

An examination of economic activity and ISO 9001 certifications in the Asia-Pacific Economic Cooperation countries

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ABSTRACT

The ISO 9001 certification process offers organizations a worldwide recognized method to improve both product quality and business processes. Prior literature on ISO 9001 has examined various issues; such as competitive advantage and improved internal processes. This study seeks to expand the body of research by examining whether macro variables (economic growth and investment) can help understand the overall use of ISO 9001 certificates in a country. Specifically, this study examines the potential association of Gross Domestic Product (GDP) and Foreign Direct Investment (FDI) and the use of ISO 9001 certificates within a country. Overall the results show a positive relation between the amount of FDI flowing into the country and the number of ISO 9001 certificates. Additionally, there is a positive relation between the growth in GDP in the prior year and the increase in the number of ISO 9001 certificates in the current year, suggesting that economic growth leads to positive growth in the number of ISO 9001 certificates.

Keywords: ISO 9001, globalization, economic growth, Foreign Direct Investment

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INTRODUCTION

The purpose of this study is to explore the intersection of a management accounting system (ISO 9001) and changes in economic development and foreign investment. Since its inception in 1987, the ISO 9001 standards have grown more prominent and expanded its reach into many industries. Its certification process provides a method to standardize and organize processes while improving efficiency. Much of the research on ISO 9001 focuses on a firm's experience with obtaining the ISO 9001 certification. Terziovski et al. (2003) show improved organizational performance following the adaptation of ISO 9001 practices when its managers adopt certification willingly. Additionally, the enhanced performance that follows ISO 9001 certification may result in the firm's increased ability to bid on projects and attract new customers [Cao and Prakash (2011)]. Research also examines ISO 9001 certificates in an international context. Many of these studies examine the association between the number of ISO 9001 certificates in a country and business activity; such as Sampaio et al. (2009), Salgado et al. (2016), and Clougherty and Grajek (2008). For example, Sampaio et al. (2009) examine R&D activity and growth of ISO 9001 certificates in the European Union. Salgado et al. (2016) examine the association of ISO 9001 certificates and Gross National Income in North America and South America.

The focus of this study is to examine how changes in Gross Domestic Product (GDP) and Foreign Direct Investment (FDI) lead to an increased interest and adoption of ISO 9001 certifications. Using a sample period of 1993-2017 and 20 countries, the results show that countries' economic growth is linked to an increase in the number of ISO 9001 certificates. Specifically, the results show ISO 9001 certifications increase the year following increases in GDP. In addition, the results show that as FDI increases in a country, the number of certifications increases contemporaneously. In conclusion, as more capital becomes available, either from recent economic growth or current investments, more firms in that country seek to standardize and optimize organizational processes through the ISO 9001 certification process. Additional analysis using membership in Organization for Economic Co-operation and Development (OECD) countries to examine whether economic development affects the results. The overall results are not affected by inclusion in the OECD organization. The results of this study contribute to the literature by showing a link between the use of ISO 9001 certificates and economic activity.

LITERATURE REVIEW

Over the last few decades, national economies have become more interconnected, and the internationally accepted and recognized ISO 9001 standards foster increased globalization. Since its inception, ISO 9001 standards have grown in scope with organizational benefits such as increases in sales and increases in market share [Tari et al. (2012)]. The adoption of a uniform management accounting system worldwide presents academic researchers with an opportunity to examine a diverse set of issues. For example, studies have examined the adoption process; such as, Poksinska et al. (2002) focusing on the need for management buy-in to optimize the benefit of ISO 9001 certification in Sweden and Douglas et al. (2003) examine service and manufacturing industries in the UK and conclude that managers value the quality improvement

contributions made after ISO 9001 implementation. Terziovski et al. (2003) examined Australian managers' motives for obtaining ISO 9001 certification and found that those more willingly enter the adoption process yielded more benefits (i.e. improved organizational performance). Acharya and Ray (2010) surveyed Indian firms, post-ISO 9001 adoption and found that a significant number of firms reported improved internal business processes. Demir (2021) found that firm-specific factors; such as willingness, managers' education, and other factors significantly determine whether the potential benefits of ISO 9001 were realized. Guler et al. (2002) found that countries with more large multinational firms tend to have more ISO 9001 certificates than countries with less large multinational firms. European Union countries with relatively more R&D expenditures tend to have fewer ISO 9001 certificates than those countries with less R&D expenditures [Sampaio et al. (2009)]. However, some research found that the competitive advantage fades as the number of certifications increases in a market [Casadesus and Karapetrovic (2005) and Karapetrovic et al. (2010)]. Pachero et al. (2022) state that ISO 9001 certifications reduce information asymmetry in international trade.

