

IMPACT OF INSURANCE SECTOR ACTIVITY ON ECONOMIC GROWTH – A META-ANALYSIS

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Abstract

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The aim of this study is to compute the overall effect size concerning the impact of insurance sector activity on economic growth. The connection of insurance activity and economic growth has been a widely investigated topic due to numerous papers and research attempts performed so far. The results, however, often differ among individual studies. Therefore a comprehensive analysis of the significance of causality from insurance activity, measured by insurance premium, to business cycle fluctuation, is well-required. Using 10 published and unpublished studies, we conduct a meta-analysis of the literature on the impact of insurance activity on economic growth. Insurance premium is taken as the measure of insurance activity. The combined significance test of individual t-statistics is employed. The calculation of the effect size allows understand the true effect relying on synthesis of so far published research with significantly higher amount of observations and better precision. Our results confirm positive effect of insurance activity on economic growth and are particularly important for policy makers who set the policy towards subjects in the insurance market.

research synthesis, effect size, Random-effect model, insurance premium

The long-standing debate on the impact of insurance market activity on economic growth has been a topic of numerous papers which use different methodologies and differ in results. Heterogeneity in estimated effects and the number of observations provides the ground for synthesis of so far published results and calculation a more precise estimation of the effect. In general, insurance market activity, both as the provider of risk transfer and indemnification and as the institutional investor, may contribute to economic growth through mobilisation of domestic savings, allowing different risks to be managed more efficiently, encouraging the accumulation of new capital, boosting financial stability, facilitating trade and commerce, supporting to reduce or mitigate losses, and fostering a more efficient allocation of domestic capital (Ward, Zurbuegg, 2000; Kugler, Ofoghi, 2005; Haiss, Sümegi, 2007). Insurance sector activity may be measured by a number of indicators. As the most frequent ones are used insurance premium and indicators involved in insurance premium, (e.g Adams *et al.*, 2009; Arena, 2008; Haiss, Sümegi, 2007; Ward, Zurbuegg, 2000). We

therefore use the insurance premium, defined as the periodic payment made on an insurance policy, as the indicator for research synthesis.

Meta-analysis is a relatively new method firstly appearing in 1980s (Havránek, Iršová, 2010a). The recent research using meta-analysis as methodology includes Havránek (2010), trying to uncover the effect of currency unions on trade, Havránek, Iršová (2010b), analysing intra-industry productivity spillovers from foreign direct investment; Lux, Crook, Woehr (2011), studying the antecedents and outcomes of corporate political activity and Stanley (2005) investigating the restriction tests of the natural rate hypothesis. Employing a meta-analysis a meta-analyst may not only calculate a more precise estimation of the effect of relationship between two phenomena, but using meta-regression he may also identify omitted variables and add new and relevant information unavailable in the original study, (Stanley, Doucouliagos, 2012). Despite the fact that meta-regression provides incomparably more possibilities of in-depth analysis we are employing the standard meta-analysis approach.

The purpose of this paper is to compute the effect size of insurance premium as the measure of insurance sector activity on economic growth on the sample of 10 studies using random-effect model and selected measure of between-study variance. Since the individual studies differ in estimated effect of insurance sector activity on economic growth we compute the overall effect size.

The paper is organised as follows: the first part provides the review of the literature, the second part presents the methodology and describes the dataset, the third part presents the results and in the last part we are discussing our results.

Importance of insurance sector activity for economic growth

It is essential to identify the channels through which the insurance sector activity impacts the economic growth. Skipper (1997) shows that insurance market activity, both as a provider of risk transfer and indemnification and as an institutional investor, may contribute to economic growth in the following ways: (a) mobilising domestic savings, (b) allowing different risks to be managed more efficiently, thereby encouraging the accumulation of new capital; (c) boosting financial stability; (d) facilitating trade and commerce (the most ancient insurance activity); (e) supporting to reduce or mitigate losses; and (f) fostering a more efficient allocation of domestic capital. According to Zweifel and Eisen (2012) insurance influences production and consumption, internal and international trade, transaction payment as well as the conservation of existing and creation of new wealth.

