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The Effect of Coherent Collective Consciousness on National Quality of Life and Economic Performance Indicators—An Analysis of the IMD Index of National Competitive Advantage

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Abstract: The scores of New Zealand and Norway on the IMD Index of National Competitive Advantage increased significantly when they passed the predicted coherence group threshold in 1993 (1% of a population practicing the Transcendental Meditation program or the √1% practicing the advanced TM-Sidhi program in a group) when compared to 44 other developed nations as shown by cross-country panel regression analysis robust to serially correlated errors, heteroskedasticity, and contemporaneous correlation of residuals (p < 0.000000000000003). Subsidiary analysis and Organisation for Economic Co-operation and Development (OECD) data confirmed that the changes were unusually broad-based (p <.000000065), sustained, and balanced in nature with five years of high growth, low unemployment, and low inflation. Taken as a whole, the findings suggest a prescription for balanced and sustained growth based on a method to enhance quality of life and innovation among the population.

Keywords: IMD Index, Norway, New Zealand, Maharishi Effect, National Competitive Advantage, Quality of Life

1. Introduction

The burning question facing governments and voters today is: What policies and programs will guarantee prosperity for all and who will deliver it? Yet it is not only government economic policy that influences economic outcomes; less tangible human factors [45], referred to by terms such as confidence, innovation, creativity, mobility, insight, opportunity, and vibrancy, play an essential role in economic success. Can a method be adopted to directly influence these more abstract determinants of economic success which interface directly with individual and social consciousness? This paper sheds light on this question by analyzing the Institute for Management Development (IMD) broad-based international measure of economic performance and quality of life. The IMD Index published yearly [29] amalgamates data from over 200 sources.

Drawing on physical field theory, we use a 'field effect' model of consciousness [22, 12, 13, 25, chap. 4], whose effects are characterized by a phase transition from disorder to order in society. Phase transitions in the physical sciences are understood as sudden decreases in entropy or disorder when a critical threshold is passed accompanied by the emergence of new system properties. The model for such a transformation is that of a step function—rapid, broad-based inception of more orderly properties and functions of the system.

The phase transition effect we studied is known as the

Maharishi Effect, named after Maharishi Mahesh Yogi who predicted it more than 40 years ago [33]. Over the last 35 years, 47 scientific research findings [36] have indicated strong empirical support for the Maharishi Effect which predicts increased positive trends and reduced problems in society when the critical threshold of one per cent of a population practicing the Transcendental Meditation[SM] program[1] or the square root of one per cent of a population practicing the advanced Transcendental Meditation® and TM-Sidhi® program in a group morning and evening [34] is passed.

The Transcendental Meditation program is an easy-to-learn, mental technique practiced 15 to 20 minutes twice a day, which has become popular as a method to improve health, increase creativity, optimize brain functioning, and reduce stress; over six million individuals have learned the technique worldwide. Over 700 research studies have validated effects for the individual such as faster reaction times, increased creativity and IQ, and improved self actualisation, and general health when the technique is practiced regularly [36]. According to Maharishi [35, p. 308], the TM-Sidhi program is an advanced aspect of the Transcendental Meditation program; it teaches the individual to think and act from the level of self-referral consciousness, enhancing coordination between mind and body while increasing coherent EEG patterns in the brain [46].

1.1. The Maharishi Effect: Previous Research on Crime and Conflict

In 1993, A prospective test of the Maharishi Effect [23] was undertaken when 4,000 advanced Transcendental Meditation participants gathered in Washington, D. C. for a six-week demonstration project. Predictions of reduced violent crime, improved approval ratings for government, and reduced need for emergency services were lodged in advance with a 27-member independent review panel and advertised in the Washington Post [23], [19]. There was a 24% reduction in violent crime compared to the trend predicted by time-series analysis of preceding data ($p < 0.000000002$), approval ratings for President Clinton increased ($p < 0.00000006$), accidents, emergency psychiatric calls, and hospital trauma cases decreased, and a quality of life index improved ($p < 0.00004$).

Over 30 studies have shown reduced crime and violence through the Maharishi Effect since 1974 [36]. For example, Hatchard et al. [24] found reduced crime in Metropolitan Merseyside, UK. Time series analysis of monthly data showed total crime fell 13.4% in March 1988 ($p < 0.00006$) when a permanent Transcendental Meditation group was formed.

Using time series analysis Orme-Johnson et al. [41, 42] analyzed the effect on world events of three large Transcendental Meditation assemblies. They found reductions in terrorism (72%) and international conflict (33%) as well as increased world stock.

1.2. USA—Economic and Social Research on the Maharishi Effect

Stock market data can be interpreted as a measure of public confidence and optimism. Cavanaugh, Orme-Johnson et al [6] used regression analysis and Box-Jenkins time series analysis respectively and found a simultaneous rise in the world's major stock markets during an assembly of 8000 (the square root of one per cent of the world's population) held at Maharishi University of Management, Iowa in December 1983 ($p < 0.00004$).

Orme-Johnson and Gelderloos [39] measured the impact of participation in the Transcendental Meditation technique in the USA on a quality of life index. A reversal in the long-term decline in US quality of life occurred as large numbers of the USA population started the Transcendental Meditation program and accelerated when the Maharishi Effect threshold was exceeded ($p < 0.0001$). The economic portion of the index reported GNP per capita as rising 2.3% in 1983 marking the end of the recession, and a sharp decline in unemployment commencing in 1983.

In a series of studies covering 1979 to 1987 using Box-Jenkins time series analysis and multiple-input transfer function analysis, Cavanaugh et al. [7-10] found highly statistically significant reductions in the monthly "Misery Index" (the sum of inflation and unemployment rates) in both USA and Canada when the coherence creating group at Maharishi University of Management exceeded the square root of one per cent of the population threshold ($p < 0.00000001$).

2. Data

The preceding case studies and previous research findings indicate a need to rigorously assess and quantify the impact of the Maharishi Effect on broad-based measures of national economic performance. The opportunity to investigate this was provided by the two developed countries enjoying the world's highest levels of participation in the Transcendental Meditation program both of which passed the Maharishi Effect threshold during 1993.

2.1. Coherence Data

Cumulative numbers of individuals instructed in the Transcendental Meditation technique in New Zealand were obtained. By the end of 1993, there were 35,593 persons instructed in the Transcendental Meditation technique. The population of New Zealand at the end of 1993 was 3,525,000.

Among the 46 countries covered by IMD data, the only other country to have reached the target of one per cent instructed in the Transcendental Meditation program during the period covered by the IMD rankings (1992 to 1998) was

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Norway. The baseline number instructed in Transcendental Meditation in Norway at 1st January 1988 was recorded as 37,000 to 38,000 with the extended range accounted for by a small recording error. Subsequently 2,925 new individuals participated in the Transcendental Meditation program before the end of 1993. There were also over 400 advanced TM-Sidhi practitioners some of whom practiced in groups generating sufficient additional coherence to pass the Maharishi Effect threshold. The population of Norway was 4,287,000 in 1992.

2.2. Economic History

New Zealand is a small, developed country whose economy has depended on exports of primary products, particularly meat, wool, forestry, and dairy products, to pay for needed imports. Its economy gradually declined between 1950 and 1990, with attendant relative falls in standard of living as compared to its major trading partners. Repeated interventions of successive governments to correct the imbalances in the persistently sluggish economy had failed to produce a sustainable model of economic success. But by 1994, it was apparent that an unexpected vibrancy had taken hold of the whole economy and the national mood.

Norway has an oil-rich economy, but despite the attendant wealth, the economy underperformed in the 1980s. Low domestic demand became linked with rising unemployment and a high rate of corporate failure which affected bank solvency. By 1994, it was clear that domestic demand had unexpectedly begun to increase ushering in an extended period of growth.

This was reflected in large increases in the IMD scores of competitive advantage for Norway and New Zealand which encompassed broad measures of economic performance and quality of life (see Table 1).

2.3. Measures of Economic Well Being of Nations

Michael Porter's analysis of "The Competitive Advantage of Nations" [44] has been adapted and augmented in econometric approaches to measuring the economic wellbeing of nations. The IMD Index contained in the IMD World Competitiveness Yearbook [29] is used in this study. It is a measure and database of the relative national economic health of industrially developed nations that has drawn upon Porter's ideas, but its broad base ensures that it is independent of any particular theory. Madeleine Linard de Guertechin defines the IMD Index in the 1997 Yearbook as a multi-dimensional approach "to capture in a single index the capacity of a country's economic structure to promote growth" (29, introduction) The IMD Index is used to test whether the economy of both New Zealand and Norway showed a significant and broad-based improvement in IMD scores relative to other developed nations at the time when they surpassed the 1% threshold of individuals instructed in the Transcendental Meditation program in 1993. The main conclusions of the analysis are also checked against the conclusions of the independently compiled OECD Economic Surveys [38].