This study furthers the research stream of studies focusing on the relationship between ISO 9001 adoption and economic activity in an international context. Salgado et al. (2016) examined Gross National Income in North America and South America and found a positive association between economic activity and the number of ISO 9001 certificates. This result held for all countries except Argentina and Canada. Clougherty and Grajek (2008) found that as international trade from developing countries to developed countries increases there is a corresponding increase in the number of ISO 9001 certificates. Le (2009) also found that as international trade increases developing countries experience a significant growth in ISO 9001 certificates.

Luchs et al. (2019) examine the use of ISO 9001 standards and economic activity in the BRIC countries (Brazil, Russia, India, and China). The overall results suggest that as the number of ISO 9001 certificates increases there is a contemporaneous increase in the amount of FDI. In addition, further analysis reveals that the current and lagged change in GDP and the lagged change in FDI are not associated with the change in the number of ISO 9001 certificates. When country indicator variables were included, the overall results were driven by Brazil and Russia. Nurcahyo and Habiburrahman (2021) consider how certifications affect a developing country's manufacturing industry. The authors show a positive relation between the number of certifications and business performance. Rodriguez-Arnaldo and Martinez-Lorente (2020) show that developing countries benefit from the implementation of ISO 9001 standards. Yang et al. (2020) demonstrate that Asia-Pacific Economic Cooperation (APAC) countries have experienced the most economic development in recent decades.

DESCRIPTIVE STATISTICS AND RESULTS

Recognizing the impact ISO 9001 certifications have on developing nations, the focus of this study is on the economically diverse nations in the APAC region. As such, this study explores how economic development, measured by GDP and FDI affects the number of certifications for APAC nations, where competitive advantages and information asymmetry may still exist. The International Organization for Standardization administers the ISO 9001 certification process and provides the data on the number of certificates for each country for the 1993-2017 sample. The data for GDP per capita and FDI per capita is available from the World Bank. The current change in GDP per capita and FDI per capita, along with the prior year's

change of the economic variables were used to capture the dynamic impact they may have on the change in the number of ISO 9001 certificates.

Column 2 of Table 1 presents the information concerning ISO 9001 certificates for the Asia-Pacific Economic Cooperation member countries per 100,000 inhabitants. Overall, there are, on average 20.53 ISO 9001 certificates for every 100,000 inhabitants. Countries with the most certificates per 100,000 inhabitants are Singapore, Australia, and New Zealand with 86.06, 66.55, and 41.08, respectively. Papua New Guinea, the Philippines, and Indonesia with 0.20, 1.48, and 1.54, respectively, have the fewest ISO 9001 certificates per 100,000 inhabitants. The Kruskal-Wallis (K-W) statistic examines whether there are significant differences among the countries in the number of ISO 9001 certificates is 343.35, significant at the 1% confidence level. This result suggests significant differences in the number of ISO 9001 registered firms among countries. Column 3 of Table 1 provides the year-to-year change of ISO 9001 certificates for the entire sample and each country. There is an overall average yearly increase of 38.48% in the number of ISO 9001 certificates. The greatest growth in the number of certificates is Vietnam with an average increase of 100.64%. Vietnam started the sample period in 1993 with zero certificates and finished in 2017 with 3,897 certificates. New Zealand experienced the slowest rate of growth in the number of certificates at an average rate of 5.01%. The K-W statistics is 30.69. This test statistic is significant at the 5% confidence level, suggesting that growth in the number of ISO 9001 certificates statistically varies across the countries in the sample.

Columns 4 and 5 of Table 1 present the information concerning GDP per capita and the change in GDP per capita. The overall mean for GDP per capita for the sample is \$19,502.57. The countries with the highest GDP per capita are the United States, Australia, and Singapore with an average across the sample period of \$50,459.70, \$49,219.88, and \$41,814.66, respectively. Vietnam, Papua New Guinea, and the Philippines have the lowest average GDP per capita. The K-W statistic testing whether country-specific differences exist for GDP per capita is 468.54. This K-W statistic is significant at the 1% confidence level, suggesting a considerable difference in GDP per capita across the sample. The mean change in GDP per capita for the overall sample is 4.04%. At the upper range of change in GDP per capita are China at 9.61% and Vietnam at 6.87%, at the lower range are Japan at 0.89% and Brunei at 1.08%. The K-W statistic is 190.87, suggesting there are statistically significant differences in the change of GDP per capita across the countries in the sample.

