Forward by Dr. David Leffler, Executive Director, Center for Advanced Military Science (CAMS)

Readers may recall my latest article in *Vigilance Security Magazine* on the topic of the paper below: "Embracing Invincible Defense Technology For Lasting Peace - A Better Idea: Invincible Defense Technology." Invincible Defense Technology (IDT) involves large groups practicing in unison the non-religious Transcendental Meditation (TM) and advanced TM techniques that harness group brain power. This approach is scientifically verified by extensive peer-reviewed research. Field-tested means have demonstrated IDT defuses societal tensions by producing a coherent super-radiance field effect that affects the consciousness of all within proximity of the group, thereby creating orderliness and harmony.

This IDT paper below by **Guy David Hatchard Ph.D.** and **Kenneth Cavanaugh Ph.D.** was originally published in *Canadian Centres for Teaching Peace*. It is no longer available there, because this organization is now defunct. *Vigilance Security Magazine* has graciously agreed to reprint it in hopes that military-related leaders worldwide will read it, share it, and be inspired to take steps to immediately deploy IDT in their militaries.

Currently tensions between Russia and the US are at an all-time high, and are simultaneously rising between the US and other countries such as North Korea, Iran and China. This high level of international tension could rapidly escalate into global catastrophe for all sides. When properly applied IDT could quickly reduce these high tensions.

IDT has the potential to end all war and create lasting world peace - something we all so desperately need during these dangerous times of crises. This scientific research paper below adds further support that IDT can prevent social problems such as crime, war, terrorism and conflict.

The Peace and Well Being of Nations:

An Analysis of Improved Quality of Life and Enhanced Economic Performance Through the Maharishi Effect in New Zealand, Norway, USA, Cambodia, and Mozambique.

A Longitudinal, Cross-Country, Panel-Regression Analysis of the IMD Index of National Competitive Advantage

Guy David Hatchard Ph.D.

and

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Contents

Abstract

The scores of New Zealand and Norway on the IMD Index of National Competitive Advantage increased significantly when they passed the Maharishi Effect threshold in 1993 (1% of a population practicing the Transcendental Meditation program or the √1% practicing the advanced TM-Sidhi program including Yogic Flying 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 ($p < 3\times10^{-15}$). Subsidiary analysis and OECD data confirmed that the changes were unusually broad-based ($p < 6.5\times10^{-8}$), sustained, and balanced in nature with five years of high growth, low unemployment, and low inflation. Case studies of the Maharishi Effect covering economic and social data from USA between 1983 and 1989, and Cambodia and Mozambique since the early 1990s indicate a similar picture of stable economic growth along with the capacity to repay government debt, improve quality of life and reduce conflict. Taken as a whole the findings suggest a prescription for balanced and sustained growth for both rich and poor nations along with a means to create and sustain a peaceful world.

Introduction

In 1989 the world appeared to be riding on the crest of a wave. The enmity between the super powers had dissolved. The global problems of conflict, starvation, and poverty seemed solvable in a new climate of cooperation between nations. The collapse of the Soviet Union in 1990 was followed by a global wave of democratization and free market economics that promised peace and prosperity. Yet alarmingly since we have witnessed the rise of new forms of conflict and terror, while famine and poverty have surged. Doctrines of unilateral military intervention have apparently failed to stem a rising tide of instability; many believe they are fueling it. The burning question of the day is '*What policies and programs will guarantee peace and prosperity?*' This paper seeks to answer this question by examining five very different nations—an oil-rich country, two developing nations, one in Africa and one in SE Asia, a developed agricultural economy, and the world's remaining 'super power'. Each has been influenced by the Maharishi Effect, whose impact we assess by analyzing a broad-based international measure of economic performance and quality of life.

The Maharishi Effect:

Drawing on physical field theory, Maharishi Effect theory discusses a 'field effect' of consciousness (Hagelin 1987, Dillbeck *et al* 1987, 1988, Hatchard 2000 chap. 4), which brings about a phase transition from disorder to order in society. Phase transitions in

the physical sciences are well understood as sudden decreases in entropy or disorder when a critical threshold is passed. Phase transitions are characterized by the emergence of new system properties such as the onset of superconductivity below a critical temperature. 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 Maharishi Effect is named after His Holiness Maharishi Mahesh Yogi who predicted it more than 40 years ago (Maharishi 1963). Over the last 35 years, 47 scientific research findings (M.U.M. 2004) have indicated strong empirical support for the Maharishi Effect, which increases positive trends and reduces problems in society when the critical threshold is passed of one per cent of a population practicing the Maharishi Transcendental Meditation[SM 1] program or the square root of one per cent of a population practicing the advanced Transcendental Meditation® and TM-Sidhi® program including Yogic Flying in a group morning and evening. These technologies are 'Technologies of Consciousness' based on the ancient Vedic understanding of consciousness, which Maharishi has revived as Maharishi Vedic Science (Maharishi 1994).

The Transcendental Meditation program is an easy-to-learn, mental technique practiced fifteen to twenty minutes twice a day, which has become popular as a method to improve health and reduce stress. Over 5 million individuals have learned the technique worldwide. During the Transcendental Meditation program, the individual learns how to systematically allow thinking activity to settle down in a natural, effortless way and experience self-referral consciousness—Transcendental Consciousness. In more simple terms, it is a state of restful alertness: body metabolism corresponds to a deep state of rest and is the mind is fully awake, but free from thought activity. Over 600 research studies have shown that the individual becomes more alert, creative, intelligent, happy, and healthy when the technique is practiced regularly (M.U.M. 2004). According to Maharishi (1995, p. 308), the TM-Sidhi program including Yogic Flying is an advanced aspect of the Transcendental Meditation program. It teaches the individual to think and act from the level of self-referral consciousness, greatly enhancing coordination between mind and body. The first stage of Yogic Flying leads to a series of short hops accompanied by 'bubbling bliss' on the subjective level and maximum coherence in the brain on the objective level (Travis et al 1990).

The Maharishi Effect: previous research on crime and conflict:

Recently, a prospective, high-profile test of the Maharishi Effect appeared in *Social Indicators Research* (Hagelin *et al.* 1999). In the summer of 1993, 4,000 advanced Transcendental Meditation participants (Yogic Flyers) gathered in Washington DC 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*. The Washington Police Chief went on record to say that nothing short of a snow storm in July could reduce violent crime by the predicted 20%. In the event, the predictions were borne out (Hagelin *et al*. 1999, Goodman 1997), there was a 24% reduction in violent crime compared to the trend predicted by time series

analysis of preceding data ($p < 2\times10^{-9}$), approval ratings for President Clinton increased ($p < 6\times10^{-8}$), accidents, emergency psychiatric calls, and hospital trauma cases decreased, and a quality-of-life index improved ($p < 4\times10^{-5}$).

Over thirty previous studies have shown reduced crime and violence through the Maharishi Effect since 1974. All of these studies are notably statistically significant (M.U.M. 2004). For example, Hatchard et al. (1996) 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 group of Yogic Flyers was formed. Within 5 years crime had fallen by 60% relative to national trends, leaving Merseyside with the lowest metropolitan crime rate in UK.

A Global Maharishi Effect is predicted whenever groups of 8,000 Yogic Flyers—the square root of one per cent of the world's population—practice together (Maharishi 1995, p. 317). Using time series analysis Orme-Johnson et al. (1989) analyzed the effect on world events of three such assemblies held over two to three weeks in USA, Europe, and India. They found reductions in terrorism (−72%) and international conflict (−33%) as well as increased world stock prices. Orme- Johnson et al (1979) reported a simultaneous reduction in tension in five world trouble spots when groups of Yogic Flyers were sent to the countries in 1978. Davies (1989) identified seven periods when there were sufficient Yogic Flyers in groups to influence the violent conflict in Lebanon between 1983 and 1985 and used impact assessment analysis to show a rise in cooperation (+66%), and a drop in war intensity (−48%), fatalities (−71%), and injuries (−68%) in Lebanon at these times. The combined significance of all the indicators together is $p < 9\times10^{-20}$.

Maharishi Effect national economic case studies: Cambodia, Mozambique, and USA:

USA, Cambodia, and Mozambique have very different economies; the most powerful in the world, and formerly the two poorest. All three have had a measurable interest in the Transcendental Meditation program; in the USA through individual and corporate interest and in Mozambique and Cambodia through government support.

The Maharishi Effect in developing nations:

The authors undertook a general survey of political and economic statistics reviewed in Europa Yearbooks for all 193 of the world's nations. Between 1990 and 1998 seventy nations changed their system of government to a multiparty democracy. Of these, thirty-three nations had no war either before or after the transition, while nine had a civil war both before and after. Twenty-six nations had no war prior but bloody civil conflict erupted soon after. Only three nations had a war before but peace afterwards—Cambodia, Mozambique, and Namibia[2]. Uniquely among those changing to democracy these three nations benefited directly from programs that Maharishi Mahesh Yogi proposed and implemented.