2.4. Sources

The IMD Yearbook has been published annually since 1987 by the International Institute for Management Development in Switzerland. It contains a database of economic and social measures from industrially developed nations, which in 1996 comprised 224 data inputs for each of 46 nations. The 224 data points data are combined through addition of z scores into 41 sub-scales which are in turn grouped into 8 categories[2] and finally combined into one overall competitiveness performance index yielding an annual ranking of the 46 countries. The Index has been compiled from 1992 to 1998 using a consistent methodology.

The data sources are made up of 35.5% that are per capita statistics unrelated to country size such as interest rates or international credit ratings, 10.7% absolute values that are positively affected by the size of the country, 11.6% growth rates, 33.3% executive surveys, and 8.9% background information. The IMD Yearbooks rank the 46 countries on each set of the 224 raw data inputs (excluding the background statistics). Each data set is then converted into z scores through the standard procedure.

Two-thirds of the data sources involve hard or measured facts drawn from a wide variety of international and national sources. Data sources are referenced, missing values (2.9%) are handled efficiently, and data issues of reliability and comparability are discussed in footnotes and appendices. The remaining one-third of the data series are derived from up-to-date surveys of senior executives from the 46 countries. A similar procedure has been used in every other year.

The IMD Yearbooks report raw values for the data inputs, but all compiled sub-scales and categories are quoted solely as rankings of nations. The country with the best performance being ranked number 1 and so on. To avoid this dilution of data, the authors obtained the series of compiled z scores for the overall Index from IMD (See Table 1) and used it in the main analysis. The effects of minor recorded data irregularities are discussed and their correction estimated in the subsidiary analysis,

3. Primary Analysis

The dependent variable is the IMD Index data (Table 1), which is a repeated measure where each of 46 countries is observed at seven yearly intervals in order to calculate a numerical value for overall international competitiveness. Since the overall IMD Index score is constructed from the

[2] These eight categories are defined as: Domestic Economy—macroeconomic evaluation of the domestic economy; Internationalization—participation in international trade and investment flows; Government— extent to which government policies are conducive to competition; Finance—performance of capital markets and quality of financial services; Management—enterprise management in an innovative, profitable, and responsible manner; Infrastructure—extent to which resources & systems are adequate to meet the needs of business; Science and Technology—capacity and success of basic and applied research; and People—availability and qualifications of human resources.

addition of z scores, the mean of each year is necessarily zero. Although the scores can in theory take any value, in practice, no country moved outside limits of ±200. The standard deviation of the IMD Index scores increased between 1992, when it was 63, to 72 in 1998.

Maharishi Effect theory predicts a phase transition in economic performance as the 1% threshold is passed. Visual inspection of Table 1 shows that both New Zealand and Norway increased their IMD scores by approximately 25 when the Maharishi Effect threshold was surpassed during 1993. To assess the statistical significance of this improved performance, the main analysis should analyze the behavior of the panel of data as a whole. Importantly, it should ensure that any statistical threats to inference such as serial correlation or heteroskedasticity of the residuals are diagnosed and properly handled. The increase in standard deviation between cross-sections suggests that cross-sectional heteroskedasticity should be checked.

Visual inspection of Table 1 indicates some volatility in individual country scores from year to year which suggests that heteroskedasticity should also be investigated in a group-wise sense. This volatility should also be visually examined and investigated on a case-by-case basis. Above all, the model should be both a good fit and demonstrably robust.

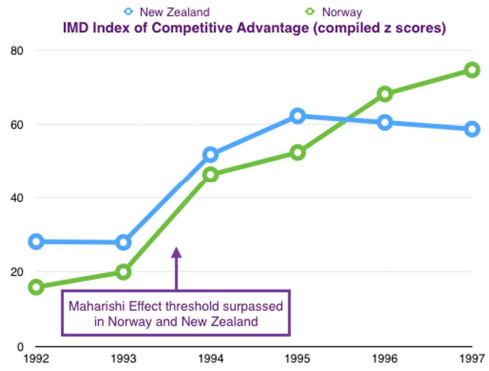

Figure 1. *IMD Scores For New Zealand and Norway 1992 to 1997.*

Table 1. *IMD Index of National Economic Well Being.*

Overall Scores 1992 - 1998* (compiled z scores)							
Country	**1998**	**1997**	**1996**	**1995**	**1994**	**1993**	**1992**
ARGENTINA	-51.21	-27.26	-50.35	-34.55	-42.30	-33.69	-30.95
AUSTRALIA	41.85	31.54	29.64	39.88	39.39	22.28	21.36
AUSTRIA	9.17	28.12	40.38	46.05	48.47	40.68	40.15
BELGIUM	8.14	15.65	36.66	30.27	37.10	41.31	37.48
BRAZIL	-65.33	-52.90	-67.45	-65.83	-91.66	-97.27	-92.36
CANADA	66.25	64.43	59.22	41.77	25.31	29.31	31.41
CHILE	-1.52	8.03	48.20	31.16	14.04	27.30	24.93
CHINA	1.71	-21.02	-15.28	-36.27	-47.41	-54.15	-57.60
COLOMBIA	-102.68	-101.78	-53.43	-51.03	-49.13	-39.31	-39.22
CZECH REPUBLIC	-66.77	-54.81	-53.47	-70.81	-68.60	-55.01	-58.44
DENMARK	69.49	67.99	69.43	64.52	72.26	75.38	72.15
FINLAND	78.34	75.35	44.15	36.58	26.27	5.59	16.28
FRANCE	17.69	30.75	30.23	36.18	45.60	34.86	32.17
GERMANY	45.50	52.57	62.25	70.31	80.07	82.59	83.47
GREECE	-63.05	-59.71	-75.12	-78.65	-69.22	-68.46	-65.91
HONG KONG	89.65	89.02	86.64	93.55	95.00	95.27	90.69
HUNGARY	-30.57	-56.31	-71.88	-86.27	-77.25	-60.48	-60.36
ICELAND	27.54	19.39	18.38	8.68	10.14	11.16	9.33
INDIA	-82.64	-93.23	-69.27	-61.14	-66.95	-76.61	76.35
INDONESIA	-75.05	-75.20	-75.78	-54.46	-56.00	-59.70	-57.97
IRELAND	62.87	48.40	28.53	21.02	22.72	14.41	13.21
ISRAEL	-0.56	-6.38	19.91	12.14	14.64	18.49	14.39
ITALY	-40.31	-54.24	-32.90	-32.99	-31.72	-28.46	-27.33
JAPAN	35.31	67.83	81.29	90.14	104.43	118.35	111.59
KOREA	-62.47	-33.40	-21.22	-6.07	-41.18	-30.35	-32.51
LUXEMBOURG	68.29	59.57	62.80	39.61	42.26	47.43	46.95
MALAYSIA	18.08	32.54	23.36	16.88	32.11	37.72	33.52
MEXICO	-62.27	-76.57	-82.18	-88.50	-38.17	-46.10	-46.99
NETHERLANDS	83.62	73.49	63.15	63.20	58.46	58.03	59.65
NEW ZEALAND	47.56	58.73	60.53	62.27	51.84	27.95	28.15
NORWAY	72.73	74.66	68.17	52.42	46.44	19.97	15.90
PHILIPPINES	-54.33	-40.84	-41.80	-59.77	-59.56	-53.13	-44.58
POLAND	-105.54	-108.77	-86.97	-107.37	-114.90	-110.90	-112.32
PORTUGAL	-36.83	-52.62	-60.20	-42.62	-38.51	-42.77	-39.20
RUSSIA	-133.41	-160.64	-179.28	-182.09	-179.59	-156.91	-140.44
SINGAPORE	141.39	135.35	119.06	120.94	106.40	116.97	113.14
SOUTH AFRICA	-100.84	-110.36	-100.18	-91.67	-84.84	-84.20	-80.67
SPAIN	-10.34	-3.74	-35.12	-26.59	-27.47	-36.42	-37.30
SWEDEN	36.65	35.01	45.21	44.14	56.47	47.57	45.76
SWITZERLAND	69.70	71.74	62.76	81.42	83.25	73.03	71.01
TAIWAN	38.64	15.59	33.08	41.74	18.93	45.05	43.71

Overall Scores 1992 - 1998* (compiled z scores)							
Country	**1998**	**1997**	**1996**	**1995**	**1994**	**1993**	**1992**
THAILAND	-71.19	-32.61	-35.37	-13.96	-7.86	-15.86	-15.18
TURKEY	-61.35	-61.01	-55.63	-54.52	-38.84	-52.20	-50.53
UNITED KINGDOM	52.93	62.64	31.37	41.23	43.06	30.58	33.29
USA	196.02	180.05	155.68	164.43	153.42	145.70	139.11
VENEZUELA	-100.87	-115.68	-117.20	-105.34	-96.93	-64.97	-62.62

*Publication date is April of that year; scores compiled from the previous year's data.

