“Does insurance hedge macro volatility? Global evidence”

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DOES INSURANCE HEDGE MACRO VOLATILITY? GLOBAL EVIDENCE

Abstract

Insurance is known in the literature as a contribution to economic growth. In our cross-country analysis, we found out that insurance density also appears to subdue macro volatility. In other words, an overall expansion of insurance coverage in an economy cushions aggregate risks. This empirical inference remains robust to controlling for other covariates known to co-move with economic activities. Given that the contribution of insurance to economic growth is more impactful in developing countries than in industrialized economies, not only this result is appealing to economic intuition, but also extends the claims in the existing researches.

Keywords insurance, macroeconomic volatility, economic stability, market completeness

JEL Classification G22, O49, D52

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INTRODUCTION

A large body of literature focuses on the link between finance and economic growth. Beck and Levine (2001) confirm that greater financial development accelerates the growth of financially dependent industries. Dabla-Norris and Srivisal (2013) found that financial depth plays a significant role in dampening the volatility of output, consumption, and investment growth, but only up to a certain point. They also found strong evidence that deeper financial systems serve as shock absorbers, mitigating the negative effects of real external shocks on economic stability. However, the literature finds a dearth in scholastic attempt to explore a potential risk diversification effect of insurance on the economy.

This research defines the macro volatility of a given country as the standard deviation of the annual growth rate of real gross domestic product (GDP), which is a proxy for economic risk and an inverse measure of economic stability. Insurance is designed to hedge against the undesired downside in the value of a given asset. Given that the insurance of a given protected property works like a put option written on the (underlying) asset, the market activity of insurance should work toward alleviating macroeconomic volatility by serving as an arrow security for market completeness. In other words, economic stability should enhance the higher proportion of insurance coverage in the cross-section of countries.

Former research evaluates the impact of the banking sector and stock market development on economic growth. A bevy of theories in the literature has paid much attention to the influence of financial sys-

tems on savings and investment decisions and, thus, long-run growth via the following mechanisms: (1) reducing the costs of identifying future investments; (2) enforcing corporate governance; (3) managing, diversifying, and trading risk; (4) pooling and mobilizing savings; (5) catalyzing exchanges of services and goods; and (6) weaken the undesired consequences of random shocks on capital investment (Levine, 2005).

Insurance can contribute to economic growth by enhancing the functions of financial systems, both as an institutional investor and as a provider of indemnification and risk transfer as follows: (1) bolstering financial stability; (2) expediting transactions in goods and services; (3) activating domestic savings; (4) efficiently managing various risks by facilitating capital accumulation; (5) harboring a more productive allocation of capital; and (6) enabling to abate losses (Skipper, 1997).

Arena (2008) investigates whether insurance market activity encourages economic growth. Using the generalized method of moments (GMM; Hansen, 1982) for dynamic models of panel data for 55 economies in the sample period from 1976 until 2004, Arena (2008) confirms that the relation is supported by the data and it is robust to controlling for various factors and restrictions. Both life and non-life insurance services have significantly positive effects on economic growth. In case of life insurance, the causal relation is more conspicuous in wealthy sovereignties, while non-life insurance helps economic growth regardless of a country's income status.

Han et al. (2010) also test the association between insurance development and economic growth by implementing GMM regressions on a dynamic panel dataset of 77 countries between 1994 and 2005. The

Table 1. Comparison between Arena (2008) and Han et al. (2010)

	Arena (2008)	**Han et al. (2010)**
Research question	Is there a causal relationship between insurance market activity (life and non-life insurance) and economic growth?	Is there a relationship between insurance (life and non-life insurance) development and economic growth?
Analysis level	Country level (high-income and developing countries)	Country level (developed and developing countries)
Method	GMM	Two-step GMM
Model	Dynamic models of panel data	Dynamic panel data with fixed effects, including period dummy variables to control for time-specific effects
	$y_{i,t} = \beta' X_{i,t} + \mu_t + \eta_i + \xi_{i,t}$, i : country; t : time period	$y_{i,t} - y_{i,t-1} = (\alpha - 1) y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t}$, i : country; t : time period
Data	55 countries (2 groups) Period: 1976–2004	77 countries Period: 1994–2005
Independent var.	X : a set of time and country-varying explanatory variables μ_t : unobserved time-specific effect η_i : an unobserved country-specific effect	X : the independent variables η : unobservable country-specific effect ε : error term
Dependent var.	Y : economic growth	Y : GDP after taking into account inflation and by the logarithm transformation
Findings	There is a causal relationship between insurance market activity (life and non-life insurance) and economic growth. For life insurance, high-income countries drive the results, and for non-life insurance, both high-income and developing countries drive the results.	Insurance development contributes to economic growth. This relationship is more significant for non-life insurance than for life insurance. The insurance (life and non-life) business play a much more important function in developing economies than they do in developed countries.