Insurance sector improves allocation of risk and decreases transaction costs. Insurers reduce losses and therefore increase the efficiency of the economy and contribute to its stability and growth (Zweifel, Eisen, 2012). Risk transfer is the main function of the insurance on the client side (Haiss, Sümegi, 2007). As far as the protection of existing wealth, insurers provide economic subjects a more stable basis for their planning by protecting existing wealth. This results in stabilization of consumption and thus supports economic growth (Zweifel, Eisen, 2012).

Insurance sector also contributes to capital accumulation. Premiums are paid at the beginning of the insured period while losses occur with a lag. This creates space for capital accumulation. There are differences between life and non-life insurance because life insurance shares at least two thirds of the capital stock. Life insurance is much more affected by regulation so its ratio of premium income to GDP varies across countries (Zweifel, Eisen, 2012). The process of capital accumulation becomes more efficient as the development of the financial intermediary function improves (Pagano, 1993). Economic subjects could generate savings in life insurance which mobilizes capital. According to Arena (2008) there is also a different effect on economic growth from life and nonlife insurance (property-liability). These two types of insurance

protect households and corporations from different risks and affect economic activity in different ways. Life insurance institutions make long-term investments to the contrary nonlife insurance companies rather make short-term ones.

Insurers monitor management to avoid excessive risks, thereby encourage the efficient use of economic resources (Zweifel, Eisen, 2012). Economic agents by purchasing insurance protect themselves against the risks of daily life. Insurance can encourage loss mitigation which can be a substitute for and complement to government security programs (Skipper, 2001). It then may be more efficient to insure against flooding rather than the government or community was negatively affected (Zweifel, Eisen, 2012).

Economic benefits from insurance mostly depend on the cultural context of a given economy (Růžicková, Novák, 2010). Where societies are indifferent to risk or risk transfer mechanisms, then social structure of the society will reduce the potential benefits from insurance (Fukuyama, 1995; Ward, Zurbruegg, 2000). If different socio-cultural determinants of insurance purchasing decisions are taken into account, then the ability of insurance to increase economic growth will be likely different across economies (Ward, Zurbruegg, 2000).

In the literature as the indicators of insurance sector activity are frequently mentioned to be the number of insurance companies, number of employees and insurance funds. Premium income relative to GDP, represented as the interest of the economy in insurance coverage, is a popular and frequent indicator for cross-country comparison.

MATERIALS AND METHODS

Based on the literature review, this paper uses insurance premium, insurance penetration and density as the measures of insurance sector activity. Insurance premium is defined as the periodic payment on insurance policy and is composed of insurance penetration and insurance density, where insurance penetration relates to insurance premiums in relation to GDP of life and non-life insurance (Čurak, Lončar, Poposki, 2009) and insurance density are the premiums per capita (Chen, Lee, Lee, 2012; Horng, Chang, Wu, 2011).

Meta-analysis is a statistical technique for combining the findings from independent studies which may differ in estimated results enabling the researcher to estimate results with higher amount of observations and better precision. Most meta-analyses are based on one of two statistical models, the fixed-effect model or the random-effects model, (Borenstein *et al.*, 2009). If the within study variances are available, a researcher can take these into account in estimation of an overall effect. Compared to a fixed-effects model the random-effects model assumes that not only within study variances (number of observations, precision) but also the effect size between a dependent and explanatory

variables may be heterogeneous among the studies in the sample.

Since the effect and the number of observations differ in the sample of studies, the random-effect model was selected. The homogeneity is tested by Cochran Q test. The model is specified as follows:

$$Y = x_i + \varepsilon_i; \varepsilon_i \sim N(0, \sigma_i^2), \quad (1)$$

$$x_i = t_i + n_i + \varepsilon_i; \varepsilon_i \sim N(0, \sigma_i^2), \quad (2)$$

where for study i : is the overall effect size of the sample of 10 studies, the effect size of an individual study and the random error. As only papers reporting t-statistics were selected, the t-statistics stand in the model as the measure of the effect size (denoted t_i) in an individual study. Number of observations stands as in the model.