New Zealand and Norway both surpassed the Maharishi Effect Threshold during 1993. The target reporting date for the 1994 IMD Index data is mid 1993. Therefore in accord with previous practice, the independent variable or Maharishi Effect Index was modeled as step function—zero for every country except Norway and New Zealand in the years 1994, 1995, 1996, 1997, and 1998 when it was assigned the value one. This follows established practice where the Maharishi Effect is described as a phase transition phenomenon, which can be understood and analyzed in the same way as transitions in physical systems [24, 25]

3.1. Statistical Methods

Annual IMD index ratings for 46 countries formed a longitudinal panel of data for the years 1992 through 1998. The cross-country panel data were analyzed using dynamic panel regression methods.

A "fixed-effect" panel regression model for the IMD index was formulated and then estimated using a procedure for cross-country data proposed by Beck and Katz [3] In this fixed-effect model (FEM), the annual value of the IMD index for each country was modeled as a linear function of three terms: (1) a country-specific regression intercept (fixed effect) that provided an estimate of the mean of the index for each country; (2) a regression coefficient designed to estimate a hypothesized shift in the mean of the index for New Zealand and Norway due to the Maharishi Effect; and (3) a random error or disturbance term Beck and Katz [3] Each of the resulting set of regression equations for the 46 countries had following simple form:

$$IMDit = \Omega oi + \Omega 1\ MEit + \sum it,\ i = 1, 2,..., G;\ t = 1, 2,..., T \qquad (1)$$

In these equations *IMDit* is the IMD index for country *i* in year *t,* G is the number of countries in the sample (46) and *T* is the number of annual observations for each country (seven). The coefficient $\wedge oi$ is a regression intercept or constant term that differs across countries. The Maharishi Effect variable *MEit* is a "step-function" binary variable that takes the value 1 for the years 1994 through 1998 for New Zealand and Norway and is equal to 0 for all other countries and time periods. The parameter $\wedge 1$ is a regression coefficient that estimates the impact of the Maharishi Effect on the mean of the index for Norway and New Zealand. Finally, $\sum it$ is a random error or regression disturbance term with mean zero.

The parameters of the panel regression model were estimated using a method suggested by Beck and Katz [3, 4] The Beck and Katz approach allows for possibly differing variance of regression errors across countries ("panel heteroskedasticity"), contemporaneous correlation of errors across countries, and possible serial correlation of residual errors. The latter three properties of the regression errors are common in the analysis of cross-country data [3] In the presence of any of the above three properties of the regression errors, ordinary least squares (OLS) regression will not be optimal [3, 4] In this case the OLS estimates of the regression parameters will be inefficient, although they are unbiased and consistent [3]; [21, ch. 11]. More importantly, in this case the estimated standard errors for the regression coefficients will be incorrect (biased and inconsistent) even in large samples, thus invalidating standard tests of hypotheses (e.g., *t*-tests and *F*-tests) [21, chap. 11-12]; [3, 4]. The method of Beck and Katz generates correct standard errors for the purpose of hypothesis testing, so-called "panel corrected standard errors" (PCSE).

3.2 The Beck-Katz Approach

The first step in the Beck-Katz approach was to estimate the fixed-effect model (1) using OLS regression. If diagnostic tests indicated the presence of significant first-order serial correlation of the regression residuals, the Prais-Winsten transformation of the data was used to eliminate the observed serial correlation [32, p. 619]. The equation was then re-estimated by OLS using the transformed data.

As recommended by Beck and Katz [3] on the basis of Monte Carlo simulation experiments, the Prais-Winsten transformation was based on a common estimated serial correlation coefficient, rather than separate coefficients for each country. The resulting regression estimates based on the transformed data are equivalent to those produced by feasible generalized least squares (FGLS) estimation of a regression model with a first-order autoregressive (AR (1)) model for the errors [21, p. 546].

An advantage of the Prais-Winsten approach is that, in contrast to the Cochran-Orcutt transformation, it does not involve discarding the first data observation for each country, leading to increased efficiency of the resulting OLS estimates [21, pp. 546-547]. Since only 7 annual observations were available for the IMD index for the 46 countries, retaining the first observation was an important consideration. This issue was particularly salient for tests of the Maharishi Effect because only two annual values of the index were available for the baseline period prior to the predicted onset of the Maharishi Effect for New Zealand and Norway in 1993 (as reflected in the IMD index data for 1994).

After removing the serial correlation of residuals in the first step of the Beck-Katz procedure, the OLS estimates of the regression slope parameters for the fixed-effect model (1)

will be unbiased and consistent. However the estimated standard errors for the parameter estimates will still be incorrect (biased and inconsistent) if the regression errors display either differing error variance across countries, cross-country correlation of the errors, or both. Because the OLS parameter estimates will be correct after any serial correlation of the errors has been removed, Beck and Katz propose basing hypothesis tests on the OLS parameter estimates of the transformed data from step one using corrected standard errors (PCSEs).

Beck and Katz [4] prove that the resulting PCSEs are consistent. Simulation experiments [3, 4] indicate that in typical cross-country studies the corrected standard errors will be accurate even in the presence of contemporaneously correlated (panel heteroskedastic) errors. Their simulations also suggest that the efficiency loss of using the OLS parameter estimates "would not be large in practical research situations" [4, p. 5].

In summary, the specification of the independent Maharishi Effect variable as a step function enables the panel regression model to provide an "impact assessment" of the Maharishi Effect intervention on the mean level of the IMD Index for Norway and New Zealand allowing for a common autoregressive error structure as well as a contemporaneous correlation of errors and differing error variance across countries. With this approach, the analysis will answer the question *'Is a significant increase in competitiveness score predicted by the increase in coherence, taking into account the time-dependent, dynamic structure of the IMD panel of scores?'*.

4. Results of Primary Analysis

The primary analysis employs panel regression analysis to determine the significance of the increases in the level of the IMD Index for the 1994-1998 as compared with the 1992-1993 baseline period. The dependent variable for the analysis was the annual value of the IMD index (compiled z scores) for the full set of 46 countries ranked by the IMD over the years 1992-1998. The sample included seven annual observations for each of the 46 countries, giving a total of 322 observations. There were no missing data values. The regression results for the primary panel data analysis of the IMD index are summarized in Tables 2 and 3. Results were calculated using LIMDEP 7.0 and EViews 3.1 for Windows.

Table 2 displays the initial ordinary least squares (OLS) regression parameter estimates for the fixed-effects model (FEM) described in equation (1). As hypothesized, the sign of the estimated impact of the Maharishi Effect on the IMD index for New Zealand and Norway was positive. The estimate of the Maharishi Effect parameter $\wedge 1$ indicated an upward shift of 36.545 in the mean level of the IMD index for the two countries, on average, for the years 1994 through the end of the sample in 1998 ($p = 0.000033$, two tailed test).

As shown in Table 2, the overall F statistic for the regression was statistically significant, indicating that the parameter estimates for all explanatory variables in the regression take together, including the estimated regression intercepts for each country, were significantly different from zero. The reported R-squared value for the regression implies that the estimated model accounted for 96.1 percent of the variation in the IMD index.

Diagnostic tests reported in Table 2 indicate violation of important assumptions underlying the OLS regression analysis. First, the Lagrange multiplier (LM) test for first-order serial correlation of the regression residuals was statistically significant, with an estimated serial correlation coefficient of 0.388. The latter test is the Breusch-Godfrey test for first-order serial correlation [18]; [21, p. 541]. Second, the LM test for differing variances for the regression errors across countries was highly significant [21, pp. 594-596], indicating violation of the OLS assumption of constant variance of the regression disturbances. Third, inspection of the (contemporaneous) correlation matrix of the regression residuals indicated substantial cross-country correlation of the errors, with a majority of the correlations varying from 0.5 to 0.9 in absolute value.

