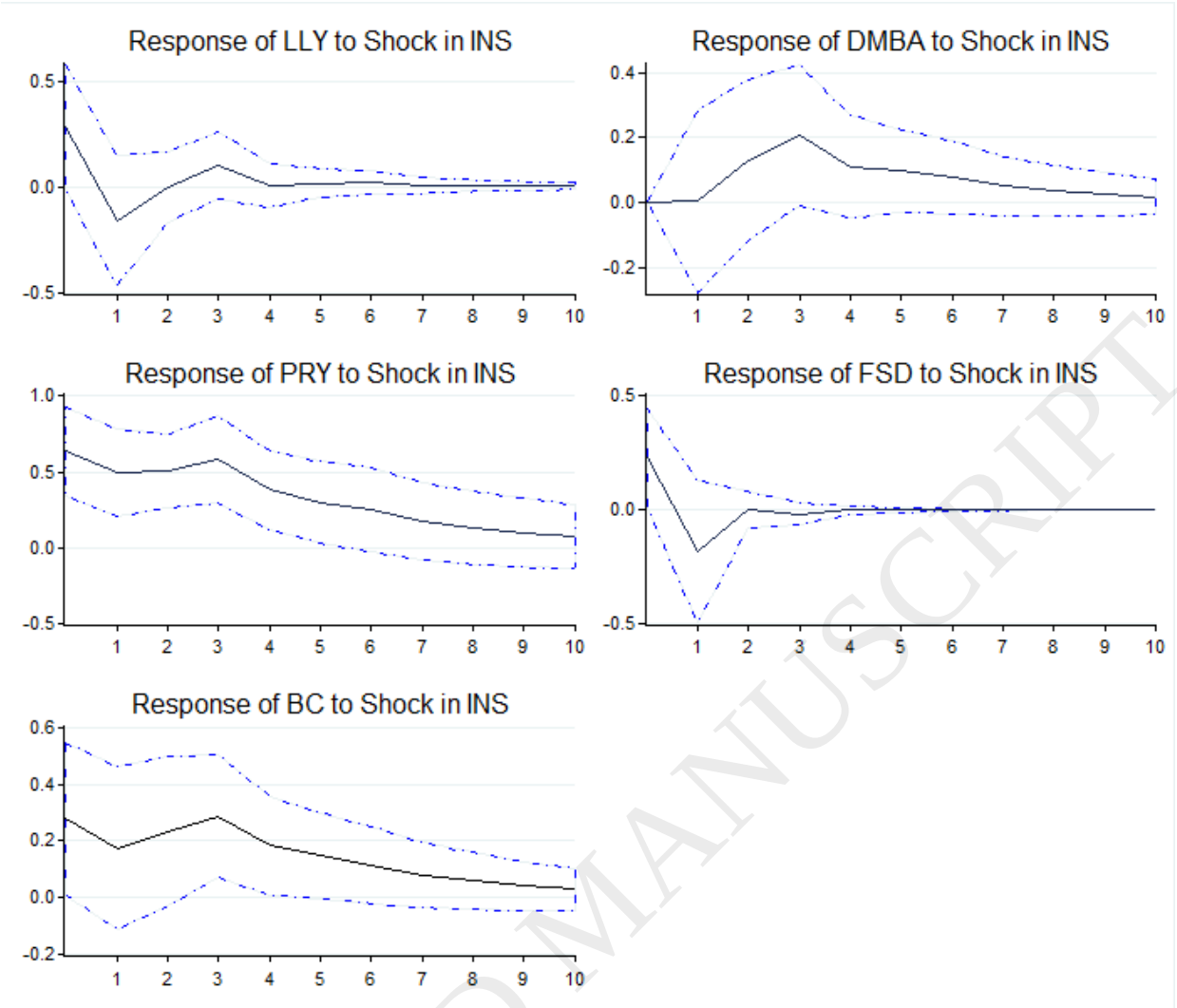

Figure 7 Response of banking activities to shock in insurance assets – Middle- and Low-income countries