development of insurance is proxied for by insurance density (premiums per capita), which turns out to be positively correlated with economic growth controlling for variables representing the banking sector, capital markets, and macroeconomic policy. Regarding the intensity of causality contingent upon the development status of countries, the economic growth impact of insurance is higher in developing rather than in developed states. Table 1 provides a comparative summary of the key references of this research, Arena (2008) and Han et al. (2010).

As most research in the literature focus on the contribution of banking system, capital markets, and insurance to economic growth, absence of discussion pertaining to the potential alleviation of macro volatility by insurance as a privatized social safety net and a catalyst of market completeness motivates this research. In order to test the hypothesis, 16 variables for 84 countries over 54 years of sample period from 1960 until 2013 are processed and estimated based on raw data sourced from databases provided by the World Bank, the Organization of Economic Cooperation and Development (OECD), and the International Monetary Fund (IMF).

According to the hitherto panel regression results of this cross-country research, insurance density as a key determinant for economic growth also appears to subdue macro volatility. According to the hitherto panel regression results of this cross-country research, insurance density as a key determinant for economic growth also appears to subdue macro volatility. That is, aggregate risks of an economy is moderated when insurance coverage is expanded throughout economy. There is some evidence of robustness to this empirical result, which is shown by controlling for other covariates known to move together with economic activities. In that the impact of insurance to economic growth appears to be more powerful in developing countries than in industrialized ones, our result appeals to economic intuition. Moreover, it extends the contentions in the previous researches.

The remainder of this paper is organized as follows: section 1 describes the data and models of our research. We provide preliminary and main results of this research in section 2. Lastly final section concludes this research and suggests future research agenda.

1. VARIABLES, DATA, AND METHODOLOGY

1.1. Variables

By referring to Arena (2008) and Han et al. (2010), this research selects, procures and estimates the variables of interest on an annual frequency through 54 years of sample period from 1960 until 2013 for 84 countries as follows: the gross domestic product (GDP; Gdp) is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. Per capita GDP (GdpCap) is GDP, constant as of 2005 US$, divided by mid-year population. Economic growth (Growth) is the growth rate of per capita GDP. As the dependent of our study, macro volatility (MacroVol) is the standard deviation of the annual growth rate of real gross domestic products (Gdp). Specifically, the type I (MacroVol1) macro volatility of a given year is the standard deviation of observations during the past 10 years. The type II (MacroVol2) macro volatility is based on seasonally adjusted, quarterly growth rate of quarterly GDPs. As the key explanatory variables of this research, insurance density (Insurance) is annual premium payments (US$) divided by population. Life insurance density (InsLife) is annual life-insurance premium payments (US$) divided by population. Non-life insurance density (InsNonLife) is annual non-life insurance premium payments (US$) divided by population.

The following are the control variables of our empirical exercises: the volatility index (Vix) is the implied volatility per Black and Sholes (1973) and Merton (1973), which proxies for the uncertainty and fear of market participants. Specifically, this research defines the type I (Vix1) and type II (Vix2) as the annual average and end-of-year

closing value of daily observations, respectively. Private credit by deposit money banks to GDP (PrivateCredit), in percent, is calculated using the following deflation method:

$$0.5 \cdot P_{a,t} \cdot \frac{\frac{F_t}{P_{e,t}} + \frac{F_{t-1}}{P_{e,t-1}}}{GDP_t}, \quad (1)$$

where F is credit to the private sector, P_e is end-of period CPI, and P_a is average annual CPI. This variable represents the development and influence of the banking system. Stock market turnover ratio (Turnover) is the percentage ratio of the value of total shares traded to average real market capitalization, whose denominator is deflated using the following method:

$$0.5 \cdot T_t \cdot \frac{\frac{M_t}{P_{e,t}} + \frac{M_{t-1}}{P_{e,t-1}}}{P_{a,t}}, \quad (2)$$