Columns 6 and 7 of Table 1 present the FDI per capita and the change in FDI per capita. The average FDI per capita for the overall sample is \$1,060.60. Hong Kong with an average FDI per capita per year of \$7,942.54 and Papua New Guinea at \$16.17 represents the high and low countries in the sample. The K-W statistic is 359.32. This statistic is significant at the 1% level of confidence, suggesting that there are statistically significant differences in the amount of FDI flowing into the sample countries. Finally, the overall mean for the change in FDI per capita is 36.18%. Over the sample period, Japan, New Zealand, and Peru experienced average yearly negative growth. The K-W of 21.43 is not statistically significant, suggesting that the difference in the change of FDI across the countries is not meaningful.

Panel A of Table 2 presents the results of regressing the current change in GDP per capita and FDI per capita and the prior year's change of both variables on the current change in the number of ISO 9001 certificates. In examining the change in GDP per capita and the prior year's change in GDP per capita, only the prior year's change in GDP per capita is statistically significant. The coefficient for the prior year's change in GDP per capita is positive, suggesting

when there is an increase in economic activity in a country there is not an immediate increase in the number of ISO 9001 certificates in the country, but the increase occurs the following year. In considering the coefficients for the current change in FDI per capita and the prior year's change in FDI per capita, only the current change in FDI per capita coefficient is significant. This coefficient is positive, suggesting a direct relation between the current change in the amount of FDI flowing into a country and the change in the number of ISO 9001 certificates. The ISO 9001 certification process requires extensive examination of internal processes and documentation. Taken together it appears that an increase in economic activity is associated with the start of the ISO 9001 certification process that concludes the following year.

Panel B of Table 2 presents the results with the inclusion of the OECD variable. This variable is classified as 1 for countries that are OECD members, and 0 otherwise. OECD countries are typically market-driven economies with developed infrastructures. The inclusion of this variable examines whether a country classification such as OECD affects the drive for ISO 9001 certificates. Similar to the results in Panel A, the coefficients for the prior year's change in GDP per capita and the current change in FDI per capita are both significant and positive. The coefficients of the current change in GDP per capita and the prior year's change in FDI per capita are not statistically significant, suggesting that they have no meaningful role in explaining the change in the number of certificates. The coefficient for the OECD variable is not statistically significant. This result is interesting since it would seem that countries with well-developed infrastructures would enable an easier, comparatively speaking, certification process. However, prior research suggests that firms in non-OECD countries can benefit relatively more from ISO 9001 certification than firms in more developed economies. Since the coefficient is not statistically significant, OECD membership does not affect the change in the number of ISO 9001 certificates.

Table 3 presents the results incorporating indicator variables representing each country in the sample. The use of country-specific variables allows the examination of whether the unique characteristics of a country explain the prevalence of ISO 9001 certificates. For the country indicator variables, Australia serves as the base country. The remaining country indicator variables are 1 for the listed country and 0 otherwise. In the presence of country indicator variables, the coefficients for the current change in FDI per capita and the prior year's change in GDP per capita are still positive and statistically significant. This result suggests that even after isolating potential country-specific characteristics these variables have a robust relation with the change in ISO 9001 certificates. The coefficients for the Papua New Guinea and Vietnam variables are positive and significant. This result suggests that the relation of the variables on the change in certificates is unique in those two countries and is different from the other countries of the sample. The coefficients for the remaining country indicators are statistically insignificant, suggesting that there is not a material difference between the relation of the GDP and FDI variables and the change in the number of certificates. Thus, there appears to be no difference in the behavior of the number of ISO 9001 certificates, in terms of GDP and FDI for the remaining countries.

