

# Relating economic infrastructure indexes to investor protection for selected emerging economies

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**Abstract** This paper employs four indexes that capture economic infrastructure. Economic infrastructure refers to the quality of economic institutions that create an environment that may support productive activities and encourage capital accumulation. A second set of indicator variables used was related to investor protection, which includes rule of law, judicial efficiency, contract repudiation and expropriation risk. Multiple and single regressions were employed to find out whether economic infrastructure is associated with investor protection. The results are robust in that relationships hold well. Countries included for analysis were 17 market-oriented emerging economies.

**Keywords** Economic Infrastructure · Investor Protection

**JEL Classification** H11 · P51 · P17

## 1 Introduction

Shleifer (2009) contends that economists have remained at odds in assessing economic progress in the last 25 years. Two divergent views are captured by two recent books that Shleifer reviews. The first book is a collection of articles edited by Balcerowicz and Fisher (2006). The second book is by Stiglitz et al (2006). While the first book comes out on the side of free market policies, the second book

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disagrees. Shleifer provides first-hand facts of economic and social development during the period 1980 to 2005. Inflation-adjusted per capita world wide rose from \$5,400 in 1980 to \$8,500 in 2005. Life expectancy grew and mortality and poverty fell. More countries became democratic with wide acceptance of free market policies. Shleifer enumerates the events of the reforms in the 1980s in China, and the elections of Margaret Thatcher in Britain and Ronald Reagan in the United States as important to mark the beginning of the economic progress during this period.

Shleifer's summary of the views outlined in the first book is that open economies in stable macroeconomic environments with protection of property rights ensure rapid economic growth. In the words of Shleifer (page 126), "Milton Friedman would have put it better, but with the same idea." His summary of the views of the second book is that the economic world is gloomy. The book is a critique of free-market policies, with proposals for alternatives. Among the alternatives are state ownership and extensive regulations with emphases on virtues of inflation and capital controls.

Shleifer's personal views regarding the quarter century under consideration is that some economies that embraced capitalism after moving away from socialism began to grow after initial setbacks. Asian economies grew rapidly, yet faced difficulties in the 1990s. Even though South America adopted budget discipline and privatization in the 1980s and 1990s, their economies did not realize rapid growth because of overbearing taxation and regulation. The experience the period taught is that economic and political disorder along with obsolete human capital can hinder economic turnaround. In short, the central challenges are human capital, predatory regulation and tax policies, especially in Africa and Latin America. Free-market policies with support from governments can deliver growth and prosperity.

Henry (2007), in his review of a large number of publications, concurs with the personal opinions of Shleifer in that liberalization, especially capital, was effective on the cost of capital, investment and economic growth. Henry used emerging market economies for his assessment of the impact of liberalization of their stock market reforms as an important shift for capital account openness. The 17 economies that will be the subject of this paper introduced stabilization programs, trade liberalization and privatization sometime between 1986 and 1995. The question Henry tries to answer is why return to capital in developing economies, in spite of liberalization, is smaller than in developed countries.

The classical answer to this question is differences in capital-to-labor ratios across countries due to the level of total factor productivity. Typically, total factor productivity is an index measure of technology or ideas. Henry proclaims that given a stock of technology, total factor productivity measures the efficiency with which an economy transforms capital and labor into output. Included also in total factor productivity are weak institutions and inappropriate government regulation that may distort decision making by reducing the total factor productivity. The return to capital in emerging economies should be higher than in rich economies unless emerging market governments encourage capital accumulation, invention and technology and skill acquisition.

For purposes of illustration, Henry groups the economic institutions into what he calls economic infrastructure and displays for the purpose of ranking a selection of emerging economies by four frequently employed measures. The four quality-of-economic-institutions indexes are the measure of social structure by Hall and Jones (1999), the Index of Economic Freedom by Heritage House (2006), the Doing

Business Index by World Bank (2006) and the Global Competitiveness Index by World Economic Forum (2006). The rating of the economies as reported by Henry (page 912) is reproduced in the paper in Appendix A.

When investors perceive that investment protection is weak, they will stay away. Five measures for investor protection were employed. They are the rule of law, efficiency of the judicial system, contract repudiation, expropriation risk, and the accounting system, incorporated from La Porta et al (1998), reported by Henry (page 913) and reproduced in this paper as Appendix B.