Since the overall effect estimate (ME) is computed as a weighted mean, giving higher weights to studies with higher number of observations, the overall computation is provided by:

$$ME = \frac{\sum_{i=1}^k n_i t_i}{\sum_{i=1}^k n_i}, \quad (3)$$

where the weights depend on the number of observations in individual studies.

This model, by assuming that the studies are a random sample out of a population of studies and modelling the variability between them, provides wider confidence intervals for the estimate of the overall effect and is generally a more conservative approach than the fixed-effects model (Poole, Greenland, 1999).

Sample of literature

In the present paper, 39 results from 10 different studies are used. Search for published studies was performed in Wiley, Elsevier, Scopus, J-Store, Ideas Repec and ISI Web of Science databases. To include unpublished papers ("grey literature" having the form of reports, working papers, dissertation theses and papers from conference proceedings, which were not published in a journal) we employed Google Scholar and National repository of grey literature databases. For all databases combinations of the keywords "insurance premium," and "growth" were used to select papers.

It is important that a meta-analysis contains an explicit set of criteria which define the population of studies that will be collected and analysed. These criteria should be stated clearly and explicitly. Therefore we are following Stanley and Doucouliagos (2012) approach, and only published (journals) and unpublished (working papers, policy papers, discussion papers) English written studies, reporting t-statistics, focused on the relationship

I: Sample description

Author	Year	Sample Coverage Region	Sample Coverage Period	Dependent Variable	Explanatory Variables	Methodology
Haiss, Sümegi	2007	29 European countries	1992-2004	real GDP per employee	total premium per employee	Cross- country panel regression
Webb, Grace, Skipper	2002	55 countries	1980-1996	GDP per capita	Life insurance premium, PL premium	Panel regression
Curak, Lončar, Poposki	2009	10 transition EU countries	1992-2007	real GDP per capita	life insurance, non- life insurance	OLS
Avram, Nguyen, Skully	2010	93 countries	1980-2006	real GDP per capita growth	insurance density, insurance penetration	OLS, GMM
Arena	2008	55 countries	1976-2004	real GDP per capita growth	life premiums to GDP, nonlife premiums to GDP	Dynamic panel GMM
Horng, Chang, Wu	2011	Taiwan	1961 - 2006	real GDP per capita	insurance density	GC
Njegomir, Stojic	2010	5 former Yugoslavian countries	2002-2008	real GDP per capita	life insurance premium, nonlife insurance premium	PLS
Ege, Sarac	2011	29 countries	1999-2008	real GDP per capita	total insurance premium	Panel OLS
Chen, Lee, Lee	2012	60 countries	1976 - 2005	real GDP per capita	insurance penetration, insurance density	panel GMM
Han, Li, Moshirian, Tian	2010	77 countries	1994-2005	real GDP per capita	insurance density	panel GMM

Source: authors' compilation

insurance premium – economic growth were included in the sample. We do not include papers with any other measure of insurance sector activity than insurance premium, (or insurance density and insurance penetration), as we think that they deserve a separate meta-analysis.

We excluded studies written in a different language than English, focusing on different factors of insurance market than insurance premium (or insurance density, insurance penetration). Also papers previously published as a working paper were not included and only the published version of the text was selected, therefore we avoided replications in all included studies in the sample. Only papers using regression models (OLS, GMM) and Granger causality were included. Papers employing long-term relationship models (e.g. cointegration) were excluded, due to the limitations of the random-effects model.