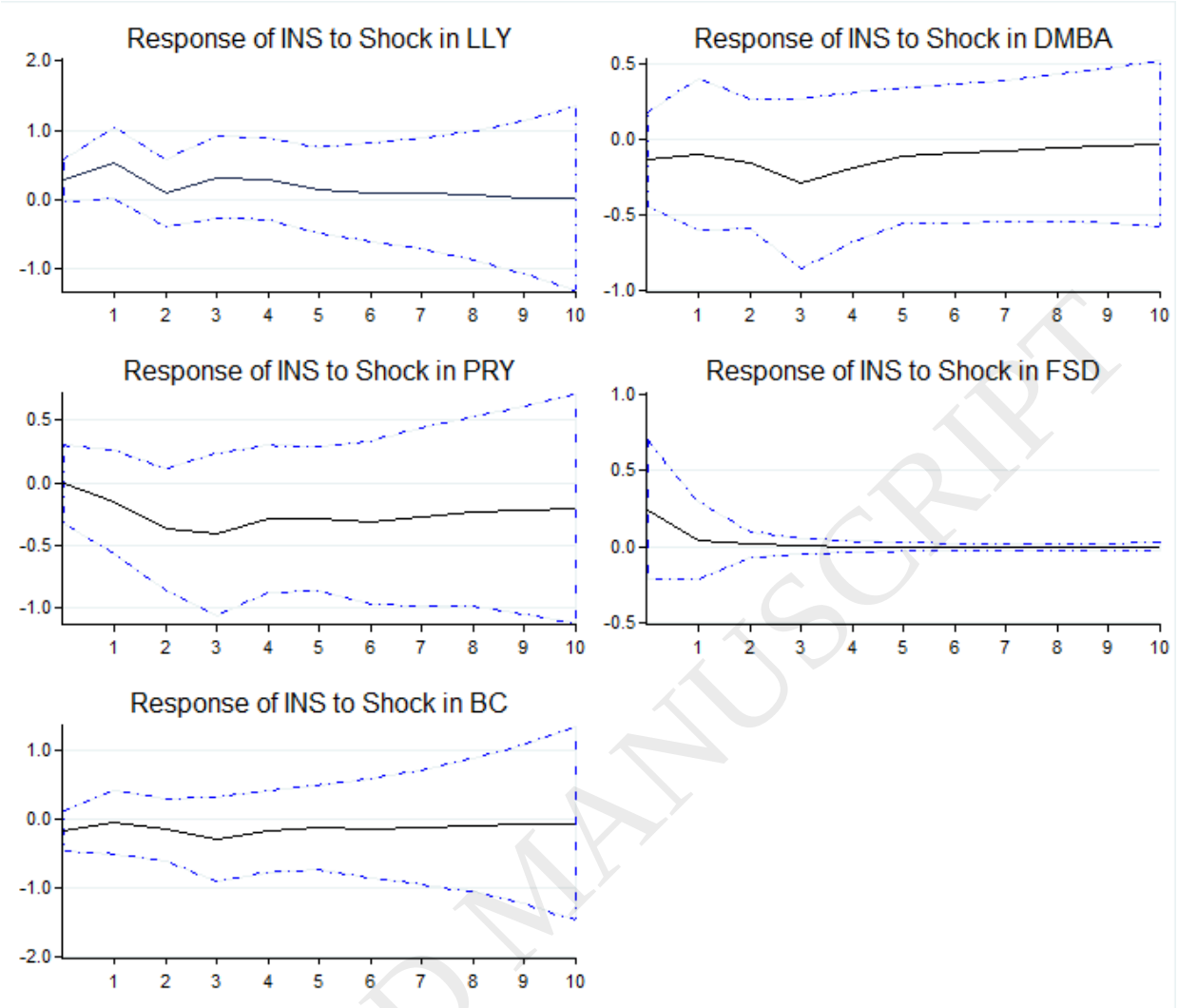

Figure 8 Response of insurance assets to shock in banking activities – Common-law countries