As described above, in the presence of any of these three violations of the standard OLS error assumptions, the standard errors for the estimated parameters will be incorrect (biased and inconsistent), thus invalidating hypothesis tests for the estimated parameters. Consequently, in order to perform valid hypothesis tests the Beck-Katz procedure [3]; [21, chap. 15] was used to correct the OLS standard errors reported in Table 2.

Table 2. *Panel Regression Analysis of IMD Index, 1992-1998 Ordinary Least Squares (OLS) Regression Estimates of Fixed Effects Model Dependent Variable: IMD Index (Compiled Z Scores)†.*

Variable	Coefficient	Standard Error	T-Ratio	P Value
Maharishi Effect	36.545	8.655	4.223	3.3×10^{-5}
Number of observations 322			Degrees of freedom 275	
F-statistic F (46, 275) 145.48 ($p = 0.000$)			R-squared 0.961	
S. E. of regression 14.629			R-bar-squared 0.954	
Sum of squared residuals 58852.80			S. D. of dependent variable 68.153	
Lag-one serial correlation 0.388			Mean of dependent variable 2.07×10^{-12}	
Durbin-Watson statistic 1.119			Akaike information criterion 2684.85	
Diagnostic Tests:				
LM test for serial correlation:			LM test for panel heteroscedasticity:	
$\chi 2$ (1) = 70.574 ($p = 0.000$)			$\chi 2$ (45) = 146.7808 ($p = 0.000$)	
Test of pooled regression vs. fixed effects:			Jarque-Bera test for normality:	
F (45, 275) = 144.913 ($p = 0.000$)			$\chi 2$ (2) = 12.845 ($p = 0.002$)	

† The data consisted of 7 annual observations on each of 46 countries, for a total sample size of 322. To conserve space, the 46 estimated country-specific intercepts (fixed effects) are not shown. These intercepts were jointly statistically significant. Complete regression results are available from the authors.

4.1. Correction for Violations of the OLS Error Assumptions

In the Beck-Katz procedure, all regression variables for the fixed-effects model were first transformed to eliminate the serial correlation of residuals and then the model was re-estimated by OLS. The resulting estimates are shown in the top panel of Table 3. After adjusting parameter estimates for residual serial correlation, panel-corrected standard errors were calculated to provide estimated standard errors that are robust to panel heteroskedasticity and contemporaneous correlation of the residuals. The calculation of the PCSEs provides corrected estimates of the OLS standard errors, but does not alter the OLS parameter estimates that have been adjusted for serial correlation. Nor does the adjustment process for the standard errors change the summary and diagnostic statistics for the regression. The resulting corrected standard errors (PCSEs) are reported in the lower panel of Table 3.

Table 3. *Corrected Panel Regression Analysis of IMD Index, 1992-1998 OLS Regression Estimates Corrected for Serial Correlation with Standard Errors Robust to Panel Heteroskedasticity, and Cross-Country Correlation of Residuals. Dependent Variable: IMD Index (Compiled Z Scores)†.*

OLS Estimates Corrected for Residual Serial Correlation:

Variable	Coefficient	Standard Error	T-Ratio	P Value
Maharishi Effect	43.023	11.890	3.618	0.0004

OLS Estimates Corrected for Serial Correlation with Standard Errors Robust to Panel Heteroskedasticity and Cross-Country Residual Correlation:

Variable†	Coefficient	Panel Corrected Standard Error	T-Ratio	P Value
Maharishi Effect	43.023	4.961	8.672	2.9×10^{-15}
Number of observations 322		Degrees of freedom 275		
F-statistic F (46, 275)) 62.82 (p = 0.000)		R-squared 0.913		
S. E. of regression 14.469		R-bar-squared 0.899		
Sum of squared residuals 57572.16		S. D. of dependent variable 45.430		
Lag-one serial correlation 0.026		Mean of dependent variable -1.43×10^{-12}		
Durbin-Watson statistic 2.052		Akaike information criterion 2677.76		

Diagnostic Tests:

LM test for serial correlation:	Jarque-Bera test for normality:
$\chi 2$ (1) = 0.244 (p = 0.622)	$\chi 2$ (2) = 7.986 (p = 0.018)
Test of pooled regression vs. fixed effects:	LM test for panel heteroscedasticity:
F (46, 275) = 61.245 (p = 0.000)	$\chi 2$ (45) = 84.702 (p = 0.0003)
Ramsey's RESET test for omitted variables:	F (3, 272) = 1.678 (p = 0.172)

† Prior to OLS estimation, the dependent and independent variables were transformed using the Prais-Winsten transformation to remove first-order serial correlation of residuals ($r1$ = 0.388). To conserve space, the 46 estimated country-specific intercepts (fixed effects) are not shown. These intercepts were jointly significant. Complete regression results are available from the authors.

In the first step of the Beck-Katz procedure, the Prais-Winsten transformation was separately applied to all variables for each country. As recommended by Beck and Katz [3] the transformation was based on single, common, estimated serial correlation coefficient for all countries, rather than separate coefficients for each country. The common estimated serial correlation coefficient was 0.388 (Table 2). The OLS parameter estimates that have been corrected for serial correlation are equivalent to those from a regression model with first-order autoregressive (AR (1)) errors that was estimated using feasible generalized least squares.

After adjustment for serial correlation, the estimated Maharishi Effect parameter indicated a significant upward shift in the mean of the IMD index for Norway and New Zealand of 43.023 units (refer to top panel of Table 3). The latter parameter estimate is unbiased and consistent [3]; [21, ch. 11], but its estimated standard error remains incorrect (biased and inconsistent) because the LM test for panel heteroskedasticity in (Table 3) indicates the presence of significantly different error variances across countries. Substantial remaining cross-country correlation of residuals was also found, which also implies biased and inconsistent OLS standard errors.

The non-significance of the LM test for serial correlation (Table 3) indicates that the Prais-Winsten transformation was successful in removing the serial correlation of the regression residuals. The R-squared value for the regression was 0.913, indicating that the regression accounted for 91.3 percent of the variation in the index. Note that because the dependent variables have been transformed, this R-squared value cannot be validly compared to that reported in Table 2. The overall F-statistic was significant, as was the F-test for the joint significance of the country-specific intercept terms for the fixed effect model. Ramsey's RESET test [18]; [31, p. 98, 80] was not significant, indicating no evidence of omitted explanatory variables or incorrect functional form of the regression equation.

The lower panel of Table 3 reports the panel-corrected standard error for the Maharishi Effect parameter. The PCSE for the Maharishi Effect parameter reported in Table 3 is robust to both panel heteroskedasticity and cross-country correlation of the regression disturbances [4].

The PCSE for the estimated Maharishi Effect parameter is substantially smaller than that resulting from adjustment for

serial correlation alone (top panel of Table 3). This reduction in the standard error results in a larger *t*-ratio for the estimated Maharishi Effect parameter t (275) = 8.672, with *p*-value 2.9 x 10^{-15}. In addition to being statistically significant, the latter estimate was also substantively important, representing 61.7 percent of the standard deviation of the untransformed IMD index (43.023/68.153).

Table 3 reports several diagnostic tests of model adequacy. These tests include an *F*-test of the "pooled regression" model versus the fixed-effects model [2, p. 12]; [21, p. 562]. The pooled regression model includes only a single common intercept term, as contrasted with the FEM reported in Table 3, which incorporates a separate intercept for each country. The *F*-test rejects the null hypothesis that the country-specific intercepts are jointly equal to zero, thus indicating that the pooled regression model is not a valid restriction on the fixed-effects model.

A further issue regarding the interpretation of the regression results in Tables 2 and 3 is the apparent non-normality of the regression residuals. The Jarque-Bera test [30] reported in both tables was statistically significant, indicating rejection of the null hypothesis that the regression residuals were drawn from a normal distribution. However, the distribution of residuals was not grossly non-normal. The histogram was bell-shaped, displaying mild negative skewness (-0.280) and positive kurtosis (3.531), as compared to the expected values of 0.0 and 3.0, respectively, for a normal (Gaussian) distribution.