RESULTS

Since the effect size is calculated a weighted mean the estimation provides a strong positive effect of insurance premium on economic growth (mean effect, Tab. II). The Cochran Q test of heterogeneity

II: Results

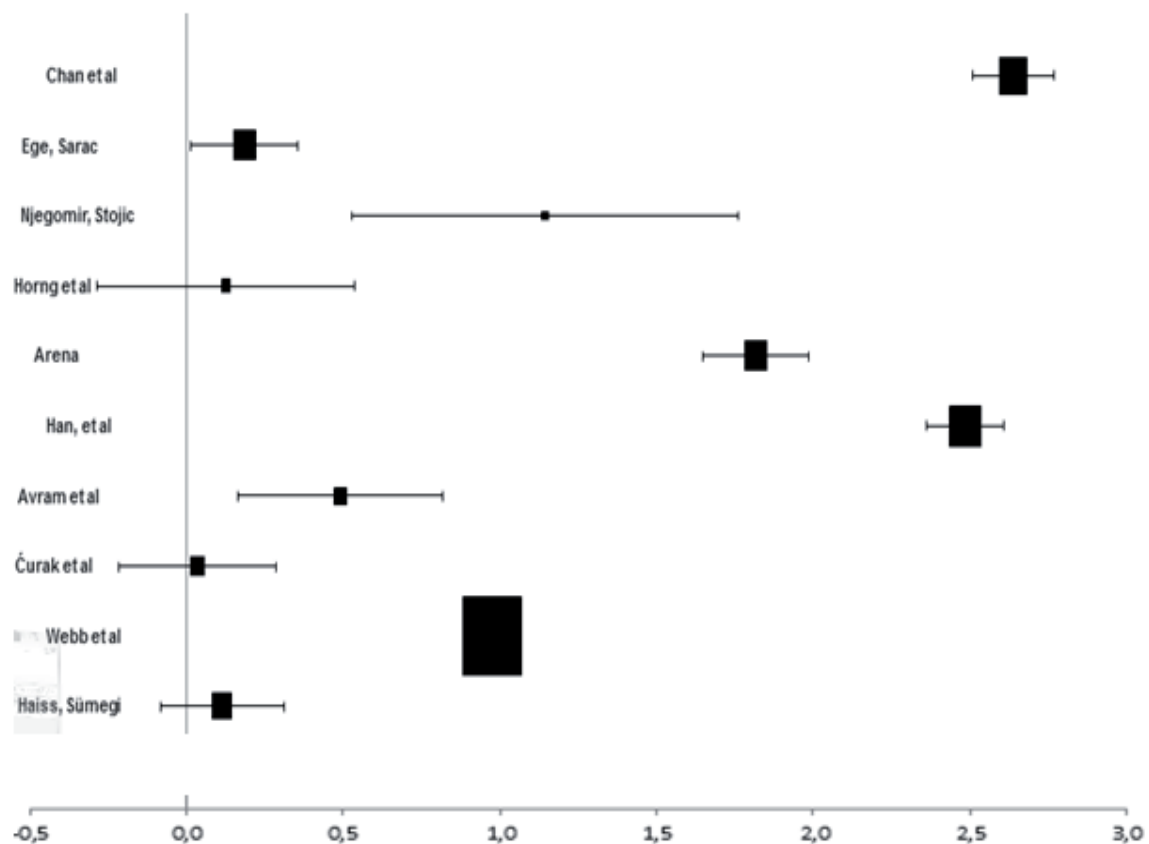
RE model	mean effect	var eff	l95%CI	u95%CI
	1.0072	0.1013	0.2870	1.7273
Cochrane Q test	value	p-value		
	1371.38	0		

Source: authors' calculation

Note: The table presents the mean affect estimation, variability, lower and upper values for the mean effect at 95% confidence interval. Cochran's Q test provides a p-value for the test of homogeneity.

indicates a strong between – study heterogeneity (homogeneity rejected at 0% significance level) which supports the random-effect model selection.

The heterogeneity of individual studies estimation graphically shows the forest plot (Fig. 2). The squares that are used to illustrate each of the studies' effect vary in size, with the size of each square reflecting the weight that is assigned to the corresponding study. The effect size for each study is bounded by a confidence interval, reflecting the precision with which the effect size has been estimated in that study. There is a relationship between a study's precision and that study's weight in the analysis. Papers with higher amount of observations were



1: Forest plot on effect sizes of all studies

Note: The size of the squares indicates the weight of a study in the model which is bounded by confidence interval range for each study. Studies with higher number of observations are considered to be more precise which is reflected in the plot by the size of the square.

