



Editors

Badri Munir Sukoco
Rahmat Heru Setianto
Nidya Ayu Arina
Ade Gafar Abdullah
Asep Bayu Nandiyanto
Ratih Hurriyati

Increasing Management Relevance and Competitiveness



PROCEEDINGS OF THE 2ND GLOBAL CONFERENCE ON BUSINESS, MANAGEMENT AND ENTREPRENEURSHIP (GC-BME 2017), AUGUST 9, 2017, UNIVERSITAS AIRLANGGA, SURABAYA, INDONESIA

Increasing Management Relevance and Competitiveness

Editors

Badri Munir Sukoco, Rahmat Heru Setianto & Nidya Ayu Arina
Universitas Airlangga, Indonesia

Ade Gafar Abdullah, Asep Bayu Nandiyanto & Ratih Hurriyati
Universitas Pendidikan, Indonesia



CRC Press

Taylor & Francis Group

Boca Raton London New York Leiden

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business

A BALKEMA BOOK

CRC Press/Balkema is an imprint of the Taylor & Francis Group, an informa business

© 2018 Taylor & Francis Group, London, UK

Typeset by V Publishing Solutions Pvt Ltd., Chennai, India

Printed and bound in Great Britain by CPI Group (UK) Ltd, Croydon, CR0 4YY

All rights reserved. No part of this publication or the information contained herein may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, by photocopying, recording or otherwise, without written prior permission from the publisher.

Although all care is taken to ensure integrity and the quality of this publication and the information herein, no responsibility is assumed by the publishers nor the author for any damage to the property or persons as a result of operation or use of this publication and/or the information contained herein.

Published by: CRC Press/Balkema

Schipholweg 107C, 2316 XC Leiden, The Netherlands

e-mail: Pub.NL@taylorandfrancis.com

www.crcpress.com – www.taylorandfrancis.com

ISBN: 978-0-8153-7455-8 (Hbk)

ISBN: 978-1-351-24189-2 (eBook)

Table of contents

Preface	xi
Acknowledgements	xiii
Organizing committees	xv
<i>Strategic management, entrepreneurship and contemporary issues</i>	
Governance of financial intangible success factors: An option in building business resilience and sustainability <i>P. Sugito</i>	3
The influences of the alliance learning process and entrepreneurial orientation on the strategic alliance performance of Indonesian construction companies <i>R. Handayani & R. Dyah Kusumastuti</i>	7
Assessing necessity and opportunity-based entrepreneurship: An analysis of demographic characteristics, propensity for new ventures and entrepreneurial motivation (a study of labor forces and entrepreneurs in Padang, Indonesia) <i>H. Rahman & D. Lesmana</i>	13
Critical assessment on zakat management: Zakat scorecard model <i>T. Widiastuti, S. Herianingrum & I. Mawardi</i>	17
Investigating entrepreneurial orientation impact on project performance in highly regulated industry: A case of renewable power industry in Indonesia <i>F.A. Firman, R.D. Kusumastuti, H.T. Kurniawan & I.M. Ruky</i>	23
How to survive in the modern era: Integrated local entrepreneurs, the traditional market and the modern store <i>P.P.D. Astuti, Y. Setyowati & A.A.G.S. Utama</i>	29
The influence of Islamic service quality toward bank customer loyalty and satisfaction of BRISyariah Surabaya <i>M.Q. Fauzi, S. Herianingrum, T. Widiastuti & R.P. Putra</i>	35
Management accounting practices in micro enterprises in the Sleman Regency, Daerah Istimewa Yogyakarta <i>A.C. Laksmi & A.P. Putra</i>	39
The power of finance: The dynamics of female entrepreneurs in fulfilling their financial needs <i>M.R. Rita, S. Wahyudi & H. Muharam</i>	43
Entrepreneurial orientation in a family business group: The role of the corporate center and its effect on business unit performance <i>O. Pendrian, K.A. Karnen, R. Rachmawati & R.D. Kusumastuti</i>	49
Developing entrepreneurship for the performing arts community through an art incubation model <i>J. Masunah & R. Milyartini</i>	55
Capability to contest on market performance <i>B.M. Sukoco & R.R. Maulana</i>	61