Henry employed the infrastructure indexes and investor protection to elicit empirical prediction that the impact of liberalization should be stronger investor protection. Henry found when comparing the emerging economies average with the G-7 average for the economic infrastructure (See Appendix A) that the G-7 scores (the lower the better) for the four indexes were 14, 14, 22 and 15, as compared to the emerging market scores of 63, 68, 83 and 59. Henry concluded that the economic infrastructure of emerging markets is weaker than that of developed countries. Similarly for the investor protection (See Appendix B), the scores for the G-7 for the five variables (the higher the better), were 9.1, 9.2, 9.2, 9.5 and 6.4 out of a maximum of 10. The scores for the developing economies were 4.8, 6.2, 6.1, 6.8 and 5.7.

The purpose of this paper is to expand the analysis by probing further the data displayed in Appendix A and Appendix B. This is done by comparing the countries for their average ranks and relating by regression methodology the economic infrastructure indexes as dependent variables to investor protection variables jointly and singly as independent variables. It is expected that the regression coefficients will be negative. Note that the accounting standards indicator variable in Appendix B will not be used in the regression because of many missing values. The paper, after this introductory section, is composed of sections 2, 3, 4 and 5.

## 2 Literature review

When dealing with international economic events of the last quarter century, globalization takes center place. Gupta and Wang (2004) cite the end of the Cold War, the formation of the European Common Market, the implementation of the North American Free Trade Area, and the economic liberalization in Asia as significant economic and political events. Added to these are the impact of technological advances, such as the internet and the fall in telecommunication costs. Galindo Martin and Escot (2004) envisioned that capital mobility can affect convergence of per capita income across nations because emerging economies provide more incentive for international investment than richer countries.

The role of institutions inducing economic growth in emerging markets is taken up by Dollar and Levin (2005), who propose that effectiveness of foreign aid depends on high-quality institutions. Alsop and Heinsohn (2005) consider also formal and informal institutions to monitor empowerment processes and outcomes or poverty monitoring. Formal and informal institutions cover law, regularity frameworks and norms cover behavior. Corrupt institutions are the concern of Lash (2004). The perception is that globalization helps foster the expansion of corruption in terms of taxes, public spending and regulations due to government growth.

Government growth leads to misuse of public power. Friedman (2005) also perceives that for emerging economies to improve their standard of living, they should continue to seek open and tolerant societies and strive to broaden and strengthen their democratic institutions.

Indexes are devised to gauge the successes and failures of policies of various countries. An example is the KPMG (2006) index with 27 cost components that lists countries for after-tax costs of start-up and operations for 10 years. The countries are listed from the least costly to the most costly. On a similar theme, Abiad and Mody (2005), in their attempt to explain the timing, pace and extent of reform of the financial sector, constructed a financial liberalization index for 35 countries. The countries were ranked on variables that included credit controls, interest rate controls, entry barriers, operational restriction and privatization. Similar indexes were constructed by Kearney (2005), whose globalization index ranked 62 countries for trade, travel, technology and links to the rest of the world, and Montalvo and Reynal-Querol (2005), whose index ranked ethnic polarization and fractionalization. The variables used were gross domestic product per capita, population, primary exports, mountains, noncontiguous states, democracy, religious fractionalization and religious polarization.

Heckelman (2002) points out that while economists understand the importance of the structure of institutions when evaluating performances, concepts such as economic freedom are elusive. National wealth can be measured by GNP, but measuring economic freedom mostly refers to the absence of governmental control and direction of resources. Heckelman goes on to explain the annual index of economic freedom by the Heritage Foundation. Ten categories are used whereby each nation is rated on a scale of 1 to 5 (the lower the better) and then the nations are classified based on their averages into free (1.00-1.99), mostly free (2.00-2.99), mostly unfree (3.00-3.99) and repressed (4.00-4.99).