Cambodia and Mozambique have enjoyed sustained economic growth, rare among the developing nations, since implementing Maharishi's Consciousness-Based approach. Elsewhere the switch to democracy has failed to deliver economic benefits. Per capita GNP in nations introducing multiparty democracy fell by 3.3% during 1990 to 1996, while the GNP of the rest of the world rose an average of 1.6%. Today, over 50 third world countries have less than 1/100 of the per capita income of the wealthiest nations. Formerly the poorest nations in the world, Cambodia and Mozambique have bucked the trend. Both countries have risen steadily up the world scale of relative economic prosperity as measured by GNP per head over the last decade (Cambodia by 24 places and Mozambique by 15 places).

In contrast, many countries that apparently had better prospects than Cambodia and Mozambique to progress in the 1990s, have failed dismally to capitalize on their opportunities. For example, in 1993 the Republic of the Congo had the advantage of much higher per capita income, greater natural resources, and a history less disrupted by war. However, a transition to democratic government supervised by the World Bank and began in 1993 gradually gave way to civil conflict. After the elections, factional fighting among elected parties eventually descended into civil war and the decade was characterized by political turmoil, civil conflict, and economic stagnation.

Case Study: Mozambique has used Transcendental Meditation in the armed forces

In Mozambique, President Chissano, whose country was in the grip of a long-running civil war and economic chaos, decided at the start of the 1990s to introduce the Transcendental Meditation program to the armed forces and the people of his nation. By the end of 1992, about 15,000 people had learned the Transcendental Meditation technique and more than 3,000 people were trained in the TM-Sidhi program including Yogic Flying. After the introduction of the Transcendental Meditation program news went around the world about the transformation that the President had been able to effect in the destiny of his nation. For example, a report in the 22 February 1993 *New York Times* said: *"Mozambique has unexpectedly emerged as a candidate for an African Success story —We have a combination of peace and rain which has not been seen in Mozambique for a quarter of a century'*."

President Chissano attributes the cessation of civil conflict in Mozambique and the ensuing development of his country to the effect of the Transcendental Meditation program — *"First I started the practice of Transcendental Meditation myself, then introduced the practice to my close family, then to my cabinet of ministers, then to my government officers, and then to the military. The result has been political peace and balance in Nature in my country …* "

Mozambique has since experienced rapid economic revival with the country boosting GDP growth rate to 12.4% per year by 1997—the highest among all African nations, lowering inflation from 70% in 1994 to single digits by 1997, and reducing its massive net overseas debt from a peak in 1993 to a positive net asset in 1998. It has also successfully competed in the African market for manufacturing contracts, discovered the world's largest deposits of titanium, and enjoyed the most stable African currency

values over an extended period. This has all happened while President Chissano had a policy of utilizing the Maharishi Effect to boost national stability and economic development.

Dr. Leffler's Added Note: For more information, see also:

War and Peace in Mozambique – A Time Line – After serious critical study and analysis of the research on Invincible Defense Technology, the Joint Chiefs of Staff of the Armed Forces of Mozambique implemented Invincible Defense Technology in different military units of their Ground, Naval and Air Forces. To better understand the ramifications of their decision and the results of the research by Dr. Hatchard and Dr. Cavanaugh see this timeline summary of Mozambique's history since the 1960's to the end of the 1990's.

Mozambique's Prevention Wing Of The Military: End War, Improve The Economy – Article originally published in *Africa Economic Analysis*, Dr. David R. Leffler and Lee M. Leffler discuss the benefits gained from deployment of Invincible Defense Technology by the Mozambique Prevention Wing of the Military.

Invincible Defense–A New "Secret Weapon!" – Article originally published *Canadian Centres for Teaching Peace*. Retired Navy SEAL officer and scientists describe the deployment of, and underlying theory behind, the Prevention Wing of the Military deployed by Mozambique military to end their civil war.

Lt. General Tobias Dai of the Mozambique army confirmed:

"Our conclusion is that the implementation of the Transcendental Meditation and TM-Sidhi Programme, with Yogic Flying, into the armed forces of Mozambique was worth the effort and the results were in line with what was predicted... As part of the peace agreement the military on both sides of the conflict were disbanded and this ended the group practice of IDT." Lt. General Dai noted: "What is very clear is that once the positive effect is created, if the group practise is stopped, the previous tendencies of higher collective stress, as determined from the crime indexes and the tense situation in the country, began to rise again." **Source**: Second International Conference on Invincible Defense: Establishing a Prevention Wing in the Military of Every Nation to Raise Military Power to Invincibility and Prevent the Birth of an Enemy

For more information about the deployment of Invincible Defense Technology (IDT) by the military of Mozambique, please see this article by **Steve Taylor Ph.D**.
in *Psychology Today*: "Can Meditation Change the World? The amazing story of the 'meditating president.'"

In Somalia, peace negotiations began in January 1993 under the auspices of the UN aimed at a transition to democracy and backed by the presence of 28,000 UN peacekeeping troops failed to lead to progress. The UN contingents were forced to withdraw and the country suffered civil conflict and fragmentation throughout the 1990s. In late January 1993, there were peace talks between the Angolan government

and UNITA rebels in Addis Ababa with Portugal, Russia, and USA observing. A cease fire was signed during September 1993. Despite UN supervised efforts to implement the cease fire over a five-year period, by 1998 the country had again descended into full civil war and economic chaos prevailed. In contrast, the case studies of Cambodia and Mozambique are indicative of broad social and economic progress along with cessation of conflict. The authors are presently subjecting the limited available data to more rigorous study. Previous research in USA provides supporting data and analysis.

Case Study: The Maharishi Effect in Cambodia

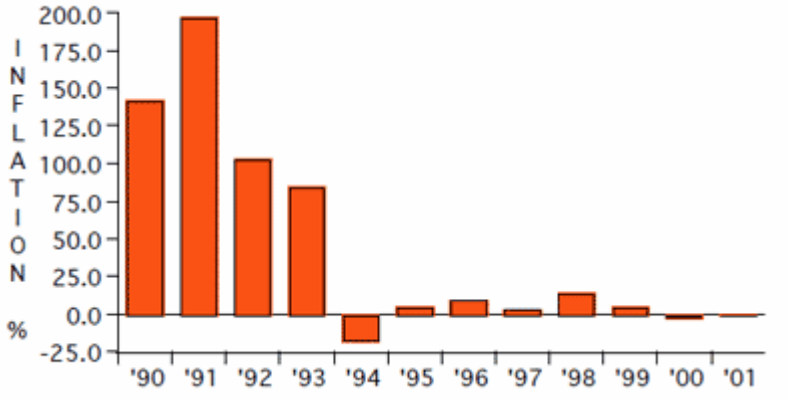
Maharishi Vedic University (MVU) Cambodia was established in 1992 as a joint venture between the Royal Cambodian Government, the Australian Aid to Cambodia Fund (AACF), and MVU Holland to provide a Consciousness-Based Education to rural youth who would not otherwise have access to higher education.

By 2004, MVU Cambodia has grown to occupy four campuses with a total of over 1000 students. The unique feature of the education system is the daily group practice of the Transcendental Meditation technique and Yogic Flying. Cambodia has a population of 10 million. The group at MVU is therefore sufficiently large to pass the √1% Maharishi Effect threshold.

Following 1993, Cambodia has undergone a remarkable transformation from a country with a civil war, martial law, a military dictatorship, no freedom of expressions or civil rights, a weak economy reliant on external assistance, poor relations with neighbors, and a prevailing sense of fear, intimidation and helplessness; to a democratic government with a restored monarchy, freedom of expression and civil rights, substantial foreign investment, greater self-sufficiency, much improved relations with neighbors, now a member of the ASEAN group of nations, and a much greater sense of confidence, security and optimism. In Cambodia prior to 1993, there were few reliable measures of social and economic factors available, but recorded trends show reduced inflation (Fig. 1) and average real GDP growth between 1994 and 2001 in excess of 5.5% p.a.

Figure 1

Cambodia Reduced Inflation (Annual change in CPI mid year) 1990 – 2001



Since 1993, Cambodia has succeeded to a relatively significant extent in harmonizing conflicting groups and realizing a genuine base for social cooperative behavior, along with strong economic growth and relatively stable political institutions. Many MVU graduates now occupy leading roles in Cambodian society. In common with many political leaders, His Majesty King Norodom Sihanouk has publicly acknowledged that *"MVU is playing an important role in human resource development and in restoration of peace and expansion of prosperity throughout the country."* The resolution of conflict, the emergence of cooperative behavior and the resurgence of economic activity is really the hallmark of the Maharishi Effect.

Dr. Leffler's Added Note: The group practice of the Transcendental Meditation® and TM-Sidhi® programs in Cambodia between 1993 and 2008 was associated with a 96.2% decline in sociopolitical violence in that war-torn country compared to violence in the preceding three years, according to a peer-reviewed study published in *Studies in Asian Social Science* in 2019. For more details see this summary in *EurekAlert*.