III: Summary results for individual studies

Study	Effect	Lower 95% CI	Upper 95% CI
Haiss, Sümegi (2007)	0.1138	-0.0842	0.3118
Webb, Grace, Skipper, (2002)	0.9824	0.9193	1.0456
Ćurak, Lončar, Poposki (2009)	0.0341	-0.2189	0.2871
Nguyen, Avram, Skully (2010)	0.4928	0.1639	0.8218
Han, et al (2010)	2.5024	2.3798	2.6251
Arena (2008)	1.8295	1.6586	2.0005
Hornig, Chang, Wu (2011)	0.1239	-0.2893	0.5371
Njegomir, Stojic (2010)	1.1513	0.5315	1.7712
Ege, Sarac (2011)	0.1846	0.0130	0.3561
Chan et al (2012)	2.6567	2.5265	2.7869

Source: authors' calculation

assigned a higher weight in the estimation of the overall effect and are considered to be more precise.

Tab. III presents effect size estimation for each individual study in the sample.

DISCUSSION

The analysis is limited by several factors which should be eliminated in further research. Firstly, the sample may not include all relevant papers because inclusion of unpublished papers was limited to working papers, discussion and policy papers. Through the National repository of grey literature were no papers selected. There is a number of dissertation thesis available on the world-wide-web, however, the authors could not get access to their full versions due to payment restrictions. We also did not treat for publication bias which results from inclusion of published papers solely. The funnel plot of detection of publication bias may indicate that the selection of papers did not properly take into account unpublished studies in conference volumes, dissertation theses, reports unavailable through the world-wide-web and unpublished papers in different databases than the National repository of grey literature. Nevertheless, there are several papers, (e.g. Rose, 2004), which only focus on published papers in journals. Another limitation lies in estimation methodology. The random-effects model is a standard meta-analytic model used not only in economics, but also in medicine and other fields. The development of the research should lead to formulation of a meta-regression model which would exponentially enhance the researcher with possibilities of effects treatment, which we could not provide using a standard random-effects model. In spite of the limitations we are convinced that research in this area is highly valuable because, to the authors' knowledge, no meta-analysis dealing with the connection of insurance activity and economic growth has been published. This also counts for the analysis of inverse causality, leading from economic growth to insurance sector activity, which is a potentially rich ground of further meta-analytic research.

The results of our research are particularly important for policy makers who set the policy towards subjects in the insurance market, i.e. insurers, reinsurers, insurance intermediaries and policy holders who primarily influence the market's development. They may help formulate research project proposals that relate to the field of insurance premium and its relation to economic growth.

CONCLUSIONS

In this paper we have calculated the effect size of the causal relationship of insurance premium on economic growth on 10 published and unpublished studies using a random-effect meta-analysis model. The overall effect size based on research synthesis through a meta-analysis is positive, therefore we may argue for positive impact on insurance sector activity on economic growth. Individual papers in the sample report different effect sizes (i.e. the measure of the strength of relationship) and cope with different numbers of observations. Therefore the random-effect model is employed to allow to control for between-study variance in estimated effects and number of observations. All individual papers in the sample indicated positive causality however given differences in precision of estimate (given by t-statistics) and number of observations, the overall effect is calculated as the weighted mean. The overall effect is positive, i.e. we come to conclusion that insurance sector activity, measured by insurance premium, positively affects economic growth (measured by GDP per capita). Using meta-analysis as the statistical method we may support our results with the sample of higher number of observations and provide more objective arguments.

Further research should lead to creation of a proper meta-regression model, enhancing the possibilities of the analysis, including a funnel plot for detection of publication bias and including control variables for various related effects and biases. The importance of conducting the inverse-causality meta-analysis, i.e. the effect of economic growth on insurance sector activity is well-required, as this field is not covered in current meta-analytic literature.