Even in the presence of grossly non-normal errors, under fairly general conditions the OLS regression parameters remain correct (unbiased and consistent) and are approximately (asymptotically) normally distributed in large samples [17, pp. 62-63]. This result also extends to the case in which the errors are heteroskedastic and serially correlated [21, pp. 458-460]. The usual hypothesis testing procedures, such as *t*-tests and *F*-tests, also remain asymptotically valid for large samples [17, pp. 62-63]. The significance of the test for normality in this case appears to be due to the very large sample size (322 observations) since the deviation from normality appears to be slight. Thus it appears unlikely that the observed mild departure from normality of residuals has any important implication for the interpretation of the empirical results shown in Table 3.

4.2. Conclusion of Primary Analysis

In sum, the estimated impact of the Maharishi Effect on the mean level of the IMD index for New Zealand and Norway remained substantial in size and highly significant after correction for serially correlated errors, differing variance of the regression residuals across countries (panel heteroskedasticity), and cross-country correlation of the errors. This significant estimated upward shift in the mean IMD index lends support to the hypothesis of a sudden improvement in the economies of New Zealand and Norway triggered in 1993 when both countries reached the predicted critical threshold of one percent of the national population instructed in the TM technique.

To further assess the appropriateness of the Maharishi Effect phase transition model and to more fully understand the character of the economic and social changes that occurred in New Zealand and Norway with the onset of the Maharishi Effect, the following three subsections (Correction of Data Irregularities, Subsidiary Analysis, and Discussion) examine the data sources and individual country performances in detail. Also the nature of the improved economic and social performance in New Zealand and Norway is compared to those of other countries. The latter discussion shows that for countries other than New Zealand and Norway, most cases of sharp upward movement in the IMD Index are the result of short-term volatility. In contrast, the improved performance of New Zealand and Norway on the IMD Index in 1994 is broad-based and then largely sustained over the subsequent five-year period. From this point of view, the large effect size and the high statistical significance obtained in the panel regression analysis are not surprising. Some alternative statistical approaches were used in preliminary analysis of the panel data, all of which were highly statistically significant indicating that the significant results reported in Tables 2-3 are quite robust to the method of analysis employed. To substantiate these results, the Discussion section will investigate the logical basis for a causal inference from the data.

5. Correction of Data Irregularities

The statistical results need to be discussed in the light of any identified irregularities in the input data series that contribute to the IMD Index.

5.1. Size

The IMD Index is calculated to favor countries with a higher population since size is considered an aid to competitive advantage. Twenty-four (10.7%) of the 224 IMD data sources are directly related to the size of the country. Some examples include Gross Domestic Product, Measures of Total Investment, Number of Computers in Use, Number of Fortune 500 Companies, Size of Banks, etc. In effect, a larger country has a greater potential to be ranked higher. This adds significance to the relatively high IMD Index score of New Zealand and Norway, which were ranked 11th and 6th by score in 1996, but only 43rd and 41st on population size.

The IMD scores can be recalculated by excluding absolute values (the excluded data is still represented in the resulting scale since IMD uses both absolute values and per capita values). An adjusted Index can be calculated by subtracting the z scores for the 24 affected data points from the overall IMD Index scores reported in Table 1.

5.2. Timing

The target timing of reported data lags by one year behind the publication date of the IMD Yearbook, which comes out in May of the quoted year. Thus the average reporting date for 1994 rankings is mid 1993. Data for New Zealand lagged

an average of 0.3 years behind the overall target date. This lag was not evenly distributed. By inspection it was determined that lags could potentially influence outcomes for 12 out of the 41 sub-scales. Norway data timing only lagged 0.13 years behind the target date and had very little impact on overall scores.

For six sub-scales, the change in the New Zealand sub-scale ranks for the following year 1994/1995 more accurately gauged the actual improvement in the 1993/94 time frame. These were Economic Sectors, Export of Goods and Services, Imports of Goods and Services, Patents, Energy Self-Sufficiency, and Educational Structures. In these cases, the time lags meant that four of these sub-scales showed larger improvements for 1994/95 than for 1993/94, one remained unchanged, and one showed that a fall for 1993/94 had become a rise in 1994/95.

For the National Debt sub-scale, two out of four New Zealand figures were three years out of date. OECD data shows that New Zealand reduced its net national debt during that three-year period. This would have improved New Zealand's ranking by 6 ranks. The 1993/94 sub-scale rank remained unchanged on the IMD Index. It should have been recorded as a positive improvement.

For the Government Expenditure sub-scale, New Zealand data for levels of government employment was seven years out of date. OECD data shows that overall government employment in central administration and defense fell by 6% between 1989 and 1993. Therefore the ranking on the Government Expenditures sub-scale should have been higher than it actually was, but the size of the annual change for 1993/94 was positive and therefore was not corrected.

For the Environment sub-scale, figures for all countries lagged three years behind the target date therefore this scale is not useful for assessing improvements in 1993/1994.

The Productivity sub-scale has five data inputs. For New Zealand, one was missing, one was up to date, one was a 1990/95 trend for overall productivity, one was two years out of date, and crucially important, agricultural productivity was five years out of date. OECD data reports that the New Zealand economy grew 0.5% in 1990, shrank 1.8% in 1991, resumed a slow upward trend in 1992, and then grew more rapidly in 1993 to attain an annual value of 5.5% by 1994, the largest among OECD countries. Therefore, although the Productivity sub-scale showed an improvement in rank, the size of the improvement (only one place) is too small.

For the R & D Resources sub-scale, four of the six New Zealand data inputs are three years out of date, one is two years out of date, and one is up to date. New Zealand's rank on this sub-scale declined in the 1994 IMD Index and then resumed an upward trend in the 1994, 1995, and 1996 IMD publications. Therefore, it is assumed that the positive change recorded in the 1995/1996 IMD publications more accurately reflect the conditions prevalent in 1993.

Data irregularities had an impact on performance in only one sub-scale of the Norwegian data. Two out of three figures for Capital Formation were one year out of date, while the fourth factor was a four-year growth rate. This sub-scale declined between 1993/94, but increased strongly between 1994/95, which more accurately reflects the Capital Formation in 1993/94.

5.3. Trends

26 data inputs (11.6%) are trends. These trends are variously reported over 3 to 5 years as average annual growth percentage rates, annual compound percentage growth rates, or geometric means. The sharpness of the improvements in the New Zealand economy in 1993 evident in OECD Surveys [38] demonstrates that data from trends used in the IMD Index will greatly underestimate the rapid improvement in the economy and expansion in business confidence, which occurred during 1993. Thus the impact of trends used in the IMD Index will mean that the regression analysis reported in the previous section underestimates the significance of improvements in the New Zealand economy. A similar, though less-marked effect is evident in the oil-based Norwegian economy, which experienced an unexpected surge in domestic growth beginning in 1993 at 2%, and doubling in 1994 to a record 4%.

5.4. Correction of IMD Scores for Data Irregularities

The detailed consideration of sub-scales shows that the analysis would be more accurate if timing could be adjusted, and more so if the effect of trends and size were also partialed out of the analysis. Whilst the time involved in such data collection and adjustment is prohibitive for the single researcher (the analyzed panel data is derived from 72,128 single data inputs), it has been possible to estimate the effect that the adjustment of timing and size would have on the overall rank of New Zealand and Norway for 1993 and 1994. This involves an approximation—a proportional approach to adjust the 41 sub-scales recorded as ranked data only in the 1996 yearbook. Each sub-scale accounts for a specific known proportion of the overall IMD index according to how many source data points feed into the calculation of the overall Index. If 1993/94 New Zealand data is on average one year out of date on a particular sub-scale compared to data from other nations in the same category, the 1994/95 sub-scale ranking of New Zealand can be used to proportionally adjust the 1993/94 rank to more accurately reflect the 1993/94 change.

This is a relatively simple, if time consuming, procedure. It is also the most conservative method of adjusting the IMD Index for timing that can be adopted. No adjustments for the effect of growth rates averaged over time were used. Our protocol underestimated the score and rank of New Zealand and Norway in 1994 as compared to the effect of completely recalculating the IMD Index. After this proportional adjustment, the z scores of the 24 'size-related' categories were subtracted from the IMD Index. On the new scale, which more accurately reflects the 'economic vibrancy' of countries, New Zealand rose from 38.75 in 1993 to 78.05 in 1994—a rise of 39.3 units (compared to 23.89 on the unadjusted scale). Norway rose from 27.69 in 1993 to 55.42 in 1994—a rise of 27.73 units (compared to 26.47 on the unadjusted scale). Since it was not feasible to

adjust the data for the remaining 44 countries, the corrected scale must be considered preliminary. However, the relatively high proportion of timing irregularities in the New Zealand analysis justifies the utility of this partial approach to data correction. The more so since the majority of other data irregularities are clustered among a few countries such as Russia, which are near the bottom of the IMD Index, well away from New Zealand and Norway. It is evident that the correction of the IMD Index for New Zealand and Norway would have a large positive impact on both the statistical significance of the size of the change between 1993/94 and on the overall rank of both countries in 1994 (New Zealand is 5th overall and Norway 10th on the resulting Economic Vibrancy Scale[3]).