where T is total value traded, M is stock market capitalization, P_e is end-of period CPI, and P_a is average annual CPI. It represents the development and influence of capital markets. Trade openness (TradeOpen) is the log of ratio of exports and imports (in 1995 US$) to GDP (in 1995 US$). General government final consumption expenditure (GovExp) includes all government current expenditures for purchases of goods and services (including compensation of employees) in percentage out of GDP. Inflation measured by the consumer price index (Inflation) per the Laspeyres formula (base year) reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Net barter terms of trade index (TradeTerms) is calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000. Human capital investment (Human) is the average ratio of enrollment in secondary education, which begins from the primary level and provides the establishment for lifelong learning and human development. Gross fixed capital formation (Capital), in percentage of GDP, includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and others like schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. The developed market dummy (Developed) equals one if a given country is classified as a developed economy or zero if developing per Han et al. (2010). Alternatively, a country can be high, middle, or low-income economy according to Arena (2008). A binary dummy variable can be constructed whether an economy belongs to either developed market (DM) or emerging market (EM) index per Morgan Stanley Capital International's (MSCI) taxonomy.

1.2. Databases and panel data construction

We source the estimates of the aforementioned variables from the databases maintained by the World Bank (Gdp, GdpCap, Growth, MacroVol, TradeOpen, GovExp, CurrAcc, Capital), the Organization for Economic Co-operation and Development (OECD; GovExp, CurrAcc, Capital), the International Monetary Fund (IMF; Inflation, CurrAcc), Insurance Journal (Sigma; Insurance, InsLife, InsNonLife), and Financial Structure Database (Turnover, InsLifePen, InsNonLifePen, Private Credit).We construct a panel dataset with the estimated and procured variables and estimate missing values by multiple imputation (Dempster et al., 1977; van Dyk and Meng, 2001) in order to minimize inefficiency due to information loss.

1.3. Models

Arena (2008) evaluates the effect of insurance variables on economic growth within the context of the standard growth regressions specification, and uses GMM that deals with unobserved time effects through the inclusion of period-specific intercepts. The general regression equation to be estimated is as follows:

$$y_{i,t} = \beta' X_{i,t} + \mu_t + \eta_i + \xi_{i,t}, \quad (3)$$

where i means country, and t means time period, respectively; y is economic growth; X is a set of time and country-varying explanatory variables, proxies of banking, stock market and insurance market development, interaction terms, and control variables; β is the vector of coefficients to be estimated; μ_t is an unobserved time-specific

effect; η_i is an unobserved country-specific effect; and $\xi_{i,t}$ is the error term.

$$y_{i,t} - y_{i,t-1} = (\alpha - 1) y_{i,t-1} + \\ + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t}, \quad (4)$$

Han et al. (2010) use two-step GMM estimators developed for dynamic panel data with fixed effects to test the role of insurance development in economic growth. In the model, Han et al. (2010) also include period dummy variables to control for time-specific effects.

where y is GDP after taking into account inflation and by the logarithm transformation, X is the independent variable other than lagged y, η and ε is unobservable country-specific effect and error term, respectively, i means country, and t means time period.

Table 2. Sample statistics

Variable	Mean	Median	Standard deviation	Minimum	Maximum	Observations	Frequency
Gdp	380.233	79.758	1149,120	0.280	14450,330	4536	Country-year
GdpCap	12.048	5.224	13.992	0.083	81.947	3930	Country-year
Growth	0.023	0.025	0.051	–0.556	1.038	4452	Country-year
MacroVol1	3.694	2.720	3.645	0.490	61.390	3359	Country-year
MacroVol2	1.347	1.000	1.152	0.100	10.900	1021	Country-year
Vix1	22.920	22.310	7.021	11.260	45.500	126	Country-year
Vix2	22.020	20.880	8.651	10.850	53.880	128	Country-year
Insurance	784.823	159.800	1258,972	1.200	8012,000	2213	Country-year
InsLife	353.843	86.200	581.894	0.000	4777,000	2213	Country-year
InsNon-Life	430.982	68.700	790.967	0.000	5730,500	2213	Country-year
PrivateCredit	46.157	32.530	38.934	1.120	284.620	3208	Country-year
Turnover	54.035	35.885	60.014	0.070	538.200	1556	Country-year
TradeOpen	–0.663	–0.600	0.706	–3.020	1.690	3401	Country-year
GovExp	15.236	14.710	5.729	2.050	76.220	3841	Country-year
Inflation	20.971	5.210	184.653	–7.630	7481,660	3544	Country-year
TradeTerms	108.155	100.000	31.79	43.880	306.560	1984	Country-year
Developed	0.413	0.000	0.496	0.000	1.000	75	Country