USA—economic and social research on the Maharishi Effect:

Continuously between 1983 and 1989 inclusive and during specific other short periods a group of Yogic Flyers in Fairfield Iowa, USA at Maharishi University of Management was consistently larger than the square root of one per cent of the US population (approximately 1530 Yogic Flyers). Gelderloos et al (1988, 1990, 1996) used time series analysis and simultaneous transfer function models to analyze content of newspapers and public statements of US President Reagan. This showed that the size of the group of Yogic Flyers at Maharishi University of Management had a positive impact on US actions towards the USSR and vice versa, especially when the group size was large.

Stock market data can be interpreted as a measure of public confidence and optimism. Orme- Johnson *et al* (1987) and Cavanaugh *et al* (1984) used regression analysis and Box-Jenkins time series analysis respectively and found a simultaneous rise in the world's major stock markets during the assembly of 8000 Yogic Flyers held at Maharishi University of Management, Iowa in December 1983 ($p < 0.00004$). The rise had not

occurred at that time of year for a five-year previous period, nor did it occur in the control periods before and after the assembly. The assembly accounted for 27% of the variance in the World Index. Time series analysis that included 151 days prior and 60 days after the assembly explicitly allowed for the effect of long-term interest rates on international stock prices and found similar highly significant effects ($p < 0.000033$). Prior cyclical behavior of the World Stock Index did not predict any rise for the experimental period.

Orme-Johnson and Gelderloos (1988) measured the impact of participation in the Transcendental Meditation technique and Yogic Flying in the USA on a quality-of-life index including 12 social indicators. 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. Cross-lagged correlations predicted enhanced quality of life from the Transcendental Meditation technique participation rate and showed this variable accounted for 44% of the variance ($p < 0.0001$). Regression analysis yielded a similar result ($p < 0.0001$). 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*. (1987-89) found sizable and highly statistically significant reductions in the monthly "Misery Index" (the sum of inflation and unemployment rates) in both USA and Canada during and following times when the coherence creating group of Yogic Flyers at Maharishi University of Management exceeded the square root of one per cent of the population threshold. The effect was larger when the group size was larger, and more significant in the USA, the country where the group was located, than in neighboring Canada. The studies statistically controlled for intensity of aggregate supply and demand shocks, influence of business cycle fluctuations, monetary growth, and growth of crude materials prices (food, energy, etc.). The group of Yogic Flyers accounted for 54% of the reduction in the US Misery Index from its peak in 1980 ($p < 1\times10^{-8}$). A significant unidirectional effect of the Yogic Flying group on the Misery Index was also found ($p < 0.025$) indicating that Yogic Flying participation was a causal factor.

GDP growth rate in USA:

GDP growth rate in USA: The key measure of US economic health—annual Real GDP Growth Rate per capita enjoyed sustained growth during the period of high US Maharishi Effect coherence between 1983 and 1989. The highest rate of annual growth of the series (5.9%) is recorded in 1984 immediately following the assembly of 8,000 Yogic Flyers. All three factors cited by the 1990 OECD US Economic Survey (OECD 1989-2002) as underpinning the 1983 to 1989 growth of the US economy—reduced unemployment, increase in stock prices, and reduced inflation—have been reported by previous time series analysis to be significantly related to the number of Yogic Flyers.

Given this, it is a reasonable hypothesis that the growth of the US economy at that time was also related to the number of Yogic Flyers. However Gross Domestic Product is composed of a huge a variety of inputs. Due to the complexity of the mutual interactions and various lags between sectors of the economy, GDP is not a good candidate for analysis through the time series analysis process.

The detailed relationships in the quarterly figures at the various lags between the level of coherence and GDP will tend to get lost in the complexity and diversity of the input factors. Dillbeck and Rainforth (1996) confirm this view. Despite this, some support for this hypothesis is provided by the onset of sustained positive growth in US GDP in 1983 and by the large jump in GDP following the 8000 Assembly in 1984. The reduction in GDP growth rate in 1990 and the subsequent US involvement in international conflict as the size of the coherence group in Fairfield fell below the Maharishi Effect threshold after 1989 also supports this interpretation. This hypothesis would gain strength if there were other nations demonstrating similar effects.

DATA

The preceding case studies and previous research findings posed the authors an intriguing challenge—how to rigorously assess and quantify the impact of the Maharishi Effect on broad based measures of **national** economic performance? The opportunity to assess 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.

Maharishi Effect Data:

Cumulative numbers of individuals instructed in the Transcendental Meditation technique in New Zealand were obtained by the authors from Maharishi Global Administration Through Natural Law (New Zealand). By the end of 1993, there were 35,593 persons instructed in the Maharishi Transcendental Meditation technique, 449 Yogic Flyers and 96 instructors of the Transcendental Meditation program. The population of New Zealand at the end of 1993 was 3,525,000 (New Zealand Government Census bulletins).

Among the 46 countries covered by IMD data, the only other country to have reached the target of one per cent instructed in the Maharishi Transcendental Meditation program during the period covered by the IMD rankings (1992 to 1998) was 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 2925 new individuals participated in the Transcendental Meditation program before the end of 1993. By this time there were over 400 Yogic Flyers some of whom practiced in groups generating sufficient additional coherence to pass the Maharishi Effect threshold. The population of Norway (OECD sources) was 4,287,000 in 1992.

New Zealand is a small, yet developed country. It is geographically distant from the world, yet its very smallness means that it must depend on exports and imports to maintain a well-mixed economic environment. Traditionally the New Zealand economy has depended on exports of primary products, particularly meat, wool, forestry, and dairy products, to pay for needed imports. However, 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 obvious imbalances in the persistently sluggish economy had failed to produce a sustainable model of economic success. But by 1994, it was apparent that a renewed 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 1980's. 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 began to increase ushering in an extended period of growth.

Measures of economic well-being of nations:

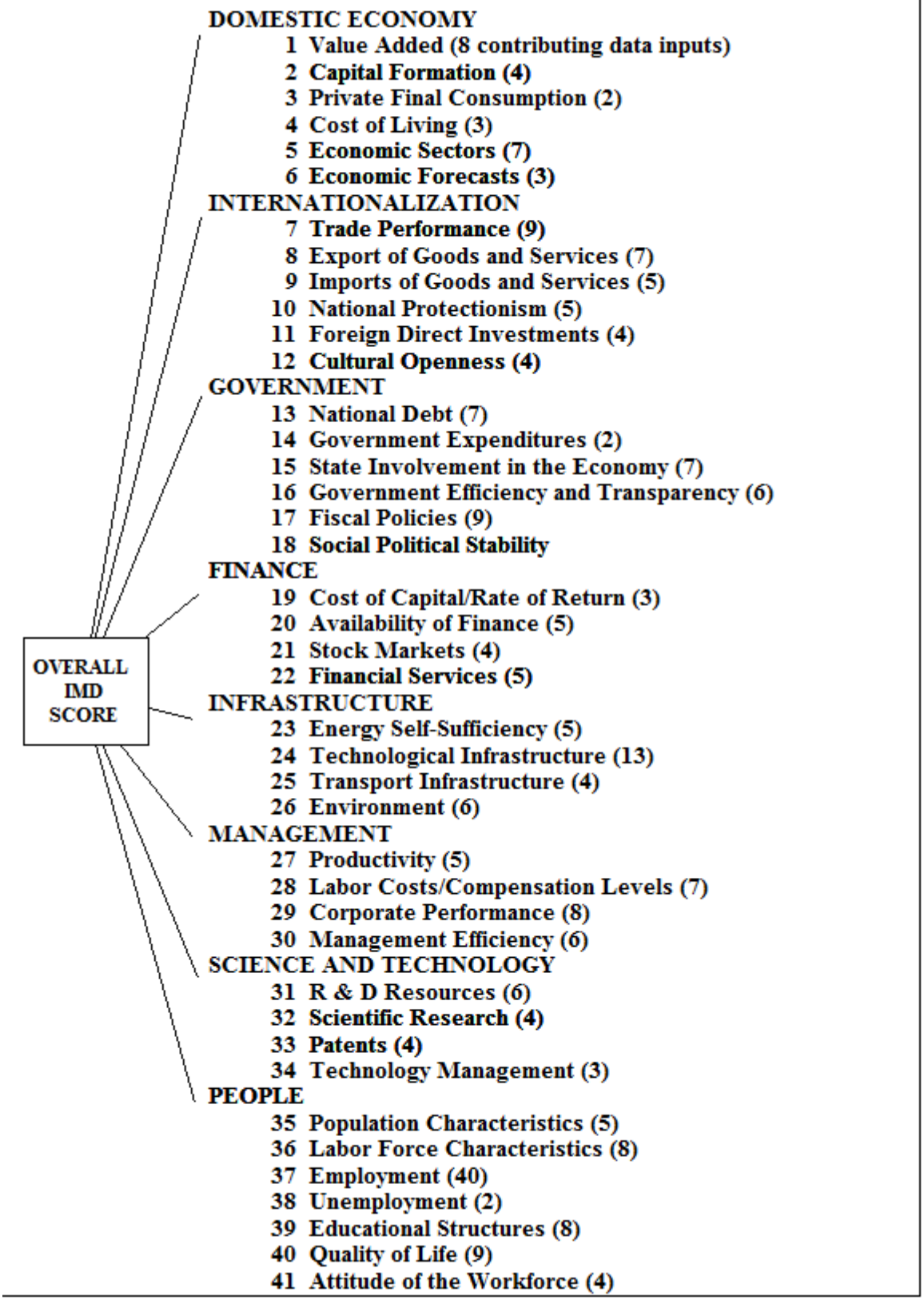
Michael Porter's analysis of "The Competitive Advantage of Nations" (1990) has been adapted and augmented in econometric approaches to measuring the economic well-being of nations. The IMD Index contained in the IMD World Competitiveness Yearbook (IMD 1987-98) is used in this study. It is a measure and 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 World Competitiveness Yearbook as a multidimensional approach "*to capture in a single index the capacity of a country's economic structure to promote growth"*. The IMD Index is used to test the hypothesis that 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.