6. Subsidiary Analysis

6.1. Breadth of Improvement on Index Sub-scales

The IMD reports ranks for each country for 1992-1996 on the 41 sub-scales that contribute to the overall IMD Index [29]. Subsidiary analysis of these ranks was undertaken to test whether the improvement of factors contributing to the rise in IMD scores was broad-based.

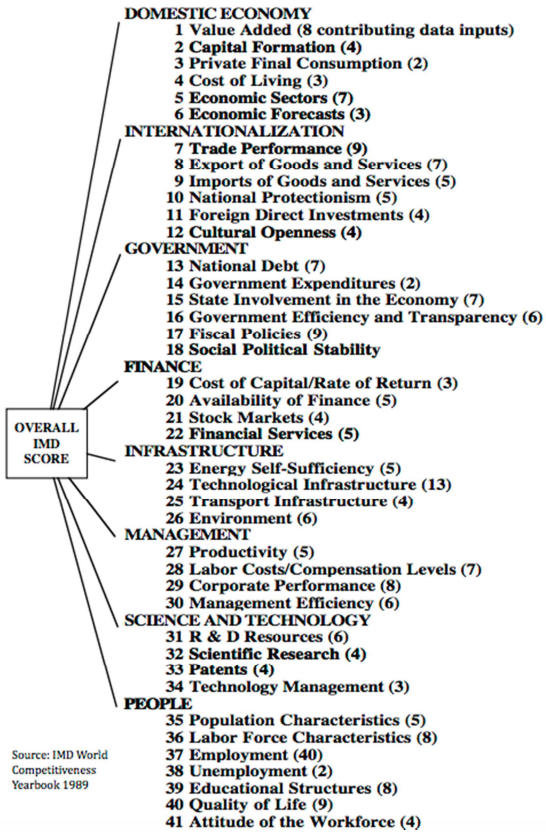

Figure 2. *IMD Index Structure—Grouped By 8 Categories and 41 Sub-Scales.*

[3]This higher score is commensurate with scores from the World Economic Forum Index of international competitiveness which placed New Zealand 3rd and Norway 7th in 1996. The World Economic Forum Index used to work jointly with IMD, but since 1996 it has published its own Index which places more emphasis than IMD on openness to trade and investment, the efficiency of government and the financial sector, labor market flexibility and educational attainment.

For each country and each year, the number of sub-scales that increased or fell in rank were recorded as a positive or negative integers; by summing these two figures an overall performance of 'integer change in rank' for sub-scales is obtained for each country for each pair of years. For 1993/4, New Zealand improved its rank on 26 sub-scales, remained unchanged on 11 and fell back on 4 sub-scales. Norway improved its rank on 28 sub-scales, remained unchanged on 7, and fell back on 5. Thus for 1993/94, New Zealand's score was 26 - 4 = +22 and Norway's score was 28 - 5 = +23.

For each of the 36 countries with complete sub-scale data for all years of the sample, the net number of sub-scale ranks showing improvement from the previous year was calculated for each country for 1993-1996. The net improvement in sub-scale ranks was calculated as the number of increased ranks minus decreased ranks. The resulting integer net-improvement totals were then converted to z scores for statistical analysis. The sample included four annual observations for each of 36 countries, yielding a total of 144 observations.

Adjustments of timing for New Zealand and Norway were then incorporated into the subsidiary analysis of sub-scales using the information reported previously. Now New Zealand shows a net gain in rank of +27 out of 39 available sub-scales and Norway +25 out of 40 available sub-scales.

6.2. Analysis of Breadth of Improvement on IMD Index Sub-scales

Panel regression analysis employing the Beck and Katz method as before was used to test the hypothesis that the onset of the Maharishi Effect in 1993 resulted in a significant average net improvement in sub-scale ranks for New Zealand and Norway relative to other countries in the sample. This subsidiary analysis, thus, investigated the hypothesis that the latter two countries showed an improvement in the IMD index from 1993 to 1994 that was significantly more broad-based than that experienced by the other 34 countries. Space does not allow us to include the full results of this analysis, which may be obtained from the authors.

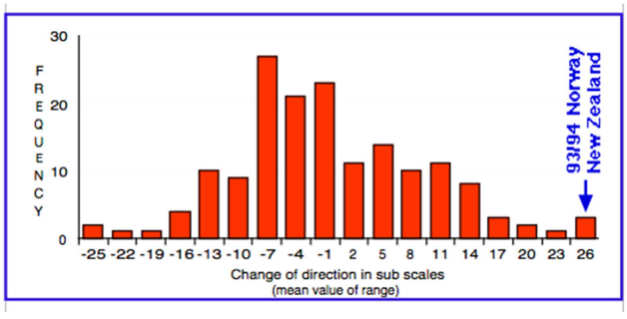

Figure 3. *Change in Sub-Scale ranks—positive minus negative change 1992-1996.*

In summary our parameter estimate indicates that, on average, the net number of increased index sub-scale ranks for New Zealand and Norway for 1993-1994 was 27.592 units higher than the mean rank-improvement score for the

remaining 34 countries over the whole sample. The magnitude of the estimated Maharishi Effect parameter was both statistically significant ($p = 0.000033$) and substantial in magnitude. The parameter estimate is nearly three (2.88) times the size of the inherent variability of the dependent variable, as measured by the latter's standard deviation. By the standards of social science, this is a large effect and lends substantial support to the primary analysis, the modeling of effect as a step function, and the unique character of the changes in New Zealand and Norway.

7. Discussion

The statistical analysis has measured the significance of the rises in Norway and New Zealand relative to all individual changes among countries and years including any other large rises. To assess further whether this change was unique, the annual change for each year and each country was expressed as a percentage of the standard deviation for the overall scores in that year. New Zealand rose by 35% in 93/94 and Norway by 39%. All other annual changes in scores were inspected; those above 25% are discussed on a case-by-case basis as follows.

The IMD scores show some volatility4, but most of the larger rises tend to be relatively short lived. This was true of Argentina, Chile, Korea, Taiwan, Philippines, United Kingdom, Russia, Poland, Spain, and Luxembourg. None of the above fitted the step function model used to assess the significance of rises in New Zealand and Norway.

Only Canada (24% and 25% between 94/96), Ireland (27% in 96/97), USA (34% in 96/97), Hungary (36% in 97/98), China (30% in 95/96 and 32% in 97/98), and Finland (43% in 96/97) have had sustained annual rises of more than 25% of the standard deviation of IMD scores. The influence of the Maharishi Effect on Canada and the USA created by a coherence-creating group in Iowa has already been the subject of research (Cavanaugh 1987, 88, 89). In fact, many Canadians participate in the coherence-creating group in Fairfield, Iowa. Similarly, there is a UK coherence-creating group in Merseyside with many Irish participants. The authors cannot assess the impact of such groups on their IMD performance. China and Hungary are rising in economic performance from a very low relative base line and are therefore not strictly comparable with New Zealand and Norway.

Finland does have a comparable economy but it does not have a coherence-creating group. Its IMD score improved 43% of the SD between 1996 and 1997, larger than the 1993/94 changes in Norway and New Zealand. OECD Surveys throw light on the nature of the economic resurgence in Finland. Prior to their collapse in 1990, Finland had a strong economic relationship with the countries of the former Soviet Union. From mid 1990 up to 1993, Finland's real GDP fell by almost 15% and unemployment rose from 3.5% to 19%. The terms of trade deteriorated. There was a financial crisis resulting in the devaluation of the currency. Following this, the 1995 OECD Finland Economic Survey concluded that the strong recovery of exports to former Comecon countries was striking, with Finnish sales to Central and Eastern Europe currently returning to levels that prevailed just before the collapse of trade with this region in 1990/91. During this recovery, exports to the EU remained largely stagnant and unemployment was still running at 17% in 1996. In 1997, the OECD Survey reported that Finland had fully recovered the enormous loss in output that it sustained after the collapse of the Soviet Union. Therefore the large rise in IMD Competitiveness ratings for Finland between 1996 and 1997 was actually a recovery from the massive economic shock that the country sustained after the collapse of the Soviet Union. Nor did Finland enjoy the balanced nature of the recovery in New Zealand and Norway where unemployment fell as the economy gained speed[5], as confirmed by OECD Surveys [38].