Note: This table provides the representative statistics of the variables of interest that are selected and estimated through 54 years of sample period from 1960 until 2013 for 84 countries as follows: the gross domestic product (Gdp) is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. Per capita GDP (GdpCap) is GDP, constant as of 2005 US$, divided by mid-year population. Economic growth (Growth) is the growth rate of per capita GDP. Macro volatility (MacroVol) is the standard deviation of the annual growth rate of real gross domestic product (Gdp). Specifically, the type I (MacroVol1) macro volatility of a given year is the standard deviation of observations during the past 10 years. The type II (MacroVol2) macro volatility is based on seasonally adjusted, quarterly growth rate of quarterly GDPs. The Volatility Index (Vix) is the Black-Sholes-Merton implied volatility (Black and Sholes, 1973; Merton, 1973) which proxies for the uncertainty and fear of market participants. Specifically, this research defines the type I (Vix1) and type II (Vix2) as the annual average and end-of-year closing value of daily observations, respectively. Insurance density (Insurance) is annual premium payments (US$) divided by population. Life insurance density (InsLife) is annual premium payments (US$) divided by population. Non-life insurance density (InsNonLife) is annual premium payments (US$) divided by population. Private credit by deposit money banks to GDP (PrivateCredit) in percent. Stock market turnover ratio (Turnover) is the percentage ratio of the value of total shares traded to average real market capitalization. Trade openness (TradeOpen) is the log of ratio of exports and imports (in 1995 US$) to GDP (in 1995 US$). General government final consumption expenditure (GovExp) includes all government current expenditures for purchases of goods and services (including compensation of employees) in percentage out of GDP. Inflation measured by the consumer price index (Inflation) per the Laspeyres formula (base year) reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Net barter terms of trade index (TradeTerms) is calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000. Human capital investment (Human) is the average ratio of enrollment in secondary education, which begins from the primary level and provides the establishment for lifelong learning and human development. Gross fixed capital formation (Capital), in percentage of GDP, includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. The developed market dummy (Developed) equals one if a given country is classified as a developed economy or zero if developing per Han et al. (2010).

Table 3. Correlation coefficients

	Growth	Macro Vol1	Macro Vol2	Vix1	Vix2	Insurance	InsLife	Ins Non-Life	Private Credit	Turnover	Trade Open	GovExp	Inflation	Trade Terms
MacroVol1	0.063***													
MacroVol2	0,001	0.391***												
Vix1	–0,022	0,138	0.530***											
Vix2	–0,018	–0,008	0.383***	0.822***										
Insurance	–0.040*	–0.272***	–0.192***	–0,112	–0,093									
InsLife	–0,03	–0.264***	–0.215***	–0.182**	–0,14	0.886***								
InsNonLife	–0.042**	–0.239***	–0.142***	–0,059	–0,055	0.940***	0.674***							
PrivateCredit	–0.092***	–0.245***	–0.106***	0,057	0,023	0.682***	0.650***	0.603***						
Turnover	0,016	–0.148***	–0.115***	0.162*	0,121	0.329***	0.264***	0.327***	0.256***					
TradeOpen	–0,02	0.088***	0,037	0,092	0,063	0.140***	0.075***	0.168***	0.279***	–0.155***				
GovExp	–0,024	0.112***	–0.204***	–0,032	–0,044	0.290***	0.266***	0.266***	0.224***	0.069***	0.189***			
Inflation	0.043**	0.091***	0.064**	0,046	0,101	–0.063***	–0.066***	–0.052**	–0.064***	0,024	–0.078***	–0,025		
TradeTerms	–0.038*	0.154***	0,056	–0,104	–0,086	–0.112***	–0.052**	–0.137***	–0.116***	–0.064**	–0.064***	–0.050**	–0,01	
Developed	0,006	–0.380***	–0.237***	–0,147	–0,076	0.637***	0.588***	0.571***	0.439***	0.074**	0.070***	0.381***	–0.082***	–0.198***