CONCLUSION

The global recognition of the ISO 9001 certificate offers organizations numerous benefits of quality management, process improvement, and obtaining and maintaining a competitive advantage. Emerging streams of research concerning ISO 9001 are cost/benefits analysis, process improvement, and exploring the motivation to obtain certification. This study furthers

research in economic activity and ISO 9001 certificates in an international setting by using a diverse set of countries and both current and previous year economic variables. Analysis of the data shows that the existence and use of the ISO 9001 certification statistically differ among the countries. The number of ISO 9001 certificates per 100,000 inhabitants in a country ranges from the fewest in Papua New Guinea to the most in Singapore. Similarly, the variables of GDP per capita, change in GDP per capita and FDI per capita are statistically different among the countries. The change in FDI per capita is not statistically different among the sample countries. Regression analysis reveals that the current change in the FDI per capita and the prior year's change in GDP per capita are associated with an increase in the ISO 9001 certification. This result held in all three regression models, highlighting the robustness of the findings. Additionally, the prior year's change in FDI and the current change in GDP are not statistically significant in any of the analyses, suggesting no meaningful association with the use of ISO 9001 certifications.

The results of this study differ significantly from others; such as Luchs et al. (2019) in several important ways. First, data for this study comes from a larger and more diverse sample. Second, the results of this study reveal that the current change in FDI and the prior year's change in GDP are significant, suggesting that both current investment and past economic growth correspond to the current growth in the number of ISO 9001 certificates. Additional analysis reveals that when membership in the OECD is included, the coefficient for the OECD variable is negative and not significant suggesting growth in the number of certificates occurs similarly among OECD countries and non-OECD countries. This developing field of interest provides researchers with opportunities to examine the impact of macro variables on ISO 9001 certificates. The results of this study shed light on how economic growth and investment lead to greater use of ISO 9001 certificates. Given the explanatory power of the analysis, future research must explore additional factors tied to the development of the use of ISO 9001 standards. This study represents a new avenue of research examining the interplay of a management accounting system (i.e. ISO 9001) and economic growth and amount of foreign investment.

REFERENCES

- Acharya, U. H., and Ray, S. (2000). ISO 9000 certification in Indian industries: a survey. *Total Quality Management*, 11(3), 261-266.
- Cao, X. and Prakash, A. (2011). Growing exports by signaling product quality: Trade competition and the cross-national diffusion of ISO 9000 quality standards. *Journal of Policy Analysis and Management*, 30(1), 111-135.
- Casadesus, M. and Karapetrovic, S. (2005). Has ISO 9000 lost some of its lustre? A longitudinal impact study. *International Journal of Operations and Production Management*, 25(6), 580-596.
- Clougherty, J. A., and Grajek, M. (2008). The Impact of ISO 9000 Diffusion on Trade and FDI: A New Institutional Analysis, *Journal of International Business Studies*, 39(4), 613-633.
- Demir, A. (2021). Inter-continental review for diffusion rate and internal-external benefits of ISO 9000 QMS. *International Journal of Productivity and Quality Management*, 33(3), 336-366.
- Douglas, A., Coleman, S., and Oddy, R. (2003). The case for ISO 9000. *The TQM Magazine*, 15(5), 316-324.
- Guler, I., Guillen, M.F., and Macpherson, J.M. (2002). Global Competition Institutions, and the Diffusion of Organizational Practices: The International Spread of ISO 9000 Quality Certificates, *Administrative Science Quarterly*, 47, 207-232.
- Karapetrovic, S., Fa, M.C. and Saizarbitoria, I.H. (2010), What happened to the ISO 9000 luster? An eight-year study, *Quality Control and Applied Statistics*, 55(3), 227-228.
- Le, H. (2009). Assessing Impact of ISO 9000 Certification on International Trade, Dissertation, Clemson University, PP. 1-93.
- Luchs, C., Maheshwari, S., and Moran, T. (2019). An Examination of ISO 9001 Certifications in the BRIC Countries, *DIAS Technology Review*, 15(2), 66-73.
- Nurcahyo, R., and Habiburrahman, M. (2021). Relationship between ISO 9001: 2015 and operational and business performance of manufacturing industries in a developing country (Indonesia). *Heliyon*, 7(1), 1-9.
- Pacheco, L., Lobo, C., and Maldonado, I. (2022). Do ISO certifications enhance internationalization? The case of Portuguese industrial SMEs. *Sustainability*, 14(3), 13-35.
- Poksinska, B., Jörn Dahlgaard, J., and Antoni, M. (2002). The state of ISO 9000 certification: a study of Swedish organizations. *The TQM Magazine*, 14(5), 297-306.
- Rodriguez-Arnaldo, O., & Martínez-Lorente, A. R. (2020). What determinants influence the diffusion of ISO 9001 by countries? *The TQM Journal*, 33(1), 223-246.