8. Analysis of Causality

The improvement in the competitiveness scores of Norway and New Zealand is highly statistically significant, but it is important to discuss the reasons why they lend support to a causal interpretation. The analysis has established a strong correlation between events; on their own, correlation and simultaneity of events only strengthen causality arguments, but do not prove causality. Granger [20] suggests that the temporal sequence of events is crucial to establishing causality. In essence, if X precedes Y, then X is a good candidate for a causal factor, but Y is not. Moreover, because economic systems involve a complexity of mutually interacting variables, if X is clearly exogenous to the existing economic system then the argument for causality is strengthened [47] Hendry and Richard [26] agree and place emphasis on the need for a satisfactory explanatory model. More than this, the examination of other potential causal factors is essential. With these factors in mind, we can discuss the arguments for causality.

8.1. Timing

Within the limits imposed by annual data, the statistical analysis shows that there was a significant improvement in a broad measure of the economic health of Norway and New Zealand at the time predicted by theory, when the Maharishi Effect threshold was surpassed. This shows a correlation, which lends support to a causal hypothesis. The subsidiary

[4]Volatility in the IMD overall scores results partly from the survey content of the Index (33%). Surveys reflect both the long and short-term views of participating executives; they also reflect changes in national mood. This can mirror the current business and political climate, which can be subject to short-term fluctuations. The IMD Index is also sensitive to regional economic factors, currency fluctuations, overseas investor confidence, stability of specific global markets, and regional conflicts.

[5]Economic theory predicts that there should be a negative relationship between unemployment rate and economic growth. This empirical regularity known as 'Okun's Law' states that the unemployment rate will decline by 0.4% for every 1% of annual real GNP growth above its trend rate of growth [15]. This was not the case during the recovery in Finland, which underlines the unusual nature of the economic changes taking place there.

analysis, which makes the timing of the data inputs more exact, strengthens this correlation considerably. Examination of all other relatively large individual movements in national IMD Index scores, has shown that most of these were examples of volatility or due to other causes.

8.2. Economic Forecasts

OECD forecasts did not predict the speed, timing, and depth of the improvements in the Norwegian and New Zealand economies. In retrospect, in 1998 the OECD reached the conclusion that 80% of the massive New Zealand government debt repayment achieved between 1994 and 1998 was not predicted by prior cyclical trends. Moreover, most influential New Zealand economic commentators did not see any prospect of significant short-term economic recovery even as late as 1992. For example, in a landmark study of the New Zealand economy, Michael Porter and Graham Crocombe wrote in 1991:

"The New Zealand economy is not well suited to the imperatives of the modern global economy. Despite recent reforms, our economy has continued to languish. The weak competitive position of many of our industries remains essentially unchanged. Government spending has become an even larger drain on the national economy.

If New Zealand is to become a prosperous nation in the next century, broad-based systematic change is required—in attitudes, institutions, policies, and strategies. These changes will take decades fully to bear fruit..." [11, p. 177]

This broad-based change came about not slowly through changes *in attitudes, institutions, policies, and strategies* as Porter and Crocombe suggest, but rapidly pointing to a novel cause such as the Maharishi Effect. These results are suggestive of the capacity of Maharishi Effect theory to predict economic improvements that were not anticipated by traditional economic theory.

8.3. Other Economies

The authors have published elsewhere [24, 25] case studies of the Maharishi Effect in Cambodia (see also Fergusson [16]), Mozambique, Merseyside, and USA, which record similar broad-based improvements. These case studies strengthen causality arguments, since they imply that the Maharishi Effect theory is robust, repeatable, and portable; especially since these four economies are radically different from one another. Cambodia and Mozambique are formerly the poorest nations in the world; USA is arguably the richest, while Merseyside is an industrial metropolitan area.

8.4. Replication

Since various effects have been found in 47 previous research studies [36], these replicated effects lend support to a causal interpretation of the findings reported here. Many of the previous studies use powerful time series analysis techniques, where daily, weekly or monthly movements in the dependent variable above and below the Maharishi Effect threshold have been shown to lead positive and negative changes respectively in the dependent variables (see for example [40]). The prospective study of the Maharishi Effect in Washington D. C. [23] also bolsters the argument for causality since the timing and size of the effect on violent crime were predicted in advance.

8.5. Model Sufficiency and Fit

The rapid onset of broad-based improvement in the IMD Index of social and economic indicators and its sub-scales provides a very good fit with the phase transition or step function model of Maharishi Effect theory used in prior research (see [25] for a full discussion of theory). Parameter constancy is also indicated since both New Zealand and Norway had comparable effect sizes.

8.6. Alternative Explanations

A crucial adjunct to causal analysis must be a discussion of alternative explanations. For example, OECD surveys seek to describe the causes of economic changes among their member countries in terms of government policy, domestic demand, strength of sectors, educational characteristics of the work force, and international factors such as export demand, exchange rates, and world economy. Particular emphasis is placed on the effect of government policy. Therefore, in seeking to identify the causes of the improvements in New Zealand, the OECD [38] discussed the role of government economic reforms that took place from 1983 to 1990. With hindsight, it described the New Zealand economy as having *"the least distorted economy among OECD members"*.

Were the New Zealand fiscal reforms in the 1980s the cause of the 1993/4 improvements in IMD scores? In part, the answer is that the improvements were far broader than could be anticipated from the nature of the reforms. The improvements appeared in virtually all economic sectors. A close study of OECD Summaries [38] shows that as late as December 1992, the OECD itself did not expect the sweeping economic reforms undertaken mainly in the mid 1980s to correct what it saw as fundamental imbalances in the New Zealand economy. In this, it was drawing upon its previous experience of the possible effects of government policy changes among its members.

Porter and Crocombe [11, p. 8, 10, and 12] also reject this explanation strongly—*"The failure of heavy government intervention was obvious, yet the early results of a rapid transition to a market economy appeared to hold little promise... Why despite one of the most rapid and far-reaching economic liberalizations ever* [begun eight years earlier], *does our economy continue to languish and unemployment soar?...*[This book] *highlights how New Zealand's institutions and policies have retarded the progress of the economy."*

Porter also suggested that the resource-dependent nature of the New Zealand economy was indicative of poor prospects [11]. Moreover, other significant New Zealand economic commentators [5] also believed as late as 1992 that not only was there little prospect of a significant improvement in the

economy, but also that the government reforms of the 1980s had in fact harmed the economy.

It is clear that the changes in government policy in New Zealand occurred many years before the economic improvements from 1993 onwards. Therefore it is natural for Porter and other economists to reject government policy as an explanatory principle. Moreover, our analysis and previous research has located similar effects of coherence in five nations, each with radically different government policies [25].

Another possible explanation is the supposition that the economies of major trading partners improved sufficiently to stimulate the growth in New Zealand and Norway. However, our analysis is comparative and it demonstrates a larger improvement in New Zealand and Norway than their trading partners. Therefore this argument must be rejected.

In general the strongest argument against other explanations is the generalized nature of the IMD Index. It includes 224 social and economic factors. The simultaneously move of such a broad range of factors, strongly suggests an exogenous variable. The coherence in collective consciousness is a clear candidate for this position. Moreover, Cavanaugh [7-10] controlled some other economic variables suggested by modern economic theory, and found that the influence of the Maharishi Effect on the Misery Index in USA was robust.

8.7. Effect of Foreign Investment

Foreign investment is another alternative exogenous variable. By the end of 1994, both New Zealand and Norway had dramatically increased their attractiveness to foreign investors. On the IMD scale of attractiveness, New Zealand rose from 9th overall to 5th and Norway from 23rd overall to 10th between 1993 and 1994. In 1994, there was a net inflow of overseas investment in stocks of New Zealand companies of US$12.42 billion. This is US$3,500 for every man woman and child in New Zealand, the second highest level of per capita overseas investment in the world (second only to Singapore). This represents 22% of New Zealand's GDP, at the time the fourth highest ratio of investment to GDP in the world (just behind Singapore, Malaysia, and Indonesia). Norway has also had a large rise in net inflow of overseas investment up from US$3.16 billion in 1992 to US$14.33 billion in 1994. This shows the rapid growth in confidence that the rest of the world had in the economies of New Zealand and Norway, but the timing of the investment does not fit as a causal factor, since foreign investment did not start to kick in until later in 1994 when the massive shift in the economic prospects and performance had already taken place and then began to attract international investors. The more so since such investment was largely predatory of assets or land rather than immediately stimulating new economic activity[6].