Note: This table provides the correlation coefficients of the variables of interest that are selected and estimated through 54 years of sample period from 1960 until 2013 for 84 countries as follows: economic growth (Growth) is the growth rate of per capita GDP. Macro volatility (MacroVol) is the standard deviation of the annual growth rate of real gross domestic product (Gdp). Specifically, the type I (MacroVol1) macro volatility of a given year is the standard deviation of observations during the past 10 years. The type II (MacroVol2) macro volatility is based on seasonally adjusted, quarterly growth rate of quarterly GDP. The Volatility Index (Vix) is the Black-Sholes-Merton implied volatility (Black and Sholes, 1973; Merton, 1973) which proxies for the uncertainty and fear of market participants. Specifically, this research defines the type I (Vix1) and type II (Vix2) as the annual average and end-of-year closing value of daily observations, respectively. Insurance density (Insurance) is annual premium payments (US$) divided by population. Life insurance density (InsLife) is annual premium payments (US$) divided by population. Non-life insurance density (InsNon-Life) is annual premium payments (US$) divided by population. Private credit by deposit money banks to GDP (PrivateCredit) in percent. Stock market turnover ratio (Turnover) is the percentage ratio of the value of total shares traded to average real market capitalization. Trade openness (TradeOpen) is the log of ratio of exports and imports (in 1995 US$) to GDP (in 1995 US$). General government final consumption expenditure (GovExp) includes all government current expenditures for purchases of goods and services (including compensation of employees) in percentage out of GDP. Inflation measured by the consumer price index (Inflation) per the Laspeyres formula (base year) reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Net barter terms of trade index (TradeTerms) is calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000. Human capital investment (Human) is the average ratio of enrollment in secondary education, which begins from the primary level and provides the establishment for lifelong learning and human development. Gross fixed capital formation (Capital), in percentage of GDP, includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. The developed market dummy (Developed) equals one if a given country is classified as a developed economy or zero if developing per Han et al. (2010). Asterisks denote p-values: * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

Table 4. GMM regression results

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	1.069 (1.592)	8.465*** (5.934)	0.965 (1,424)	0.017** (2.057)	0.073*** (7.076)
Insurance	–0.000*** (–3.914)	–0.001*** (–2.611)	–	–	–
InsLife	–	–	–0.001*** (–4.697)	–0.000* (–1.762)	–0.000*** (–4.196)
InsNon-Life	–	–	0.000 (–0.048)	0.000 (0.024)	–0.000*** (–4.581)
PrivateCredit	–0.021*** (–8.527)	0.003 (0.364)	–0.021*** (–8.396)	–0.000*** (–4.286)	–0.001*** (–6.553)
Turnover	0.002** (2.318)	0.018*** (4.820)	0.002* (1,958)	0.000*** (2.979)	0.000** (2.494)
VixLag	–	0.517*** (15.352)	–	–	–
TradeOpen	1.300*** (8.317)	1.366** (2.511)	1.268*** (8.115)	0.006*** (3.402)	0.033*** (5.024)
GovExp	0.060*** (4.643)	–0.143*** (–3.777)	0.060*** (4.634)	–0.001*** (–4.218)	–0.004*** (–9.227)
Inflation	0.002** (2.540)	0.004*** (4.080)	0.002** (2.529)	0 (–1.426)	–0.000*** (–2.990)
TradeTerms	0.042*** (7.000)	0.002 (0.427)	0.042*** (7.057)	0.000*** (2.600)	0.000*** (4.826)
Capital	–0.038*** (–3.630)	0.110*** (2.950)	–0.036*** (–3.448)	0.002*** (7.765)	0.001 (1.611)
Developed	–	–	–	–0.006 (–1.549)	0.113*** (4.826)
Emerging	–	–	–	–0.003 (–1.111)	0.012 (0.371)
Pooled	–	–	–	Yes	–
Fixed effects	No	–	No	–	–
Time FE	–	Yes	–	–	Yes
Multiple imputation	Yes	Yes	Yes	–	Yes
No. of obs.	4536	4368	4536	1033	4536

Note: This table provides the GMM regression results based on the variables of interest that are selected and estimated through 54 years of sample period from 1960 until 2013 for 54 countries. The dependent variable variable is the macro volatility (MacroVol), which is the standard deviation of the annual growth rate of real gross domestic products (Gdp). Specifically, the type I (MacroVol1) macro volatility of a given year is the standard deviation of observations during the past 10 years. The type II (MacroVol2) macro volatility is based on seasonally adjusted, quarterly growth rate of quarterly GDP. The independent variables are as follows: the Volatility Index (Vix) is the Black-Sholes-Merton implied volatility (Black and Sholes, 1973; Merton, 1973) which proxies for the uncertainty and fear of market participants. Specifically, it is the end-of-year closing value of daily observations. Insurance density (Insurance) is annual premium payments (US$) divided by population. Life insurance density (InsLife) is annual premium payments (US$) divided by population. Non-life insurance density (InsNonLife) is annual premium payments (US$) divided by population. Private credit by deposit money banks to GDP (PrivateCredit) in percent. Stock market turnover ratio (Turnover) is the percentage ratio of the value of total shares traded to average real market capitalization. Trade openness (TradeOpen) is the log of ratio of exports and imports (in 1995 US$) to GDP (in 1995 US$). General government final consumption expenditure (GovExp) includes all government current expenditures for purchases of goods and services (including compensation of employees) in percentage out of GDP. Inflation measured by the consumer price index (Inflation) per the Laspeyres formula (base year) reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Net barter terms of trade index (TradeTerms) is calculated as the percentage ratio of the export unit value indexes to the import unit value indexes, measured relative to the base year 2000. Gross fixed capital formation (Capital), in percentage of GDP, includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. The developed market categorical variable (Developed) denotes if the country belongs to the developed market (DM) per Morgan Stanley Capital International (MSCI) classification, while the emerging market categorical variable (Developed) if the country is grouped in the emerging market (EM) index. Asterisks denote p-values: * $p < 0.10$, ** $p < 0.05$, and ***$p < 0.01$.