Sources: The IMD Yearbook has been published annually since 1987 by IMD, the International Institute for Management Development in Switzerland. It contains a data base 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 subscales, which are in turn grouped into 8 categories[3] and finally combined into one overall competitiveness performance index (See Fig. 2) yielding an annual ranking of the 46 countries.

Email communication with IMD indicated that the Index has been compiled from 1992 to 1998 using a consistent methodology. This new methodology was first used in 1996. At that time, the new method was retrospectively applied to update the IMD Index for years 1992 – 1995.

Figure 2

Figure 2: IMD Index Structure—Grouped by 8 Categories and 41 Sub Scales



OVERALL IMD SCORE

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. For example in late 1995, a 72 question survey was sent out to 21,000 businessmen of whom 3,162 responded. This data was used in the 1996 IMD Yearbook analysis. A similar procedure has been used in every other year.

The IMD Yearbooks report raw values for the data inputs, but all compiled subscales 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,

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 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 sixty-three, to seventy-two in 1998.

Table 1: IMD Index of National Economic Well Being

Overall Scores 1992 – 1998* (compiled *z* scores)

	1998	1997	1996	1995	1994	1993	1992
ARGENTINA	-51.21	-27.26	-50.35	-34.55	-42.3	-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	37.1	41.31	37.48

BRAZIL	-65.33	-52.9	-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	48.2	31.16	14.04	27.3	24.93
CHINA	1.71	-21.02	-15.28	-36.27	-47.41	-54.15	-57.6
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	-68.6	-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	45.6	34.86	32.17
GERMANY	45.5	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	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	-75.2	-75.78	-54.46	-56	-59.7	-57.97
IRELAND	62.87	48.4	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	-32.9	-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	-33.4	-21.22	-6.07	-41.18	-30.35	-32.51
LUXEMBOURG	68.29	59.57	62.8	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	-88.5	-38.17	-46.1	-46.99
NETHERLANDS	83.62	73.49	63.15	63.2	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	15.9
PHILIPPINES	-54.33	-40.84	-41.8	-59.77	-59.56	-53.13	-44.58
POLAND	-105.54	-108.77	-86.97	-107.37	-114.9	-110.9	-112.32
PORTUGAL	-36.83	-52.62	-60.2	-42.62	-38.51	-42.77	-39.2
RUSSIA	-133.41	-160.64	-179.28	-182.09	-179.59	-156.91	-140.44
SINGAPORE	141.39	135.35	119.06	120.94	106.4	116.97	113.14
SOUTH AFRICA	-100.84	-110.36	-100.18	-91.67	-84.84	-84.2	-80.67
SPAIN	-10.34	-3.74	-35.12	-26.59	-27.47	-36.42	-37.3
SWEDEN	36.65	35.01	45.21	44.14	56.47	47.57	45.76
SWITZERLAND	69.7	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
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	-52.2	-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	145.7	139.11
VENEZUELA	-100.87	-115.06	-117.2	-105.34	-96.93	-64.97	-62.62

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

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 at the time 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.

New Zealand and Norway both surpassed the Maharishi Effect Threshold (1% of the population for the Maharishi Transcendental Meditation technique combined with √1% for groups of Yogic Flyers) 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 (Hatchard *et al*. 1996).

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 (1995). 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[4]. Each of the resulting set of regression equations for the 46 countries had following simple form:

$$IMDit = \beta oi + \beta 1\ MEit + \varepsilon it\ ,\ i = 1, 2, \ldots, G;\ t = 1, 2, \ldots, T \quad (1)$$

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 *βo*i 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 *β1* is a regression coefficient that estimates the impact of the Maharishi Effect on the mean of the index for Norway and New Zealand. Finally, *εit* is a random error or regression disturbance term with mean zero.[5]

The parameters of the panel regression model were estimated using a method suggested by Beck and Katz (1995, 1996). 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 (Beck and Katz, 1995). In the presence of any of the above three properties of the regression errors, ordinary least squares (OLS) regression will not be optimal (Beck and Katz, 1995, 1996).[6] In this case the OLS estimates of the regression parameters will be inefficient, although they are unbiased and consistent (Beck and Katz, 1995; Greene, 2000, 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) (Greene, 2000, ch. 11-12; Beck and Katz, 1995, 1996). The method of Beck and Katz generates correct standard errors for the purpose of hypothesis testing, so-called "panel corrected standard errors" (PCSE).

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 (Kmenta, 1986, p. 619). The equation was then re-estimated by OLS using the transformed data.

As recommended by Beck and Katz (1995) 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 (Greene, 2000, 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 (Greene, 2000, 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).[7]

Beck and Katz (1996) prove that the resulting PCSEs are consistent. Simulation experiments (Beck and Katz, 1995, 1996) 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" (Beck and Katz, 1996, 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?'

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 1992-93 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 $\beta 1$ 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 = 3.3 x 10^{-5}, 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. In order to conserve space, the estimated country-specific intercepts are not shown in Tables 2 and 3 (Complete regression results are available upon request from the first author). The reported Rsquared 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 (Godfrey, 1988; Greene, 2000, p. 541). Second, the LM test for differing variances for the regression errors across countries was highly significant (Greene, 2000, 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 in Beck and Katz (1995, 1996) no formal test was employed because the cross-country correlations are imprecisely estimated.[8]

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 (Beck and Katz, 1995; Greene, 2000, ch. 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 x 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: χ2(1) = 70.574 (*p* = 0.000)	LM test for panel heteroscedasticity: χ2(45) = 146.7808 (*p* = 0.000)
Test of pooled regression vs. fixed effects: *F*(45, 275) = 144.913 (*p* = 0.000)	Jarque-Bera test for normality: χ2(2) = 12.845 (*p* = 0.002)

† The dependent variable was the net improvement in year-to-year net subscale ranks (transformed to z-scores) for the IMD Index. The data consisted of 4 annual observations (*T* = 4) on each of 36 countries (*G* = 36) with complete data, yielding a total sample of 144 observations.

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: χ2(1) = 0.244 (*p* = 0.622)

Jarque-Bera test for normality: χ2(2) = 7.986 (*p* = 0.018)

Test of pooled regression vs. fixed effects: *F*(46, 275) = 61.245 (*p* = 0.000)

LM test for panel heteroscedasticity: χ2(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 (*r*1 = 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 (1995), 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 (Beck and Katz, 1995; Greene, 2000, 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 Rsquared 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 (Godfrey, 1988; Kennedy, 1998, p. 98, 80) was not significant, indicating no evidence of omitted explanatory variables or incorrect functional form of the regression equation.[9]

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 (Beck and Katz, 1996).

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 2.9×10^{-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 (Baltagi, 1995, p. 12; Greene, 2000, 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 (1987) 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 (Fomby et al., 1984, p. 62-63). This result also extends to the case in which the errors are heteroskedastic and serially correlated (Greene, 2000, pp. 458-460). The usual hypothesis testing procedures, such as *t*-tests and *F*-tests, also remain asymptotically valid for large samples (Fomby et al., 1984, p. 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.

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 2-4 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.

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.

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.

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 subscales. Norway data timing only lagged 0.13 years behind the target date and had very little impact on overall scores.

For six subscales, the change in the New Zealand subscale 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 the Four of these subscales 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 subscale, 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 subscale rank remained unchanged on the IMD Index. It should have been recorded as a positive improvement.

For the Government Expenditure subscale, 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 subscale 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 subscale, 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 subscale 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 subscale showed an improvement in rank, the size of the improvement (only one place) is too small.

For the R & D Resources subscale, 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 subscale 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 subscale 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 subscale declined between 1993/94, but increased strongly between 1994/95, which more accurately reflects the Capital Formation in 1993/94.