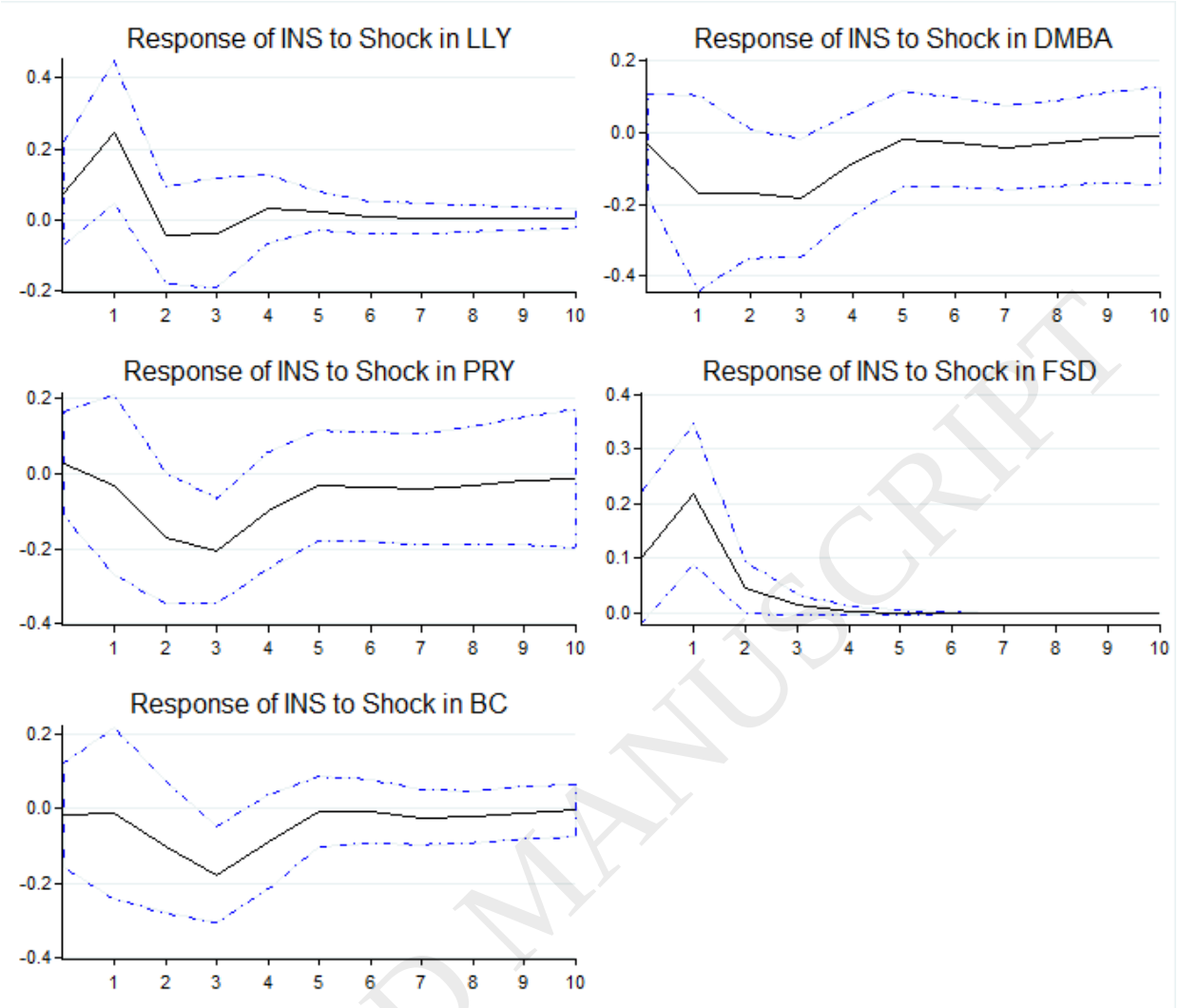

Figure 9 Response of insurance assets to shock in banking activities – Civil-law countries