2. EMPIRICAL RESULTS

2.1. Preliminary results

Based on estimates and extracted variables, Table 2 exhibits the representative statistics and correlation coefficients of the sample. According to the MSCI classification, among 84 sample countries even 23 and another 23 countries are grouped as developed (DM) and emerging market (EM) economies, while the rest 46 countries do not belong to either MSCI category.

Table 3 provides the correlation coefficients of the sample. As many variables are highly mutually correlated, endogeneity and multicolinearity may pose challenges for identifying appropriate regression models. In addition, as empirical models based on economic theories can be over identified we will employ the GMM to conduct panel regression analyses.

2.2. Main results

Table 4 shows the results of GMM regressions. Models 1, 2, 3, and 5 are based on the panel multiply imputed for missing values. In Model 1, the macro volatility (MacroVol) is regressed on to insurance density (Insurance) controlling for activities in the banking system (PrivateCredit) and capital market (Turnover), and proxies for economic openness (TradeOpen), fiscal policy (GovExp), price level (Inflation), export competitiveness (TradeTerms), and aggregate fixed assets (Capital).

It is shown that the economy becomes less risky the more it is insured (Insurance), and this cross-country implication is statistically significant. Among covariates, a larger establishment of banks (PrivateCredit) appears to lessen aggregate risks. However, a more liquid stock market (Turnover) and more international trade (TradeOpen) may exacerbate economic fragility. Model 2 with time fixed effects and an additional control for the fear of participants in the financial market (Vix, lagged) maintains the inference drawn from Model 1. In Model 3, we further dissect the intensity of insurance into life (InsLife) and nonlife insurance (InsNonLife) services to verify the aggregate hedging effect of insurance: economic stability is enhanced the more people are insured on themselves (InsLife). However, how agents' protection against value losses in their properties (InsNonLife) leads to diminished macro volatility is inconclusive in this model. Model 4, with pooled regression, continues to confirm the argument controlling for the economic and market maturity of countries proxied for by the MSCI developed (Developed) and emerging (Emerging) market indices, and the inference remains largely and qualitatively unchanged. Repeating the same identification of variables with time fixed effects in Model 5, more extensive insurance on both people (InsLife) and assets (InsNonLife) are shown to lower risks faced by the economy and market.

According to the hitherto panel regression results of this cross-country research, the density of insurance (insurance premiums per capita) as a key determinant for economic growth appears to also subdue macro volatility. In other words, an overall expansion of insurance coverage in an economy cushions aggregate risks. This empirical inference remains robust to controlling for other covariates known to co-move with economic activities. Given that the contribution of insurance to economic growth is more impactful in developing countries than in industrialized economies, not only this result is appealing to economic intuition but also extends the claims of existing findings in the literature.

CONCLUSION

A large body of literature focuses on the link between finance and economic growth. Beck and Levine (2001) confirm that greater financial development accelerates the growth of financially dependent industries. Dabla-Norris and Srivisal (2013) find that financial depth plays a significant role in dampening the volatility of output, consumption, and investment growth, but only up to a certain point. They also find strong evidence that deeper financial systems serve as shock absorbers, mitigating the negative ef-

fects of real external shocks on economic stability. However, the literature finds a dearth in scholastic attempt to explore a potential risk diversification effect of insurance on the economy. According to the hitherto panel regression results of this cross-country research, insurance density as a key determinant for economic growth appears to also subdue macro volatility. That is, aggregate risks of an economy is moderated when insurance coverage is expanded throughout economy. There is some evidence of robustness to this empirical result, which is shown by controlling for other covariates known to move together with economic activities.

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