Salgado, E.G., Beijo, L.A., Sampaio, P., Mello, C.H.P., and Saraiva, P. (2016). ISO 9001 Certification in the American Continent: a Statistical Analysis and Modeling, *International Journal of Production Research*, 54(18), 5416-5433.

Sampaio, P., Saraiva, P., and Rodrigues, A.G. (2009). An Analysis of ISO 9000 Data in the World and the European Union, *Total Quality Management & Business Ethics*, 20(12), 1303-1320.

Terziovski, M., Power, D., and Sohal, A. S. (2003). The longitudinal effects of the ISO 9000 certification process on business performance. *European Journal of Operational Research*, 146(3), 580-595.

Tarí, J.J., Molina-Azorín, J.F. and Heras, I. (2012), Benefits of the ISO 9001 and ISO 14001 Standards: a literature review, *Journal of Industrial Engineering and Management*, 5(2), 297-322.

Yang, L., Wang, Y., Wang, R., Klemeš, J. J., Almeida, C. M. V. B. D., Jin, M., ... and Qiao, Y. (2020). Environmental-social-economic footprints of consumption and trade in the Asia-Pacific region. *Nature Communications*, 11(1), 1-9.

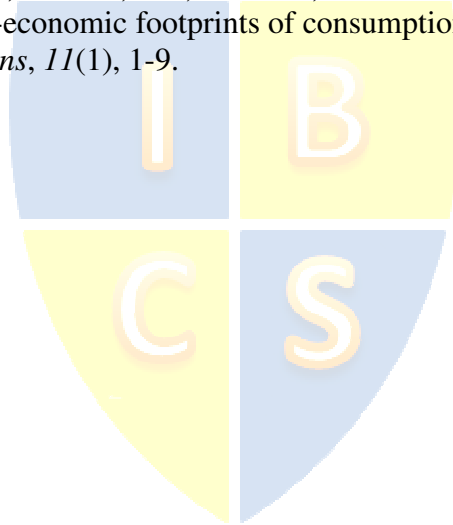


Table 1: Descriptive Statistics

	ISO 9001 per 100,000 capita	Change in ISO 9001	GDP per Capita	Change in GDP per Capita	FDI per Capita	Change in FDI per Capita
Overall Mean	20.53	0.3848	19,502.57	0.0404	1,060.60	0.3618
Std Dev	26.80	1.0969	17,561.31	0.0368	2,787.56	7.3009
Australia	66.55 35.72	0.1016 0.3655	49,219.88 6,488.22	0.0332 0.0088	1,235.22 1,025.70	0.2871 1.5550
Brunei	20.64 13.90	0.3438 0.9932	33,549.92 1,717.40	0.0108 0.0230	1,034.68 819.02	3.7143 19.1737
Canada	23.26 10.83	0.1581 0.4460	39,151.39 4,119.06	0.0255 0.0164	1,091.32 836.96	0.7865 3.3251
Chile	12.57 11.91	0.3747 0.5315	10,307.21 2,353.601	0.0439 0.0246	611.94 486.98	0.1686 0.5324
China	11.21 9.22	0.7120 1.3101	4,176.86 2,492.10	0.0961 0.0214	93.97 65.86	0.1460 0.3549
Hong Kong	38.78 17.01	0.1622 0.3727	32,954.44 6,948.08	0.0361 0.0327	7,942.54 6,531.87	0.2825 0.6036
Indonesia	1.54 1.07	0.5493 1.1359	2,397.54 586.02	0.0470 0.0399	31.86 35.60	0.2373 2.2353
Japan	29.80 18.86	0.3022 0.6096	32,451.38 1,796.87	0.0089 0.0189	71.73 78.97	-2.0749 14.1115
Malaysia	20.56 13.07	0.1863 0.3580	7,433.53 1,473.52	0.0549 0.0374	243.47 121.86	3.8481 18.4519
Mexico	3.06 2.01	0.3606 0.6452	9,435.40 571.16	0.0232 0.0320	211.63 85.44	0.1537 0.5197
New Zealand	41.08 18.78	0.0501 0.2864	33,562.04 4,036.53	0.0318 0.0171	406.90 440.07	-3.0152 11.0453
Papua New Guinea	0.20 0.16	0.5283 2.0736	2,183.68 262.93	0.0399 0.0531	16.17 23.71	0.8953 2.6074
Peru	1.76 1.60	0.3559 0.6614	4,318.40 1,236.91	0.0498 0.0301	157.52 109.57	-0.1842 2.2638
Philippines	1.48 0.99	0.6318 1.5093	2,210.31 480.60	0.0488 0.0195	29.13 21.63	0.3788 1.0019
Russia	6.45 10.86	0.6084 1.0428	7,247.45 1,963.99	0.0174 0.0594	161.22 165.23	0.3842 0.9591
Singapore	86.06 32.05	0.0990 0.2991	41,814.66 9,959.19	0.0591 0.0399	6,770.19 4,519.02	0.3290 0.7144
South Korea	26.87 16.16	0.4371 1.1774	21,075.08 5,861.44	0.0494 0.0340	170.19 85.40	0.2195 0.5552
Thailand	6.61 4.74	0.6108 1.3886	4,441.11 921.78	0.0390 0.0371	96.23 55.82	0.3098 0.9885
United States	9.37 3.78	0.1413 0.3467	50,459.70 5,285.47	0.0254 0.0158	777.45 390.02	0.1792 0.4444
Vietnam	2.77 2.62	1.0064 2.5738	1,661.46 631.81	0.0687 0.0122	58.61 45.17	0.1900 0.4489
K-W Statistic	343.35***	30.69**	468.54***	190.87***	359.32***	21.43