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 (1989-2002) 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%.

Correction of IMD scores for data irregularities: The detailed consideration of subscales 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 subscales recorded as ranked data only in the 1996 yearbook. Each subscale 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 subscale compared to data from other nations in the same category, the 1994/95 subscale 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[10]).

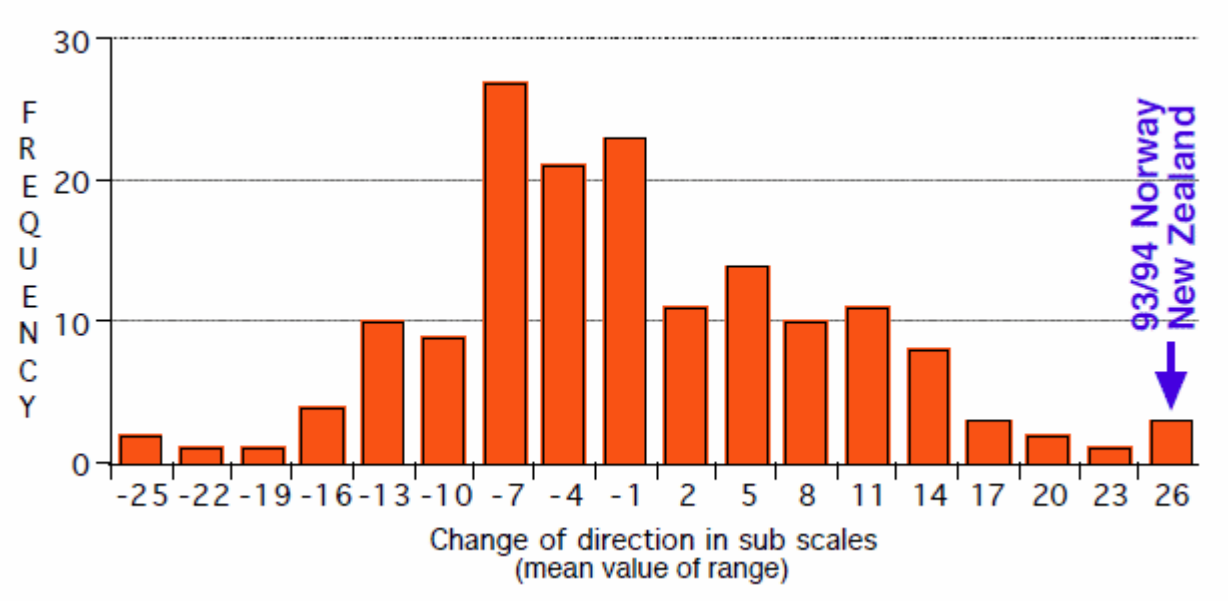
SUBSIDIARY ANALYSIS

Breadth of Improvement on Index Subscales: The IMD reports ranks for each country for 1992-1996 on the 41 subscales that contribute to the overall IMD Index. Subsidiary analysis of these ranks was undertaken to test whether the improvement of factors contributing to the rise in IMD scores was broad-based.

For each country and each year, the number of subscales 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 subscales is obtained for each country for each pair of years. For 1993/4, New Zealand improved its rank on 26 subscales, remained unchanged on 11 and fell back on 4 subscales. Norway improved its rank on 28 subscales, 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 subscale data for all years of the sample, the net number of subscale ranks showing improvement from the previous year was calculated for each country for 1993-1996. The net improvement in subscale 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 subscales using the information reported previously. Now New Zealand shows a net gain in rank of +27 out of 39 available subscales and Norway +25 out of 40 available subscales.

Figure 4 plots all the rank sums for all countries for all years 1992 to 1996 with the New Zealand and Norway figures corrected for timing values.

Figure 3: Annual Change in 41 Subscale Ranks—positive minus negative change (1992/96)



Analysis of breadth of improvement on IMD Index subscales: Panel regression analysis was used to test the hypothesis that the onset of the Maharishi Effect in 1993 (as reflected in the 1994 IMD index data) resulted in a significant average net improvement in subscale 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. To estimate the impact of the Maharishi Effect, a binary dummy variable was included as an explanatory variable that took the value 1 for the observation corresponding to the change in ranks from 1993-1994 for New Zealand and Norway and was otherwise equal to 0. The dependent variable in this regression is a year-to-year change score.

In the initial step of the analysis, a fixed-effect model for the rank-improvement data was estimated using ordinary least squares regression (not shown). The *F*-test for the pooled regression model versus the FEM indicated that the country-specific intercepts, taken together, were not statistically significant from zero (Table 4). Since the pooled regression model could not be rejected as a restriction on the FEM, the country-specific intercepts were dropped from the regression equation and replaced by a common intercept. The resulting pooled OLS regression estimates are summarized in the top panel of Table 4.

Table 4

Panel Regression Analysis: Breadth of Improvement in Subscale Ranks, 1993-1996

OLS Pooled Regression Estimates with Standard Errors Robust to Panel Heteroskedasticity and Cross-Country Residual Correlation

Dependent Variable: Year-to-Year Net Improvement in Index Subscale Ranks†

OLS Estimates:

Variable	**Coefficient**	**Standard Error**	**T-Ratio**	**P Value**
Maharishi Effect	27.592	6.437	4.287	3.3 x 10-5
Constant	-1.592	0.759	-2.098	0.0377

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

Variable	**Coefficient**	**Panel Corrected Standard Error**	**T-Ratio**	**P Value**
Maharishi Effect	27.592	5.106	5.404	6.5×10^{-8}
Constant	-1.592	0.515	-3.092	0.0020

Number of observations 144 — Degrees of freedom 142
F-statistic *F*(1, 142) 18.376 (*p* = 0.0003) — R-squared 0.115
S.E. of regression 9.039 — R-bar-squared 0.108
Sum of squared residuals 11602.31 — S.D. of dependent variable 9.573
Lag-one serial correlation -0.132 — Mean of dependent variable -1.208
Durbin-Watson statistic 2.264 — Akaike information criterion 1044.69

Diagnostic Tests:

LM test for serial correlation: χ2(1) = 2.603 (*p* = 0.107)
Test of pooled regression vs. fixed effects: *F*(35, 107) = 0.672 (*p* = 0.910)

LM test for panel heteroscedasticity: χ 2(35) = 41.987 (*p* = 0.194)
Jarque-Bera test for normality: χ2(2) = 0.569 (*p* = 0.752)

† 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.

The significant positive estimate for the Maharishi Effect parameter reported in Table 4 lends support to the hypothesis of an improvement in the IMD index that was significantly more broad-based than that experienced by the other 34 countries in the

sample. This parameter estimate indicates that, on average, the net number of increased index subscale 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 (-1.592, as measured by the common intercept).

The overall *F*-statistic indicated that the regression was significant. The R-squared value of 0.115 indicates that the regression explained 11.5 percent of the variability of the dependent variable. The R-squared values for this regression cannot be meaningfully compared to those for the regressions reported in Tables 2-3 because the dependent variables are different. As is common with data expressed as change scores or first-differences, the proportion of variance explained is relatively small, indicating the presence of a great deal of "noise" in the rank-improvement data. It is well known that transforming a variable to first differences (change scores) amplifies the proportion of its variance that is due to random noise, leading to reduced R-square values.

Despite the small proportion of variance accounted for by the model, the magnitude of the estimated Maharishi Effect parameter was both statistically significant (p = 3.3 x 10-5) 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 (Table 4). By the standards of social science, this is a very large effect.

Except for the presence of substantial contemporaneous correlation of residuals across countries, diagnostic tests indicated that the other statistical assumptions of the regression analysis were satisfied.[11] The test for first-order serial correlation of the residuals indicated that the observed serial correlation coefficient (-0.132) was not statistically different from zero. Re-estimation of the model using transformed data based on the Prais-Winsten transformation indicated that the results reported in Table 4 were not substantially affected by the presence of this (non-significant) serial correlation of residuals. After adjustment for first-order serial correlation, the estimated Maharishi Effect parameter was slightly larger, 28.694, and significant ($t(142)$ = 4.515, $p = 1.3 \times 10^{-5}$).12 In other diagnostic tests, the LM test for heteroskedasticity of the regression errors across countries was not significant, and the null hypothesis of normally distributed errors could not be rejected (Table 4).

To correct for the presence of cross-country correlation of the errors, panel-corrected standard errors (PCSEs) were calculated. The lower panel of Table 4 shows that the resulting PCSEs are smaller than the OLS standard errors, yielding a corrected t-statistic for the Maharishi Effect parameter of t = 5.504 ($p = 6.5 \times 10^{-8}$). Thus, these results lend support to the hypothesis that New Zealand and Norway, on average, displayed an improvement in the IMD index from 1993-1994 that was substantially and significantly more broad-based than that experienced by the remaining 34 countries in the sample.