SUMMARY

This paper studies the impact of insurance activity and economic growth on the sample of 10 published and unpublished studies using a random-effects model of meta-analysis. Due to the statistical evaluation of so far published research the estimation of the impact is more precise. Heterogeneity of results of studies in the sample was indicated therefore the random-effects model was selected. The model takes into the account the between-study heterogeneity, and is calculated as weighted mean, giving higher weights to studies with higher number of observations. Studies with higher number of observations are considered to be more precise. Insurance premium (or its components insurance density and insurance penetration) is taken as the measure of insurance sector activity, GDP per capita then as the measure of economic growth. The studies were searched for in main economic databases and also unpublished papers were included into the dataset. Explicit criteria for inclusion and exclusion of papers into the sample were defined. Research synthesis through meta-analysis revealed that insurance sector activity positively affects economic growth but this argument is supported by significantly higher number of observations due to the sample size. Effects of insurance sector activity on economic growth in all individual papers are graphically presented by a forest plot. Further aim of the research is outlined, particularly in the connection to meta-regression analysis, and also the importance of the research on the inverse causality, i.e. the impact of economic growth on insurance sector activity is discussed. Since the estimation of the overall effect is more precise than in individual papers, the results are particularly important for policy makers who set the policy towards subjects in the insurance market, i.e. insurers, reinsurers, insurance intermediaries and policy holders.

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REFERENCES

- ADAMS, M. et al., 2009: Commercial Banking, Insurance and Economic Growth in Sweden between 1830 and 1998. *Accounting, Business & Financial History*, 19, 1: 21–38. ISSN 1466-4275.
- ARENA, M., 2008: Does insurance market activity promote economic growth? A Cross-country Study for Industrialized and Developing Countries. *The Journal of Risk and Insurance*, 75, 4: 921–946. ISSN 1539-6975.
- BORENSTEIN, M. et al., 2009: *Introduction to Meta-Analysis*. 1. vyd. Chichester, UK: Wiley Publishing. ISBN 9780470057247.
- CHEN, P.-F., LEE CH.-CH., LEE CH.-F., 2012: How does the Development of the Life Insurance Market Affect Economic Growth? Some International Evidence. *Journal of International Development*. 24, 7: 865–893. ISSN 1099-1328.
- ĆURAK, M., LONČAR, S., POPOSKI, K., 2009: Insurance Sector and Economic Growth in Transition Countries, *International Research Journal of Finance and Economics*, 34: 29–41. ISSN 1450-2887.
- EGE, Í., SARAC, T. B., 2011: The Relationship between Insurance Sector and Economic Growth: An Econometric Analysis. *International Journal of Economics and Research*, 02, 02: 1–9. ISSN 2229-6158.
- FUKUYAMA, F., 1995: *Trust: The Social Virtues and the Creation of Prosperity*. London: Penguin books. 458 p. ISBN 0-14-025943-0.
- HAISS, P., SÜMEGI, K., 2007: The Relationship between Insurance and Economic Growth in Europe: A theoretical and empirical analysis. *Empirica*, 35, 4: 405–431. ISSN 1573-6911.
- HAN, L., LI, D., MOHSIRAN, F. T. Y., 2010: Insurance Development and Economic Growth. *The Geneva Papers on Risk and Insurance Issues and Practice* 35, 2: 183–199. ISSN 1018-5895.
- HAVRÁNEK, T., 2010: Rose Effect and the Euro: is the magic gone? *Review of World Economics (Weltwirtschaftliches Archiv)*, 146, 2: 241–261. ISSN 1610-2886.
- HAVRÁNEK, T., IRŠOVÁ, Z., 2010a: Measuring Bank Efficiency: A Meta-Regression Analysis. *Prague Economic Papers*, 2010, 4: 307–328. ISSN 1210-0455.
- HAVRÁNEK, T., IRŠOVÁ, Z., 2010b: Meta-Analysis of Intra-Industry FDI Spillovers: Updated Evidence. *Finance a úvěr, Czech Journal of Economics and Finance*, 60, 2: 151–174. ISSN 0015-1920.
- HORNG, M.-S., CHANG, Y.-W., WU, T.-Y., 2011: Does insurance demand or financial development promote economic growth? Evidence from Taiwan. *Applied Economic Letters*, 19, 2: 105–111. ISSN 1466-4291.
- KUGLER, M., OFOGHI, R., 2005: Does insurance promote economic growth? Evidence from the UK. In: *Money Macro and Finance Research Group/ Money Macro and Finance (MMF) Research Group Conference 2005*, 1–3 September, University of Crete, Rethymno, Greece. Available on: <http://repec.org/mmfc05/paper8.pdf>.
- LUX, S., CROOK, T. R., WOEHR, D. J., 2011: Mixing Business With Politics: A Meta-Analysis of the Antecedents and Outcomes of Corporate Political Activity. *Journal of Management*, 37, 1: 223–247. ISSN 1557-1211.