The indexes used in this paper for economic infrastructure (Appendix A) and investor protection (Appendix B) as gathered by Henry (2007) are examples of attempts to rate and rank countries. In the remaining part of this section, a discussion is provided to summarize the index by Hall and Jones (See Appendix A) and the La Porta et al index (See Appendix B). Hall and Jones (1999) explain that their hypothesis is that differences in capital accumulation, productivity and, as a consequence, output per worker are related in a fundamental way to differences in social infrastructure across countries. Infrastructure means institutions and government policies as determinants of the economic environment, which may enable or hinder firms and individuals to accumulate capital, acquire skills, invention and technology transfer. In a sample of 127 countries, Hall and Jones found powerful and close association between output per worker and measures of social infrastructure. Corrupt government officials, impediments to trade, poor contract enforcement and government interference hinder achieving high levels of output per worker.

La Porta et al (1998) claims that differences in legal protections of investors explain why firms are financed and owned differently across countries. Italian companies rarely go public. Germany has a small stock market, but very large and powerful banks. Russian stocks were nearly worthless immediately after privatization and Russian companies have virtually no access to external finance. American and British companies are widely dispersed. Such differences can be explained by the legal rules of the different countries. Commercial laws, La Porta et al presume, came from two

traditions: the English common law and civil law derived from Roman law. For this purpose, they assembled data covering legal rules concerned with the right of investors and the quality of the enforcement of these rules.

The literature review provided sundry opinions and rationales for constructing a variety of indexes to capture a variety of economic and social ideas that may explain the behaviors of societies and governments. The next section will explore the methodology pursued in this paper, followed by sections 4 and 5.

### 3 Data and method

The data used in this paper shown in Appendix A and Appendix B is obtained from Henry (2007), who gathered from various sources as explained in section 2. A variety of schemes are attempted to provide further insights into the relationships between four indexes related to economic infrastructure and four investor protection variables. The four economic infrastructure indexes are Hall and Jones, Heritage House, World Bank Doing Business, and World Economic Forum. The four investor protection variables are rule of law, judicial efficiency, contract repudiation and expropriation risk. The fifth indicator variable, accounting standard, in Appendix B is not taken into consideration in this research because of many missing data. The method of research entails the following.

- a. Since the ranking in the indexes for the 17 emerging economies is based on rankings of 130 countries, a new ranking device is made to rank the economies among themselves. This will give a better picture of the place each economy occupies among the rest.
- b. The ranks of the 17 countries of the four indexes as shown in Appendix A will be transformed into a continuous scale to allow the use of parametric analysis of variance and regression analysis rather than the use of nonparametric methods typically used when dealing with rank data.

The transformation used for each of the rank data is

$$Z_{ij} = \frac{x_{ij} - \bar{x}_j + 3s_j}{6s_j}, i = 1, \dots, 18 \tag{1}$$

where  $\bar{x}_j$  and  $s_j$  are the mean and the standard deviation of the observations of index  $j=1, \dots, 4$ . The  $Z_{ij}$  transforms an observation of country  $i$  for index  $j$  into standardized units between zero and one. To show this, an appeal is made to the Empirical Rule.

$$p(-3\sigma_x < x - \mu_x < 3\sigma_x) \cong 1.00.$$

Adding  $3\sigma_x$  to each side of the inequality, the result is

$$p(0 < x - \mu_x + 3\sigma_x < 6\sigma_x) \cong 1.00.$$

Dividing each side by  $6\sigma_x$ , the result is Eq. 1.

- c. Analysis of variance is conducted on the transformed data of Appendix A to test for equality of means of the four indexes between the economies. If the

hypothesis of equality is rejected, a multiple comparison procedure will be performed to group the economies into subsets of comparable means.  
 d. Multiple regression is undertaken in the form

$$\hat{\mu}(Y_i|x_1, x_2, \dots, x_4) = \hat{Y}_i = b_0 + b_1x_1 + \dots + b_4x_4, \tag{2}$$

where  $\hat{Y}_i, i = 1, \dots, 4$ , are the economic infrastructure indexes as the dependent variables, as transformed by Eq. 1 of Appendix A, and where  $x_1$ =rule of law,  $x_2$ =judicial efficiency,  $x_3$ =contract repudiation and  $x_4$ =expropriation risk as shown in Appendix B. Appendix B values are not transformed in a similar manner as Appendix A because the values are already continuous values. It is expected that the regression coefficients will be negative because the ranks of Appendix A and their transformation by Eq. 1 operate in the opposite direction of Appendix B.