DISCUSSION

The statistical analysis has already measured the significance of the rises in Norway and New Zealand relative to all individual changes 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 volatility[13], 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 the coherence creating group in Iowa has already been discussed. 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[14], as confirmed by OECD Surveys.

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 (1969) 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 (Zellner 1988). Hendry and Richard (1982) agree and place emphasis 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.

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 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.

Economic forecasts: OECD forecasts did not predict correctly 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 (see Cost Benefit Analysis). 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…"* (Crocombe *et al.* 1991, 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. Nor did the World Bank anticipate the rapid recovery in Mozambique, which we have discussed. These results

are suggestive of the capacity of Maharishi Effect theory to predict economic improvements that were not anticipated by traditional economic theory.

Other economies: Case studies of the Maharishi Effect are reported for Cambodia, Mozambique, and USA, which record very 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 three economies are radically different from one another. Cambodia and Mozambique are formerly the poorest nations in the world, and USA is arguably the richest. The authors have published elsewhere (Hatchard *et al* 1996, 2000) another case study of improved economy and quality of life in Merseyside, which is an industrial metropolitan area.

Replication: Repeated demonstrations of effectiveness strengthen causality arguments greatly. Since effects have been found in a range of five national economic systems and in 47 previous research studies (M.U.M. 2004), these replications 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 Orme-Johnson *et al*. 1988). The prospective study of the Maharishi Effect in Washington D.C. (Hagelin 1999) also bolsters the argument for causality since the timing and size of the effect on violent crime were predicted in advance.

Model sufficiency and fit: The rapid onset of broad-based improvement in the IMD Index of social and economic indicators and its subscales provides a very good fit with the phase transition or step function model of Maharishi Effect theory used in prior research (see Hatchard 2000 for a full discussion of theory). Parameter constancy is also indicated since both New Zealand and Norway had comparable effect sizes. Moreover the Cost Benefit Analysis and previous research indicates USA, Norway, and New Zealand had similar improvements in GDP, inflation, and unemployment, as did Cambodia and Mozambique. All five nations enjoyed freedom from conflict and played a peace role in world affairs when the Maharishi Effect threshold was exceeded.

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 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 1980's 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 shows that as late as December 1992, the OECD itself did not expect the sweeping economic reforms undertaken mainly in the mid 1980's 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 (Crocombe *et al* 1991, 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 (Crocombe *et al* 1991). Moreover, other significant New Zealand economic commentators (Burnell *et al* 1992) 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 1980's 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 parallel results in five nations, each with radically different government policies.

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 Maharishi Effect is the clear candidate for this position. Moreover, Cavanaugh (1987-89) 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.

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[15].

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.

Have the economic changes in Norway and New Zealand been 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 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.**

Even so every economy remains subject to the influence of global economic shocks and competitive trends. Both New Zealand and Norway are small countries easily affected by the changing global economy. Both rely on exports of primary products. Maharishi Effect theory suggests that New Zealand and Norway should be more 'adaptable' in the face of global economic shocks, but also that they will be vulnerable as long as the other national economies to which they are linked through trade are not using the Maharishi Effect themselves. Whilst the IMD Index has enlarged in its data content sufficiently since 1998 to invalidate statistical comparison with earlier years, OECD reports are indicative of recent trends.

Recent trends in New Zealand: New Zealand's economy can be upset by changes in demand and prices for agricultural goods. It is also vulnerable to shifts in global

climate. The 1999 OECD Survey discusses some of the obstacles that New Zealand has to overcome including the high and continuing trade barriers that New Zealand exporters face in markets for products in which it has a competitive advantage, and the country's relative geographic isolation and small size. Given these factors, the OECD concluded that the New Zealand economy had performed well. However, due to the Asian currency crisis, the economy slowed down in the first half of 1998, but the effect proved to be temporary. The 1999 OECD Survey reported that by the second half of 1998 a recovery was underway and was projected to gather strength in the near term with real GDP growth rising to around 3.5% in the year 2000. The June 2002 OECD survey summarized that the New Zealand economy had been remarkably resilient in the face of the mild world recession. With reference to defense, recently New Zealand has disbanded its strike air force, stayed out of the Iraq war, and played an successful peacekeeping role in the Pacific.

Recent trends in Norway: The 1999 Norway OECD Survey commented on the sustained strong growth in Norway. It discussed soaring oil and gas exports together with increasing sales of nonoil 'traditional' commodities, which contributed to a sharp widening of the current account surplus.

Fixed capital formation was boosted by high profits and rising capacity utilization, while substantial gains in real earnings buoyed private consumption. Strong job creation raised the employment rate to almost 80% of the working-age population (a record high), facilitated by a flexible response from the labor force. At the same, time, inflationary pressure remained subdued. The OECD also reported that by 1998 the potential for expanding the labor supply was almost exhausted with record vacancies as the unemployment rate dropping below 3%. In 1998, the Norwegian economy was affected by oil price fluctuations and by the government's own decision to limit oil production.

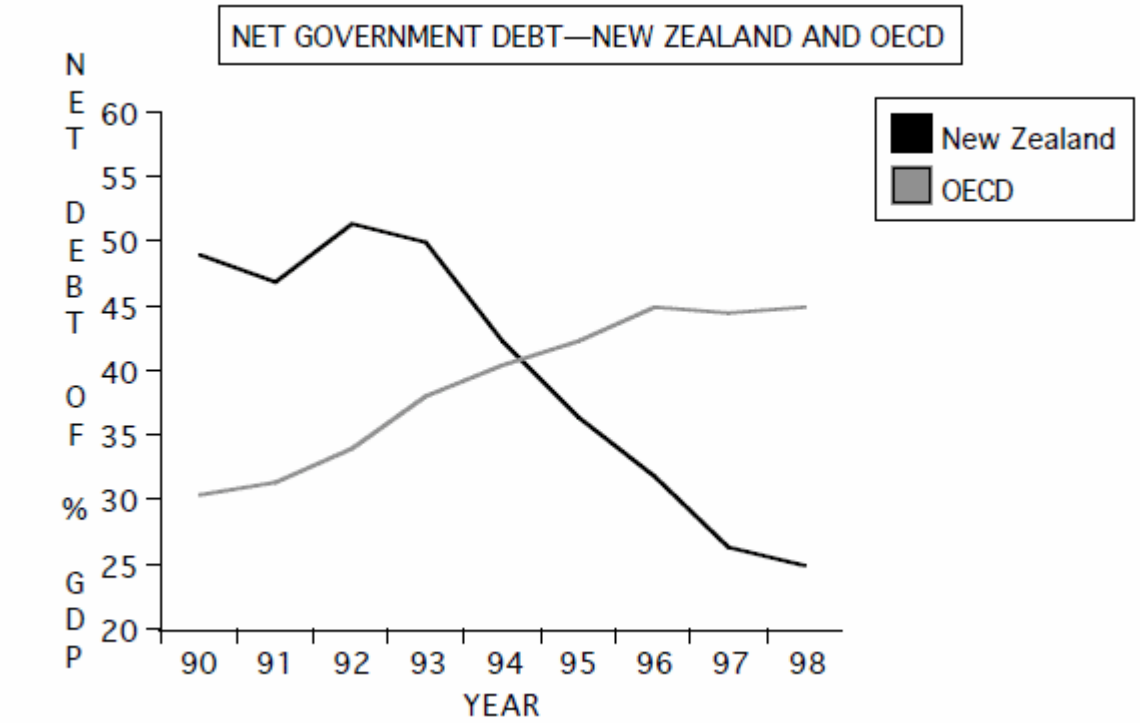
Later, in June 1999, the OECD Outlook attributed the mild 1998 economic slowdown directly to falls in oil prices; but there was a soft landing for the Norwegian economy with mainland growth of 1% to 1.5% in 1999. Subsequently, high employment and large government surpluses have continued to be buoyed by oil incomes. Since 2000, Norway has halved the size of its military.

COST BENEFIT ANALYSIS

Other studies have assessed the economic impact of the Maharishi Effect through reduced crime (Hatchard 1996) and reduced healthcare costs (Herron 1996). These findings indicated substantial savings. Hatchard (2000 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. 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 (2000) examined the principle sources of government revenue. New Zealand government treasury and OECD

sources show that after the Maharishi Effect threshold was passed in 1993, the New Zealand government retired 23.5% of GDP in net total debt over a four-year period (figure 4). During this time real GDP increased from US$42.6 billion to US$47.5 billion.

Figure 4



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. The government had been facing a persistently high debt to GDP ratio that defied fiscally conservative reform prior to the Maharishi Effect threshold being passed in 1993, New Zealand's subsequent performance approximates the step function typical of the Maharishi Effect (Figure 4). 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 Maharishi Effect threshold in 1993 and supports our view reported 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 (1987-89), 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 the Maharishi Effect, we arrive at $713 increase in GDP over four years for each $1 spent implementing the Maharishi Effect 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.

The Maharishi Effect as an economic multiplier: Our cost-benefit summary suggests that the Maharishi Effect can 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 'stable peace', 'good health', 'improved education', or 'creativity and innovation'.