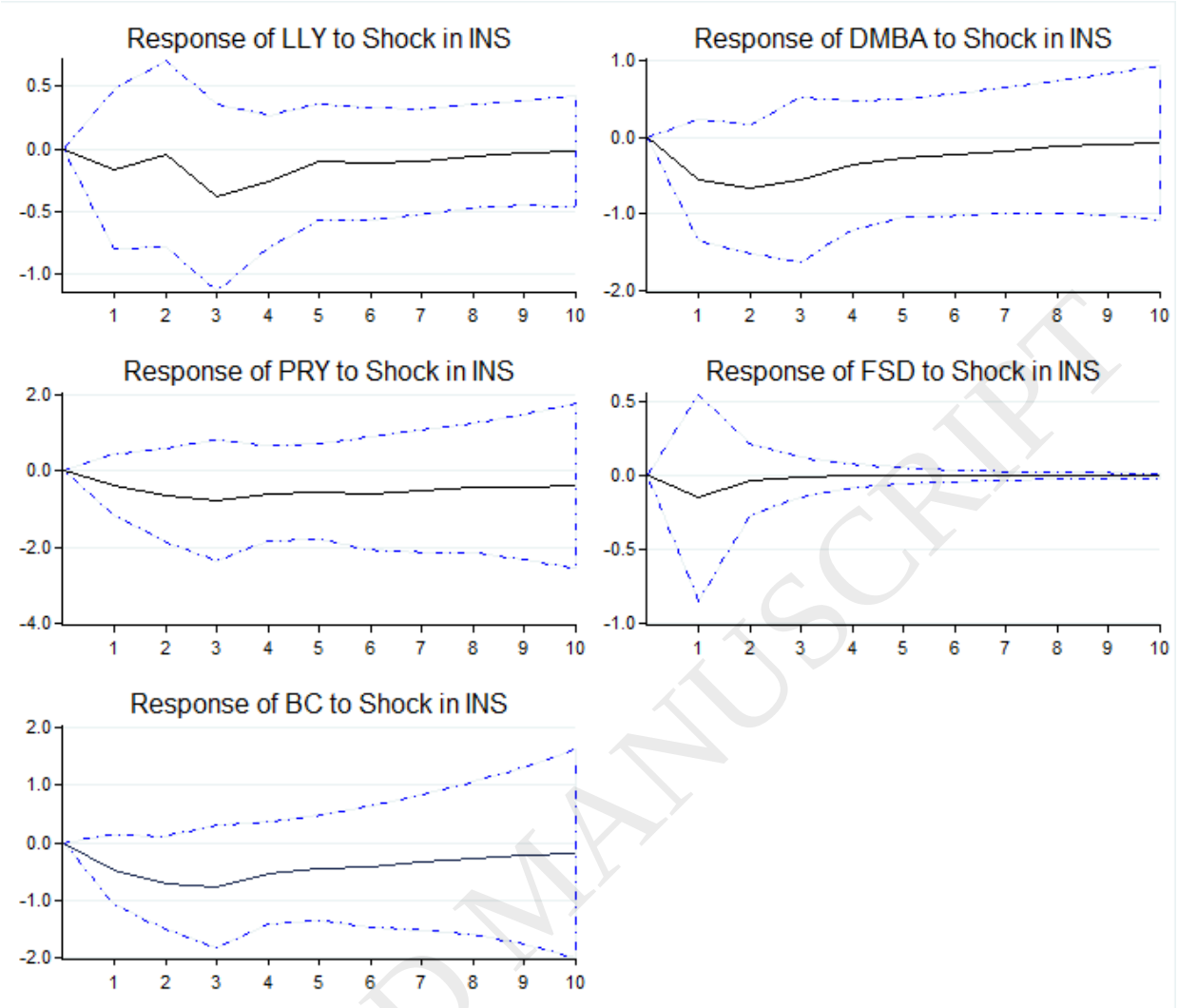

Figure 10 Response of banking activities to shock in insurance assets – Common-law countries