In the event that the model of Eq. 2 does not produce significant coefficients with the proper anticipated negative signs, an alternative is to use simple linear regression of the form

$$\mu(\hat{Y}|x) = \hat{Y} = a + bx \tag{3}$$

where  $\hat{Y}$  = transformed index of Appendix A and  $x$  is an indicator variable of Appendix B, and where  $x$  = rule of law, judicial efficiency, contract repudiation and expropriation risk.

### 4 Results

As indicated earlier, this research employed data as summarized by Henry (2007). The data is provided in Appendix A for economic infrastructure, the smaller the rank, the more it is superior, and Appendix B for investor protection, the larger the score, the more it is superior. Table 1 ranks the 17 emerging economies in descending order among themselves rather than their ranks among all 130 countries. The table provides the mean and the standard deviation of the ranks of the four indexes. South Korea and Thailand have a mean of 3.0, with corresponding standard deviations of 1.15 and 2.31, indicating more agreement among the indexes in ranking South Korea than Thailand. There was substantial consistency among the four indexes in ranking Zimbabwe, with a mean of 17.25 and a standard deviation of only 0.96.

Table 2 is the transformation of the scores of Appendix A by Eq. 1, which transforms the scores into numbers between 0 and 1.00. To make the idea clearer, remembering that the mechanism to transform the data for each index by Eq. 1 is

$$Z = \frac{x - \bar{x} + 3s}{6s},$$

the transformation for Argentina for the Hall and Jones index from its value in Appendix A with a rank of 77, a mean of 63.17 and standard deviation=30.13 is

$$Z = \frac{77 - 63.17 + (3)(30.13)}{(6)(30.13)} = 0.5765$$

**Table 1** Rank of economic infrastructure indexes of emerging markets

	Hall and Jones Index C1	Heritage House Index C2	World Bank Doing Business Index C3	World Economic Forum Index C4	Mean	SD
Argentina	12	3	11	13	9.75	4.57
Brazil	10	12	14	12	12.00	1.63
Chile	6	1	4	4	3.75	2.06
Colombia	13	10	9	11	10.75	1.71
India	14	18	16	6	13.50	5.26
Indonesia	7	11	17	7	10.50	4.73
Jordan	5	8	8	8	7.25	1.50
Malaysia	2	6	3	3	3.50	1.73
Mexico	9	13	5	9	9.00	3.27
Nigeria	18	14	13	17	15.50	2.38
Pakistan	17	16	7	16	14.00	4.69
Philippines	15	9	15	14	13.25	2.87
South Korea	4	4	2	2	3.00	1.15
Thailand	1	5	1	5	3.00	2.31
Turkey	11	7	10	10	9.50	1.73
Venezuela	8	15	12	15	12.50	3.32
Zimbabwe	16	17	18	18	17.25	0.96

C1 Hall and Jones (1999), C2 Heritage House (2006), C3 World Bank (2006), C4 World Economic Forum (2006). Henry (2007) and calculations by the authors.

as shown in Table 2. The transformation of Appendix A into corresponding values as shown in Table 2 allows a performance of analysis of variance for equality of means between the 17 countries of the indexes rather than using the Krustal-Wallis test for rank analysis of variance (See Conover 1980). It is not surprising that the ANOVA test with  $F=10.52$  ( $p=0.000$ ) rejects the hypothesis of equality of mean indexes. Yet, the multiple comparisons procedure provides an interesting way to group the countries into comparable sets.

The top set is made up of four countries (Chile, Malaysia, South Korea, Thailand). The next set is made up of three countries (Jordan, Mexico, Turkey). The next set is made up of five countries (Argentina, Colombia, Indonesia, Philippines, Venezuela). The next grouping is made up of four countries (Brazil, India, Nigeria, Pakistan). Standing alone at the last spot is Zimbabwe.