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 an integrated 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 and Mozambique debt repayment was a priority for their governments. This was achieved on a massive and unprecedented scale after the Maharishi Effect threshold was passed. Currently the New Zealand government is cushioned by a massive current account and asset surplus, rare in the modern world. In Norway, the government has spent heavily on social welfare, health, and education. In the USA, lower tax rates were a political priority. In Cambodia, economic, educational, and infrastructure projects have regenerated the economy of the nation.

In summary, we have found evidence that the Maharishi Effect is applicable to a variety of economies, small and large, poor and rich, agricultural and industrial. Once the participation threshold is passed, the effect leads to broad-based improvements affecting diverse sectors of the economy and measures of quality of life. Our analysis is also consonant with previous research on the Maharishi Effect, which shows reduced crime, violence, and conflict and enhanced progress towards peace. As such, it represents a unique form of ethical investment that appears to not only create the peaceful and orderly 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 (Romer 1996). Dr. Huw Dixon, Professor of Economics at the University of York and Associate Editor of the *Economic Journal* has suggested that government policy should be guided by the results of research on the Maharishi Effect (1996):

> *"I have been following the research on the Maharishi Effect as it has developed over the last twenty years. There is now a strong and coherent body of evidence showing that the Transcendental Meditation and TM-Sidhi program provides a simple and cost-effective solution to many of the social problems we face today. This research and its conclusions are so strong, that it demands action from those responsible for government policy."*

International strategy to create the Maharishi Effect on a global level: Explaining that peace and prosperity will only be secured if governments everywhere develop the human resources of their people, on 12th January 2004, Maharishi invited governments and well-wishers of peace in the world to help establish 3000 Maharishi Vedic Universities—one in every major city of the world.

The universities will each house coherence creating groups of 1-200 Yogic Flyers and offer Consciousness-Based Educational programs for the population at large. Maharishi's proposal includes the creation of a number of groups of 8000 Yogic Flyers—one in USA and several in India. Maharishi refers to this program as a 'Peace Government', which he predicts will quietly improve the global economy and generate more peaceful world events (MOU 2004).

We conclude that the maintenance of tolerance and peace, the happy, harmonious coexistence of peoples and beliefs, and the economic vitality of nations all rely on the

well being of the individual and social mind. In essence, our findings suggest that the secret of nationhood and good government lies in the development of the alertness, creativity, and consciousness of individual citizens. This understanding is rooted in the Vedic tradition, which Maharishi represents. His unique contribution lies in the rediscovery that only a few individuals practicing Vedic technologies to develop full consciousness is a powerful means to maintain the peace and well-being of nations.

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Dr. Hatchard's research interests combine diverse academic and practical themes including research on crime prevention, health care delivery, education, economic development, conflict resolution, and food safety. The central thesis of his published research work is that Transcendental Meditation is a method to reduce stress and enhance educational and health outcomes which has a highly significant impact on programs to resolve crime and conflict and ensure economic stability. He has helped to pioneer research programs using field-based models from the physical sciences to analyze social and economic indicator data series.

Research on Social Indicators

Since 1976, Dr. Hatchard has conducted research and supervised projects to implement prevention-orientated health care systems and crime prevention programs utilising the Transcendental Meditation program in UK, USA, and New Zealand. This has particularly included the use of time series intervention analysis and panel regression analysis to model crime rates and show how they can be reduced and economic development stimulated by using the Transcendental Meditation program to reduce the overall levels of stress and enhance the creative potential of society.

In 2000, Dr. Hatchard completed his Ph.D. thesis investigating the relation between the development of creative potential and the economic, innovative, competitive, and social performance of New Zealand, Norway, USA, Mozambique, Metropolitan Merseyside, UK, and Wellington, NZ in relation to other 46 industrialised economies. He used data on participation rates in the popular means of developing creative potential—Transcendental Meditation—to analyze the relationship between innovation and broad-

based measures of economic and social health using time series and regression analysis of panel data involving the analysis of 224 social statistics for each of 46 countries. Drawing on the theoretical framework of Michael Porter and others, he has demonstrated a strong relationship between the development of the human resources of creativity, innovation, and entrepreneurial skill and the development of national economic potential. His research shows how stress-reducing methods can be a crucial element in programmes to improve educational and health outcomes and thereby impact successfully on the transition from conflict to peace.

Educational Research

He has undertaken research in secondary level curriculum design for mastery learning, equal opportunity learning and evaluation regimes, and personal development of academic and creative potential. Dr. Hatchard has developed an overall learning strategy incorporating six approaches which enhanced achievement and enjoyment of learning:

1. mastery testing strategies that take account of individual learning characteristics,
2. peer tutoring and feedback systems,
3. holistic instructional charts and drama units,
4. self-development strategies including Transcendental Meditation as a method to enhance learning ability, increase conceptual thinking, improve creativity, and lower anxiety levels, and
5. the development of project-based syllabi along with application projects designed in conjunction with local industry to improve the quality of life,
6. use and development of distance learning materials in video format that can be delivered via satellite or internet.

Food Safety, Health, Regulatory, and Trade Systems

In the light of recent concerns about global food safety and biointegrity, Dr. Hatchard has worked on an internet-based, point-to-point system of safe food trading backed up by genetic and conventional testing schemes. He is also currently working on a four dimensional taxonomy of medical intervention effectiveness.

Career Achievements and Highlights:

Guy Hatchard has not only undertaken ground-breaking research on the Maharishi Effect, (the phenomenon whereby a few individuals practising the Transcendental Meditation program and Yogic Flying in a group can reduce negative trends such as crime and violence and enhance positive trends including economic development, national well-being and world peace), but he has also applied his research findings to develop practical programmes for the good of society.

From 1990 to 1996 he was Director of MESA, a non-profit community development trust within Skelmersdale new town UK with a total capitalisation over £20 (NZ$50)

million which comprises over 300 members, a natural health care clinic, an award-winning school, a community centre, a recreation centre, 60 houses, and a business incubation centre. Under Dr. Hatchard's direction, MESA organised a crime prevention program in Merseyside, which has helped to reduce crime by 60% relative to other metropolitan areas. This finding was published in 1996 in Vol 2:3 of Psychology, Crime, and Law. In 1993, Dr. Hatchard was honoured as a key note speaker at the Annual Conference of the British Psychological Society on Criminal and Legal Psychology. In 1999, the MESA project won the prestigious BUPA (British Urban Renewal Association) award for best practice.

From 1996 – 2000 he was the founding Director of the Natural Food Commission. In this role, Dr. Hatchard travelled widely and lectured throughout the Pacific region and Europe. In 2000, he testified before the Royal Commission on Genetic Modification. In 1998, he was invited to address MPs from all parties at the Parliament House. In 1997, he was keynote speaker at the Annual Conference of PANAPS in Malaysia. In 1997, he gave a series of lectures in Australia and met with State Ministers of Health. In 1997, Dr. Hatchard was nominated to the NZ Minister of Consumer Affairs by Greenpeace, the Wellington Safe Food Campaign, and the Pacific Institute of Resource Management as a NZ consumer representative on the Australia New Zealand Food Authority.

In 1990, he was director of a 20-person Maharishi Foundation medical relief team in Armenia after the catastrophic 1989 earthquake in which programme over 35,000 Armenians participated.

Currently Dr. Hatchard is planning an Institute for Health, Education and Well Being in Wanaka, New Zealand.

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Biography:

Kenneth Cavanaugh, Ph.D.

Dr. Ken Cavanaugh received his undergraduate degree with honors from Yale University (1964), Master's degrees from Princeton University (1969) and Stanford University (1973), Ph.D. from the University of Washington (1983), and Doctorate in World Peace (DWP) from Maharishi European Research University (2005).

Dr. Cavanaugh's research has primarily focused on empirical investigation of potential impacts of field effects of consciousness on the quality of life in society. He has authored or co-authored more than 30 published papers on social-indicators research and as well as other topics in applied statistics.

His research has been published in many leading journals, including *Social Indicators Research, Journal of Social Behavior and Personality, Proceedings of the American Statistical Association, The Journal of Mind and Behavior, Journal of Offender Rehabilitation, Journal of International Money and Finance, Cancer Research, Modern Science and Vedic Science*, and *Psychology Crime and Law*. Many of these publications on social-indicators research have been reprinted in several volumes of *Scientific Research on Maharishi's Transcendental Meditation and TM-Sidhi Programme: Collected Papers.*

Career Achievements and Highlights:

A consistent theme running through Dr. Cavanaugh's career is his interest in education as well as in efforts to promote world peace and an improved quality of life in society. While on leave from graduate studies at Princeton University, Dr. Cavanaugh worked from 1966 to 1968 in the field of peace education with the World Without War Council of Greater Seattle, a non-profit educational organization that promotes peaceful solutions to violent conflict.