- NGUYEN, Y., AVRAM, K., SKULLY, M., 2010: Insurance and Economic Growth: A Cross Country Examination. *Australian Centre for Financial Studies–Finsia Banking and Finance Conference*. Available on: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1646757.
- NJEGOMIR, V., STOJIČ, D., 2010: Does Insurance Promote Economic Growth: The Evidence from ex-Yugoslavia region. *Ekonomika misao i praksa: časopis Sveučilišta u Dubrovniku*, 19, 1: 31–48. ISSN 1330-1039.
- PAGANO, M., 1993: Financial Markets and Growth: An Overview. *European Economic Review*, 37, 2–3: 613–622. ISSN 0014-2921.
- POOLE, C., GREENLAND, S., 1999: Random-Effects Meta-Analyses Are Not Always Conservative. *American Journal of Epidemiology*, 150, 5: 469–475. ISSN 1476-6256.
- ROSE, A. K., 2004: A Meta-Analysis Of the Effect of Common Currencies on International Trade. *NBER Working Paper No. 10373*. Available on: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.132.7173&rep=rep1&type=pdf>.
- RŮŽIČKOVÁ, K., NOVÁK, P., 2010: The Effects of Competencies on the Company Value. *Acta Univ. Agric. et Silv. Mendel. Brun.*, 58, 6: 415–420. ISSN 1211-8516.
- SKIPPER, H. D., 1997: Foreign Insurers in Emerging Markets: Issues and Concerns. *Center for Risk Management and Insurance Occasional Paper 97-2*. Available on: <http://rmictr.gsu.edu/Papers/FOREIGN.pdf>.
- SKIPPER, H. D., 2001: *Insurance in the general agreement on trade in services*. 1st ed. London: Aei Press, 82 p. ISBN 978-0844771595.
- STANLEY, T. D., 2005: Integrating the Empirical Tests of the Natural Rate Hypothesis: A Meta-Regression Analysis. *Kyklos*, 58, 4: 611–634. ISSN 1467-6435.
- STANLEY, T. D., DOUCOULIAGOS, H., 2012: *Meta-regression Analysis in Economics and Business*. Routledge Advances in Research Methods. 1st ed. New York: Routledge, 186 p. ISBN 978-0-415-67078-4.
- WARD, D., ZURBRUEGG, R., 2000: Does Insurance Promote Economic Growth? Evidence from OECD Countries. *The Journal of Risk and Insurance*, 67, 4: 489–506. ISSN 1539-6975.
- WEBB, I., GRACE, M. F., SKIPPER, H. D., 2002: The Effect of Banking and Insurance on the Growth of Capital and Output. *Center for Risk Management and Insurance*, Working Paper 02-1. Available on: <http://rmictr.gsu.edu/working.htm>.
- ZWEIFEL, P., EISEN, R. 2012: *Insurance Economics*. 1st ed. Berlin: Springer New York, 451 p. ISBN 978-3-642-20547-7.

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