Table 3 provides the results of the multiple regression (Eq. 2), regressing the four economic infrastructure indexes as transformed in Table 2, each as a dependent variable on the four variables of Investor Protection as shown in Appendix B. The four variables are rule of law, judicial efficiency, contract repudiation and expropriation risk. As indicated earlier, the fifth indicator variable in Appendix B, accounting standards, is not employed because of missing data. Using data on the 17 countries in the multiple regression shown in Table 3 produced mixed results for explanations. Some coefficients were outright not significant with the wrong sign for

**Table 2** Transformation of economic infrastructure indexes of emerging markets

	Hall and Jones Index C1	Heritage House Index C2	World Bank Doing Business Index C3	World Economic Forum Index C4	Mean	SD
Argentina	0.5765	0.2893	0.5702	0.5597	0.4989	0.1399
Brazil	0.5267	0.5901	0.6468	0.5423	0.5765	0.0541
Chile	0.3885	0.2517	0.2906	0.3156	0.3116	0.0576
Colombia	0.5876	0.5243	0.4860	0.5365	0.5336	0.0419
India	0.6318	0.7733	0.6966	0.4086	0.6276	0.1570
Indonesia	0.3995	0.5384	0.7005	0.4493	0.5219	0.1322
Jordan	0.3387	0.4538	0.4821	0.4609	0.4339	0.0646
Malaysia	0.2723	0.3786	0.2791	0.3098	0.3099	0.0486
Mexico	0.5046	0.6089	0.3481	0.4958	0.4893	0.1073
Nigeria	0.7922	0.6371	0.5970	0.7458	0.6930	0.0912
Pakistan	0.7756	0.6841	0.4668	0.6876	0.6535	0.1315
Philippines	0.6484	0.5055	0.6660	0.5714	0.5978	0.0740
South Korea	0.3332	0.3363	0.2714	0.2982	0.3098	0.0308
Thailand	0.2612	0.3598	0.2523	0.3621	0.3089	0.0603
Turkey	0.5433	0.4115	0.5319	0.5016	0.4971	0.0597
Venezuela	0.4438	0.6465	0.5817	0.6702	0.5855	0.1016
Zimbabwe	0.6705	0.7546	0.7694	0.8504	0.7612	0.0737

C1 Hall and Jones (1999), C2 Heritage House (2006), C3 World Bank (2006), C4 World Economic Forum (2006). See Eq. 1 for the transformation

Henry (2007) and calculations by the authors

every index, such as the coefficient for judicial efficiency. For the rule of law, the signs as expected were all negative but were not significant for two indexes, the World Bank Doing Business and the World Economic Forum. For the variable contract repudiation, again the signs were, as expected, all negative, but significant only for the World Bank

**Table 3** Multiple regression of economic infrastructure and investor protection

Dependent Variable Index	Rule of law		Judicial efficiency		Contract repudiation		Expropriation risk	
	b1	p-value	b2	p-value	b3	p-value	b4	p-value
Hall and Jones	-0.0523	0.044	0.0006	0.971	-0.0800	0.166	0.0239	0.738
Heritage House	-0.0574	0.081	0.0061	0.765	-0.1120	0.137	0.1290	0.183
World Bank Doing Business	-0.0411	0.125	-0.0149	0.387	-0.1850	0.008	0.1540	0.063
World Economic Forum	-0.0073	0.761	0.0025	0.877	-0.0206	0.714	-0.0957	0.200

For dependent variable indexes see Appendix A. For independent variables  $b_i$ ,  $i=1, \dots, 4$ , the regression coefficients, see Appendix B

Henry (2007), and calculations by the authors



Doing Business index. For the expropriation risk variable, all the coefficients were positive (the wrong sign) for all the indexes with the exception of the World Economic Forum index, but the coefficient was not significant.

The somewhat mixed results of the multiple regression could be blamed on shortage of degrees of freedom of only 12. Furthermore, Intriligator (1978) explains that in econometric models, data used are usually nonexperimental. The explanatory variables move together as usual in economic data. When multicollinearity arises, the estimated standard errors of the regression coefficients tend to be large and the t-ratios of the coefficients tend to be small and appear not to be significant from zero. An alternative is the use of simple linear regressions of Eq. 3, whereby the values of each of the four Economic Infrastructure indexes reported in Table 2 are regressed, as dependent variables, on the four indicator variables of Investor Protection of Appendix B. The results are shown in Table 4. It seems, overall, that the investor protection indicator variables singly support all the economic infrastructure indexes with one exception. The exception is the indicator variable judicial efficiency, which was not significant and of the wrong sign (positive, three of four possibilities). The results of Table 4 support the idea that the quality of economic institutions denoted as economic infrastructure hinges on investor protection as measured by rule of law, judicial efficiency, contract repudiation and expropriation risk. Three out of four of these showed statistical significance for explanations of the quality of economic infrastructure.