[6]Foreign investors are looking for monetary gains; they do not necessarily care about the long-term interests of target countries. They will tend to pull the plug on investments for short-term reasons [37], [43].

8.8. Independent Confirmation of Economic Progress: OECD Economic Surveys

The improvements in the economies of New Zealand and Norway have been independently assessed by OECD Surveys published biannually. The surveys confirm the unusual, far reaching, unexpected, and sustained nature of the economic resurgence in both countries. Among other things, OECD surveys found that both New Zealand and Norway enjoyed sustained periods of low inflation, high economic growth, and low unemployment after the Maharishi Effect threshold was passed. It is quite clear that the OECD was taken aback by the speed and depth of the economic changes in both countries. The trends were not predicted accurately in earlier forecasts and were characterized as atypical or unexpected in later reports after the changes emerged in 1993/4.

8.9. Were the Economic Changes in Norway and New Zealand Sustained

The impact of the Maharishi Effect on the economy of New Zealand and Norway has been modeled as a step function—in 1993/4 it is clear that the economy of both countries 'stepped up' to a new level of performance. By the beginning of 1998, New Zealand and Norway had enjoyed five years of sustained economic growth with low inflation and low unemployment. The relevant 1999 OECD Economic Surveys [38] concluded that the strong performance of the Norwegian economy since 1993 has lifted mainland GDP by 20% in only five years, and during the last five years New Zealand has experienced relatively rapid economic expansion by both past and international standards.

9. Cost Benefit Analysis

Our results suggest an intriguing strategy for national economic development. Some economists have suggested the general distribution of a minimum wage will be an effective strategy to stimulate economic development. The approach suggested by our results is a program to increase coherence in collective consciousness by increasing creativity and optimum brain functioning among a small select group of the population, who then produce a highly influential field effect among the whole population. Is this practical and cost effective? Other studies have assessed the economic impact of the Maharishi Effect through reduced crime [24] and reduced healthcare costs [27]. These findings indicated substantial savings. Hatchard [25, chap. nine] undertook a more global measure of the economic impact of the Maharishi Effect on the New Zealand economy whose conclusions we summarize here.

9.1. GDP and Government Debt Reduction in New Zealand

Comparing 1988-92 and 1993-97 New Zealand had a relative increase in real GDP growth rate per capita of 3.28% p.a.. Excluding oil revenues, Norway had an increase in real GDP Growth rate of 3.43% p.a. after the Maharishi Effect

threshold had been surpassed. To estimate of how much of the increase in GDP is due to the Maharishi Effect, Hatchard [25] examined the principle sources of government revenue. New Zealand government treasury and OECD sources show that after the coherence threshold was passed in 1993, the New Zealand government retired 23.5% of GDP in net total debt over a four-year period. During this time real GDP increased from US$42.6 billion to US$47.5 billion.

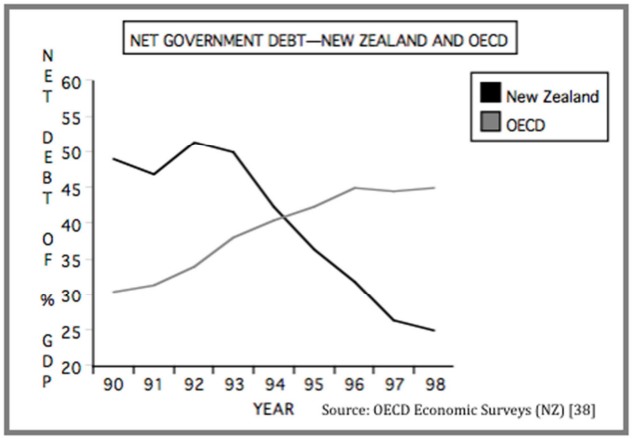

Figure 4. *Government Debt New Zealand and OECD Average 1990-98.*

Using OECD data, net debt was reduced from US$21.1 billion to US$12.4 billion—a total of US$8.7 billion in debt retirement. This is a very significant economic performance for a small nation. The government had been facing a persistently high debt to GDP ratio that defied fiscally conservative reform prior to the coherence threshold being passed in 1993. New Zealand's subsequent performance approximates the step function typical of the Maharishi Effect. The OECD Secretariat calculated that only one-fifth of the debt reduction ($1.7 billion) could be accounted for by prior cyclical trends. This indicates a phase transition in the New Zealand economy when it reached the coherence threshold in 1993 and supports our view discussed elsewhere (Hatchard 2000) that the dynamics of the economy had changed.

The OECD also reported that during the 1994-1997 period, the government received NZ$3.24 billion (US$1.62 billion) in sales of assets and lowered personal income tax rates by 0.6% of household income and indirect taxes by 0.5% of GDP during this four year period—a total of approximately US$1.36 billion. Taking the headline figure of US$8.7 billion in net government debt reduction, subtracting the US$1.96 billion identified as resulting from previous trends and the US$1.62 billion in asset sales, and adding the US$1.36 in tax reductions, the New Zealand government had a net gain of US$6.48 billion over four years.

During this four-year period, economic activity increased by US$14.44 billion compared to the previous trend. This yielded a tax revenue benefit @ 38% of US$5.49 billion to the New Zealand Government. In addition, the government benefited by US$1.02 billion in reduced welfare payments to the unemployed. The sum of increased tax revenues and reduced unemployment benefits is US$6.51 billion.

The cost of instructing one per cent of the population of New Zealand in the Transcendental Meditation program at 1999 prices is 38,000 x $575 = NZ$21.85 million (US$10.93 million).

In summary the New Zealand Government had a net debt reduction of US$6.48 billion, which, according to the OECD, could not be accounted for by previous cyclical trends; and a net increase in revenues from increased tax-take and reduced unemployment of US$6.51 billion. The equivalence of these two headline figures suggests that the net increase in tax revenues was the entirely the result of new economic factors not predicted by previous economic trends. On this basis, it would be very conservative to rely on Cavanaugh's time series analysis [7-10] which reports that 54% of the reduction in the Misery Index in the USA was due to the Maharishi Effect. Taking 54% of the improved economic performance of New Zealand to be the result of coherence creating, we arrive at $713 increase in GDP over four years for each $1 spent implementing the coherence creating strategy and corresponding benefits to the government coming to $320. This suggests that each person learning the Transcendental Meditation program generated US$205,000 in increased GDP over a four-year period.

9.2. Coherence as an Economic Multiplier

Our cost-benefit summary suggests that a coherence creating program can be added to any economic system as an economic multiplier. In effect a cascade of benefits are stimulated in the economy; the estimated government saving of $320 for every dollar invested represents an annual rate of return on capital of 8,000%. Moreover, some savings are unquantified due to either a lack of empirical data to support an estimate or the essentially 'priceless' and vital nature of commodities such as 'improved quality of life' or 'increased creativity and innovation'.

10. Conclusion

The empirical data and statistical analysis presented in this study lends support to the hypothesis that the Maharishi Effect had a substantial impact on the IMD Index scores of National Competitive Advantage for both New Zealand and Norway. This suggests a basis for wealth generation in a coherence creating approach to national economic development. Results of analysis, previous research and case studies reported here appear to provide governments with a simple-to-implement, highly cost-effective intervention to develop national human resources, multiply investment, and improve economic performance.

We have found that as the Maharishi Effect stimulates economic growth, the wealth generated is distributed in different ways through the economic channels that are active in that nation, and by the government via the taxation and spending process. In New Zealand debt repayment was a priority for their government. This was achieved on a massive and unprecedented scale after the Maharishi Effect

threshold was passed. In Norway, the government spent heavily on social welfare, health, and education.

Coherence creating represents a unique form of ethical investment that appears to not only create conditions necessary to underpin economic growth but also to dynamically multiply itself hundreds of times in the wider economy thereby benefiting the entire population by stimulating GDP, as well as reducing unemployment, inflation, and government debt. This understanding extends the growing perception that human factors underlie the growth and stability of economic systems [45].

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