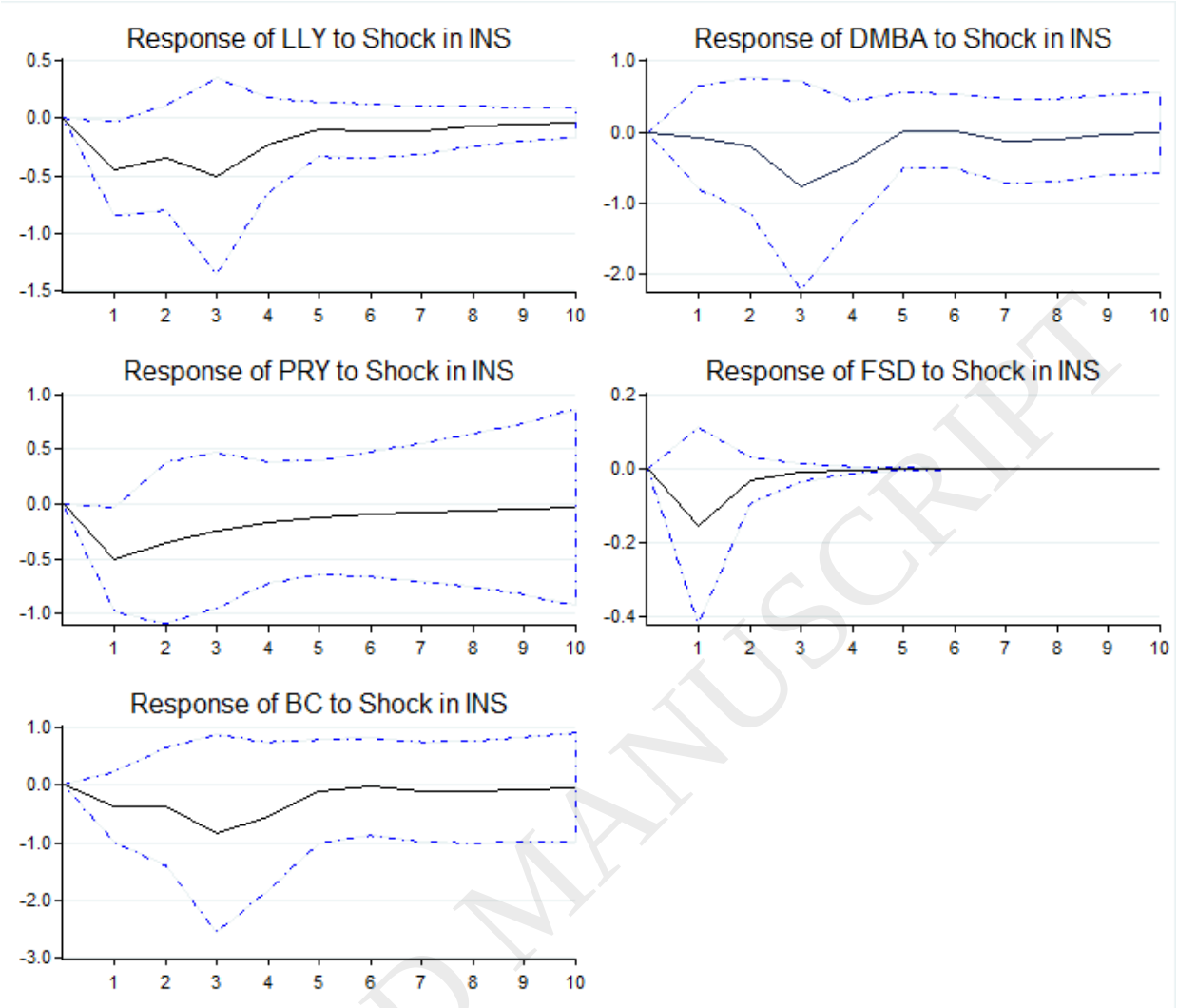

Figure 11 Response of banking activities to shock in insurance assets – Civil-law countries

Table 1 Cross-sectional summary statistics

	N	Mean	Std.	Min.	Max.
INS	73	17.363	21.916	0.199	82.268
LLY	73	62.910	42.482	10.973	269.448
DMBA	73	68.886	43.569	5.347	197.751
PRY	73	62.038	42.242	3.538	169.342
FSD	73	55.775	39.826	4.371	259.601
BC	73	57.936	38.846	3.538	152.968
Note: See Table A1 in Appendix for variable definition.					

Table 2 Granger causality tests – The full sample

Variables	Null hypothesis	p-value
INS versus LLY	INS does not Granger-cause LLY	0.076
	LLY does not Granger-cause INS	0.001
INS versus DMBA	INS does not Granger-cause DMBA	0.714
	DMBA does not Granger-cause INS	0.006
INS versus PRY	INS does not Granger-cause PRY	0.712
	PRY does not Granger-cause INS	0.001
INS versus FSD	INS does not Granger-cause FSD	0.238
	FSD does not Granger-cause INS	0.000
INS versus BC	INS does not Granger-cause BC	0.602
	BC does not Granger-cause INS	0.006
Note: Numbers are the p-value of the test of null hypotheses.		

Table 3 Granger causality tests – Different income levels

Variables	Null hypothesis	High-income countries	Middle- and low-income countries
INS versus LLY	INS does not Granger-cause LLY	0.131	0.058
	LLY does not Granger-cause INS	0.016	0.541
INS versus DMBA	INS does not Granger-cause DMBA	0.467	0.196
	DMBA does not Granger-cause INS	0.005	0.018
INS versus PRY	INS does not Granger-cause PRY	0.164	0.001
	PRY does not Granger-cause INS	0.004	0.002
INS versus FSD	INS does not Granger-cause FSD	0.561	0.067
	FSD does not Granger-cause INS	0.000	0.650
INS versus BC	INS does not Granger-cause BC	0.419	0.094
	BC does not Granger-cause INS	0.015	0.005
Note: Numbers are the p-value of the test of null hypotheses.			

Table 4 Granger causality tests – Legal origin of country

Variables	Null hypothesis	Common	Civil
INS versus LLY	INS does not Granger-cause LLY	0.117	0.183
	LLY does not Granger-cause INS	0.121	0.008
INS versus DMBA	INS does not Granger-cause DMBA	0.483	0.595
	DMBA does not Granger-cause INS	0.568	0.012
INS versus PRY	INS does not Granger-cause PRY	0.713	0.099
	PRY does not Granger-cause INS	0.442	0.008
INS versus FSD	INS does not Granger-cause FSD	0.678	0.275
	FSD does not Granger-cause INS	0.544	0.001
INS versus BC	INS does not Granger-cause BC	0.343	0.271
	BC does not Granger-cause INS	0.544	0.023

Note: Common denotes common-law origin, and Civil is civil-law origin. Numbers are the p-value of the test of null hypotheses.