As Henry (2007) explained, investors will shy away from economies with weak protection of investment. When investor protection is weak, effective returns to capital is

**Table 4** Linear regression of economic infrastructure and investor protection

Variable Index	Independent variable	Coefficient b	p-value
Hall and Jones	Rule of Law	-0.0751	0.001
	Judicial Efficiency	0.0026	0.913
	Contract Repudiation	-0.0996	0.001
	Expropriation Risk	-0.1134	0.003
Heritage House	Rule of Law	-0.0507	0.044
	Judicial Efficiency	0.0107	0.641
	Contract Repudiation	-0.0570	0.095
	Expropriation Risk	-0.0480	0.247
World Bank Doing Business	Rule of Law	-0.0544	0.039
	Judicial Efficiency	-0.0066	0.784
	Contract Repudiation	-0.0968	0.003
	Expropriation Risk	-0.0842	0.043
World Economic Forum	Rule of Law	-0.0544	0.026
	Judicial Efficiency	0.0018	0.936
	Contract Repudiation	-0.0985	0.001
	Expropriation Risk	-0.1247	0.000

For dependent variable indexes see Table 2. For independent variable b, the regression coefficient, see Appendix B.

Henry (2007).

reduced, which in turn reduces incentive of investment flows from rich to poor countries. Therefore, the advice given to emerging economies (Henry 2007 page 912) is, “Because investors in emerging economies receive less protection than their counterparts in rich countries, lifting restrictions on capital inflows may generate smaller changes in assets prices and capital flows that would occur if emerging economies gave investors the same average level of protection they receive in developed economies.”

## 5 Conclusions

The focus of this paper is to explore a variety of indexes that portray economic infrastructure as related to investor protection. The economic infrastructure was based on four well-known indexes accumulated by Henry (2007) to rate and rank emerging economies as reproduced in Appendix A. Henry also provided indicator variables for investor protection as reproduced in Appendix B. The results of the single regression show evidence that economic infrastructure is highly related to rule of law, contract repudiation and expropriation risk.

## Appendix A

**Table 5** Economic infrastructure of emerging markets

	Hall and Jones Index C1	Heritage House Index C2	World Bank Doing Business Index C3	World Economic Forum Index C4
Argentina	77	23	101	69
Brazil	68	87	121	66
Chile	43	15	28	27
Colombia	79	73	79	65
India	87	126	134	43
Indonesia	45	76	135	50
Jordan	34	58	78	52
Malaysia	22	42	25	26
Mexico	64	91	43	58
Nigeria	116	97	108	101
Pakistan	113	107	74	91
Philippines	90	69	126	71
South Korea	33	33	23	24
Thailand	20	38	18	35
Turkey	71	49	91	59
Venezuela	53	99	104	88
Zimbabwe	94	122	153	119

C1 Hall and Jones (1999), C2 Heritage House (2006), C3 World Bank (2006), C4 World Economic Forum (2006) Henry (2007)

## Appendix B

**Table 6** Investor protection in emerging markets

	Rule of Law	Judicial Efficiency	Contract Repudiation	Expropriation Risk	Accounting Standards
Argentina	5.4	6.0	4.9	5.9	4.5
Brazil	6.3	5.8	6.3	7.6	5.4
Chile	7.0	7.3	6.8	7.5	5.2
Colombia	2.1	7.3	7.0	7.0	5.0
India	4.2	8.0	6.1	7.8	5.7
Indonesia	4.0	2.5	6.1	7.2	NA
Jordan	4.4	8.7	4.9	6.1	NA
Malaysia	6.8	9.0	7.4	8.0	7.6
Mexico	5.4	6.0	6.6	7.3	6.0
Nigeria	2.7	7.3	4.4	5.3	5.9
Pakistan	3.0	5.0	4.9	5.6	NA
Philippines	2.7	4.8	4.8	5.2	6.5
South Korea	5.4	6.0	8.6	8.3	6.2
Thailand	6.3	3.3	7.6	7.4	6.4
Turkey	5.2	4.0	6.0	7.0	5.1
Venezuela	6.4	6.5	6.3	6.9	4.0
Zimbabwe	3.7	7.5	5.0	5.6	NA

La Porta et al (1998) and Henry (2007)

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