*** Significant at the 1% confidence level

** Significant at the 5% confidence level

Table 2: Regression Results

Panel A			
Variable	Coefficient	t statistics	p-value
Intercept	0.256	3.776***	0.000
Changed in GDP per Capita	1.778	1.066	0.287
Changed in FDI per Capita	0.018	2.605**	0.009
Changed in GDP per Capita lagged	3.490	2.162**	0.031
Changed in FDI per Capita lagged	0.005	0.732	0.465
Adj. R Squared 0.028			
Panel B			
Variable	Coefficient	t statistics	p-value
Intercept	0.339	3.996***	0.000
Changed in GDP per Capita	1.423	0.847	0.397
Changed in FDI per Capita	0.017	2.439**	0.015
Changed in GDP per Capita lagged	3.158	1.944*	0.053
Changed in FDI per Capita lagged	0.004	0.602	0.548
OECD	-0.180	-1.624	0.105
Adj. R Squared 0.032			

Changed variables are calculated by finding the percent change from the previous year for variables.

Lagged variables represent the prior year's observations of the previously defined variables.

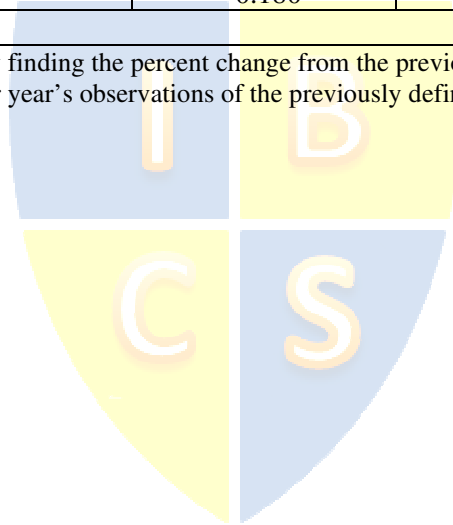


Table 3: Regression Results Country-Specific Analysis

Variable	Coefficient	t statistics	p-value
Intercept	0.019	0.082	0.935
Changed in GDP per Capita	1.315	0.730	0.466
Changed in FDI per Capita	0.018	2.593	0.010
Changed in GDP per Capita lagged	3.369	1.923	0.055
Changed in FDI per Capita lagged	0.006	0.789	0.430
Brunei Darussalam	0.290	0.888	0.375
Canada	0.061	0.190	0.849
Chile	0.217	0.670	0.503
China	0.290	0.825	0.410
Hong Kong	-0.435	-1.359	0.175
Indonesia	0.395	1.232	0.219
Japan	0.298	0.927	0.354
Korea, Rep.	0.222	0.687	0.492
Malaysia	-0.048	-0.148	0.883
Mexico	0.320	0.999	0.318
New Zealand	0.032	0.098	0.922
Papua New Guinea	0.606	1.776*	0.076
Peru	0.205	0.624	0.533
Philippines	0.512	1.600	0.110
Russian Federation	0.484	1.515	0.130
Singapore	-0.067	-0.207	0.836
Thailand	0.464	1.448	0.148
United States	-0.408	-1.271	0.204
Viet Nam	0.798	2.377**	0.018
Adj. R Squared 0.029			

Country indicator variables are 1 for the listed country and 0 otherwise.