After receiving his Master's degree in Public and International Affairs from the Woodrow Wilson School of Public and International Affairs at Princeton in 1969, Dr. Cavanaugh served as Regional Director of Admissions at Princeton University. He was responsible for international admissions as well as for admissions activities in 27 states in the U.S.

From 1973 to 1975, Dr. Cavanaugh served as Special Assistant to the President, University Secretary, and Dean of International Affairs at Maharishi International University (now Maharishi University of Management). After completing his Master's degree at Stanford University in 1973 he was inspired to join the faculty at MIU because of its innovative consciousness-based approach to higher education. Through this approach, MUM seeks to develop the full creative potential of the student by promoting integrated brain functioning and simultaneously providing high-quality training in traditional academic disciplines. The University's commitment to promoting world peace and an improved quality of life in society through scientifically validated, consciousness-based technologies was also a major attraction.

While on leave from MUM, Dr. Cavanaugh completed his doctoral training at the University of Washington in Seattle. After receiving his Ph.D. in 1983 he rejoined the faculty of MUM in the School of Business and Public Administration, helping to found its new Master of Business Administration and Ph.D. programs. From 1991 to 1993 he served as Director of the School's undergraduate program in Government and Public Policy and taught courses in peace studies and international relations in that program.

In 1990, Dr. Cavanaugh was director of an 8-person team of scientists and other faculty from Maharishi University of Management that lectured and taught for seven months in Russia and Ukraine at leading scientific institutes, medical research institutes, medical clinics, universities, government ministries, and as well as other public venues. The team presented scientific research on consciousness-based solutions to challenges facing those countries in the areas of individual and public health, societal conflict and crime, economic prosperity, and world peace.

In 1993, Dr. Cavanaugh taught at Maharishi Institute of Management in Kenya. From 1995 to 1997, Dr. Cavanaugh served as the founding President of MUM's proposed branch campus in Chicago, Maharishi University of Management in Chicago.

In addition to conducting research on the field effects of consciousness and the quality of life, Dr. Cavanaugh currently guides doctoral students in their dissertation research and teaches graduate courses in statistical analysis and research methods in the Department of Business Administration at MUM. In addition to his faculty duties at MUM, Dr. Cavanaugh currently serves as President of Invincibility Foundation, Fairfield, Iowa (2008 to present). The foundation supports innovative, scientifically validated, consciousness-based approaches to promoting world peace and an improved quality of life in society.

FOOTNOTES

1. © 1999 Maharishi University of Management. ® Transcendental Meditation, TM-Sidhi, TM, Consciousness-Based, Maharishi, Maharishi Vedic Approach to Health, Maharishi University of Management, and Maharishi Vedic Science are registered or common law trademarks licensed to Maharishi Education Development Corporation and used under sublicense or with permission.

2. Cambodia and Mozambique both had long standing civil conflicts before adopting Maharishi's programs. Namibia was engaged in a war of independence against the white South African regime. The implementation of Consciousness-Based Education programs in the black townships and cities of South Africa and its influence on national development is not covered in this paper. **Dr. Leffler's Added Note: More information about Invincible Defense Technology see article by Idriss Zackaria, an international reporter, editor, and specialist in international media and strategic communications:** https://www.excellenceafrica.org/vigilance-invincible-defense-technology/

3. 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, **People**—availability and qualifications of human resources

4. Beck and Katz (1995) suggest that the fixed-effects model (FEM) is more appropriate for cross-country studies than a random-effects model (REM) or error-components model. The FEM model is appropriate because the objective is to draw statistical inferences that are confined to the OECD countries in the sample, a sample that was not randomly selected (Hsiao, 1986, p. 43; Baltagi, 1995, p. 10). Using an REM model, the estimate of the Maharishi Effect parameter $\beta 1$ was very close, both in magnitude and statistical significance, to the corresponding FEM estimate in Table 2.

5. In matrix notation, the fixed-effect model of equation (1) may be written as follows:

$y = X\beta + \varepsilon$.

In this equation, y is an $N \times 1$ column vector of values of the dependent variable, *IMDit*, for each of the 46 countries. In the primary analysis of the current study $T = 7$, $G = 46$, and the total sample size is $N = TG = 322$. For all vectors and matrices in this equation, the values of the T longitudinal values for each different country are stacked on top of each other in sequential (time) order by country. The $N \times (G + 1)$ matrix $\boldsymbol{X}$ of explanatory variables contains G columns of dummy binary variables, one for each country, plus one column of observations on the independent variable, the Maharishi Effect dummy variable *MEit*. The matrix β is a $(G + 1) \times (G + 1)$ matrix of regression coefficients. The error matrix $\boldsymbol{\varepsilon}$ is a $N \times 1$ vector of random disturbances, with error covariance matrix $\boldsymbol{\Omega}$ having typical element $E(\varepsilon it\ \varepsilon jt)$ and dimension $N \times N$.

6. More formally, the OLS estimates of the regression slope coefficients in (1) will be optimal in the sense defined here if the errors eit are independent and identically distributed with mean zero and variance σ 2 with covariance matrix $\boldsymbol{\Omega} = \sigma 2\ \mathbf{I}$, where $\mathbf{I}$ is a $T \times T$ identity matrix. It is also required that the explanatory variables $\boldsymbol{X}$ be independent of the errors, εit, for all i and t. Balestra (1996) discusses further assumptions required to establish the consistency of OLS estimates of the intercept terms in the FEM. The consistency of the estimated intercepts in the fixed-effects model requires the assumption that the total sample size N increases by holding G fixed while T is increased to infinity. The regression slope coefficients are consistent no matter how N is increased.

7. The calculation of the panel-corrected standard errors may be described as follows (Beck and Katz, 1996). If the regression residuals are arranged in a $T \times G$ matrix $\boldsymbol{E}$, with the G columns of E made up of T residuals for each country, then a consistent estimate of the $G \times G$ matrix of error variances and contemporaneous covariances is given by

$\Sigma = (\boldsymbol{E}'\boldsymbol{E})/\ T$

with σi 2 along the matrix diagonal and σij off the diagonal. Since the errors are assumed to be serially independent, the estimated variance-covariance matrix of the errors is given by

$$\Omega = \Sigma \otimes IT$$

where $\otimes$ denotes the Kronecker product and $\boldsymbol{I}T$ is a T x T identity matrix. The PCSEs are estimated by the square root of the diagonal elements of the k x k matrix resulting from the following matrix operations

$$(\boldsymbol{X'X})-1\ \boldsymbol{X'}\ \boldsymbol{\Omega}\ \boldsymbol{X}\ (\boldsymbol{X'X})-1$$

where X is the N x k matrix of independent variables.

8. For the sample analyzed in the current study, the elements of the contemporaneous correlation matrix for the residuals are very imprecisely estimated. Each of the G x $(G + 1)/2$ contemporaneous correlations in the G x G correlation matrix for the errors ε are estimated using, on average, $2T/G$ observations (Beck and Katz, 1995). For the current study T (the number of time series observations for each country, 7) is less than G (the number of countries, 46). Thus, less than one observation is available to estimate each element of the error correlation matrix.

9. The RESET test was designed to test for omitted explanatory variables but it is also a powerful test for incorrect functional form, such as non-linearities (Kennedy, 1998, p. 98, 80). The variant of the test employed here was based on auxiliary OLS regression in which the predicted (fitted) values from the OLS regression raised to the power two, three, and four were added to the original regression equation to proxy for the effects of possible unknown omitted explanatory variables (Godfrey, 1988, ch. 4). The RESET test is an F-test for the joint statistical significance of these three additional variables.

10. 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.

11. Due to a near-singular matrix it was not possible to calculate the RESET test for the regression reported in Table 3.

12. The same feasible generalized least squares (FGLS) procedure used in the primary analysis was employed to correct for first-order serial correlation of the regression residuals. To conserve space, these adjusted regression results are not shown here but they are available upon request from the authors.

13. 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.

14. 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 (Dornbusch *et al* 1988). This was not the case during the recovery in Finland, which underlines the unusual nature of the economic changes taking place there.

15. Many major domestic companies such as the New Zealand Telecom company have become wholly or partly owned by overseas interests. the result is that many decisions that used to be made in the coherent atmosphere of either New Zealand or Norway, which both enjoyed the benefits of the Maharishi Effect, are now made increasingly in overseas countries, where the collective consciousness is not so harmonious and wholly supportive of their interests. For example, the 1999 OECD Survey of Norway concluded that even though GDP growth was still running at 2.5% to 3%, *investor concerns triggered substantial capital outflows after the summer of 1998*. The exchange rate plunged, interest rate soared, and the current account surplus, which had reached a record of 6% in the previous two years, vanished in 1998. In a sense, foreign investment is especially predatory. 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 (Naylor 1994, Patnaik 1997). In Norway's case, a natural slowdown in growth rates, as capacity limits and full employment were reached, was turned, by panicky investors, into a major fluctuation in the domestic economy, which tended to undermine consumer confidence and business profits.

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