Appendix

Table A1 Variable definition

Variable	Definition	Data source
INS	Ratio of insurance assets to GDP	The World Bank
LLY	Ratio of liquid liabilities in the financial system divided by GDP	Beck et al. (2000, 2009); Čihák et al. (2012)
DMBA	Deposit money bank assets divided by GDP	Beck et al. (2000, 2009); Čihák et al. (2012)
PRY	Ratio of credit issued to the private sector by commercial banks and other financial intermediaries to GDP	Beck et al. (2000, 2009); Čihák et al. (2012)
FSD	Ratio of financial system deposits to GDP	Beck et al. (2000, 2009); Čihák et al. (2012)
BC	Ratio of private credit from deposit banks divided by GDP	Beck et al. (2000, 2009); Čihák et al. (2012)

Table A2 Countries included

Country	Period	Country	Period
Australia	1988-2014	Japan	1980-2014
Austria	2000-2013	Jordan	2000-2012
Belgium	2000-2013	Kazakhstan	2002-2014
Bolivia	2001-2014	Kenya	2001-2013
Brazil	2000-2013	Latvia	1997-2008
Bulgaria	1999-2014	Macedonia	2000-2013
Burkina Faso	2001-2011	Malaysia	2002-2014
Cameroon	2001-2012	Mauritius	1999-2013
Canada	1980-2008	Mexico	1980-2014
Cape Verde	1995-2014	Netherlands	2000-2013
Chad	2000-2012	Nicaragua	2001-2013
Chile	1980-2014	Norway	1995-2006
Colombia	1997-2014	Oman	2004-2014
Costa Rica	2003-2014	Panama	2002-2013
Cote d'Ivoire	2001-2012	Paraguay	2000-2014
Croatia	2000-2014	Peru	1998-2014
Czech Republic	2000-2014	Philippines	2002-2014
Denmark	1994-2014	Poland	1991-2014
Dominican Republic	2001-2014	Portugal	1999-2012
Ecuador	2002-2013	Romania	2003-2014
Egypt	1999-2014	Senegal	2002-2012
El Salvador	2002-2014	Serbia	2002-2014
Fiji	2004-2014	Singapore	2000-2014
Finland	1999-2013	Slovenia	2001-2013
France	2000-2013	South Africa	2000-2013
Gabon	2003-2013	South Korea	2002-2012
Germany	1999-2013	Spain	1999-2013
Greece	2001-2013	Sweden	2001-2014
Guatemala	2001-2014	Switzerland	1999-2013
Honduras	1998-2014	Tanzania	2000-2013
Hong Kong	2001-2011	Thailand	2002-2013
Hungary	1989-2014	Tunisia	2001-2012
Iceland	2000-2014	Turkey	1995-2013
Indonesia	2001-2012	United States	1980-2012
Israel	2000-2013	Uruguay	2000-2014
Italy	1999-2013	Venezuela	1999-2012
Jamaica	2001-2013		

Table A3 Panel unit root test

		INS	LLY	DMBA	PRY	FSD	BC
IPS	Level	-3.936	2.543	0.203	1.146	2.147	0.947
		(0.000)	(0.995)	(0.580)	(0.874)	(0.984)	(0.828)
	FD	-6.858	-5.711	-5.506	-4.967	-5.866	-4.915
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ADF-Fisher	Level	-5.391	2.322	-0.223	0.498	2.606	1.067
		(0.000)	(0.990)	(0.412)	(0.691)	(0.995)	(0.857)
	FD	-9.459	-7.831	-6.462	-6.489	-7.441	-6.280
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PP-Fisher	Level	-8.387	4.329	1.779	3.029	3.047	2.948
		(0.000)	(1.000)	(0.962)	(0.999)	(0.999)	(0.998)
	FD	-22.910	-7.884	-8.382	-7.572	-8.915	-6.964
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: IPS denotes the Im–Pesaran–Shin panel unit root test. ADF-Fisher and PP-Fisher represent the Fisher-type ADF and Phillips–Perron panel unit-root tests, respectively. FD denotes first-differenced. The null hypothesis is that all the panels contain a unit root. p-values are in parentheses.