The influence of the socio-economic status of parents toward entrepreneurial attitudes <i>H. Mulyadi, M. Arief Ramdhany & S. Sulastri</i>	67
Analysis of the factors affecting the elected mode of transportation for workers using an analytical hierarchy process <i>E. Mahpudin & H. Sulistiyo</i>	71
Multidimensional approach for assessing service quality in the service industry <i>Y.D. Lestari</i>	75
The influence of entrepreneurship orientation and management capability on performance of small and medium enterprises in Bogor <i>A. Setyo Pranowo, H. Hari Mulyadi, Z. Musannip Efendi Siregar & Y. Hendayana</i>	81
The influence of family factors on expatriate performance <i>N. Kartika</i>	85
Is firm size an important determinant for firms in establishing political connections? <i>N.N. Amorita, D. Agustia & I. Harymawan</i>	91
Integration of corporate social responsibility and resource based theory to create and capture value <i>N. Nandang & H. Mulyadi</i>	95
<i>Organizational behavior, leadership and human resources management</i>	
Superior performance model of human resources <i>T. Yuniarsih, Disman & M.D. Sugiharto</i>	103
The impact of fiscal decentralization on economic growth and manpower absorbed at districts/cities in South Kalimantan Province <i>Muzdalifah & R. Purwono</i>	109
Work-family conflict and satisfactions: A job demand-resources model perspective <i>J. Sulistiawan</i>	115
Building employee engagement through transformational leadership, psychological empowerment and affective commitment <i>P. Yulianti & N. Hamidah</i>	121
The impact of transformational leadership, learning organization and job autonomy on creative self-efficacy <i>I.B.G.A. Permana & W. Astiti</i>	127
Enhancing commitment to organizational change initiative and performance outcomes <i>N.A. Arina & P. Yulianti</i>	131
The influence of Perception of Usefulness (PoU) and Perceived Ease of Use (PEU) on the perception of information system performance <i>F. Sayekti & L.E. Wijayanti</i>	137
Knowledge sharing benefits: The contingency effects of environmental contexts <i>A. Qomariyah</i>	141
The antecedents of entrepreneurial intentions in students of Airlangga university (A study of student participants in WEBS in the faculty of economics and business) <i>P. Yulianti & I.G.N.W.H. Saputra</i>	147
Effect of proactive personality and Organizational Support for Career Development (OSCD) on career satisfaction and job performance <i>V. Octia & D. Ratmawati</i>	153
The effects of transformational and transactional leadership on work performance of middle-level leaders with organizational commitment as mediator: A study of state-owned company, Pelabuhan Indonesia III Inc. <i>A. Eliyana, S. Maarif & R.J. Sunarsono</i>	159

Transformational leadership style, team performance and team job satisfaction: Mediation by levels of cognitive trust and collective efficacy <i>P. Yulianti & R. Sanjaya</i>	165
The impact of self-efficacy and perceived organizational support on operational managers' readiness to change <i>H. Prima & A. Eliyana</i>	171
 <i>Marketing management</i>	
Factors affecting customer retention in a priority banking program <i>I.R. Aliyah, S. Soebandhi & A. Baktiono</i>	179
The impact of messages assertiveness on compliance with perceived importance as a moderation variable on the anti-cigarette campaign in Surabaya <i>Kristiningsih, R.S. Wuryaningrum & A. Trimarjono</i>	183
Demographic variables and environmentally friendly behavior in a developing country <i>T. Handriana</i>	189
Antecedents and consequences of ongoing search information <i>D.T. Firmansyah & D. Mardhiyah</i>	195
Role of negative brand name perception and religiosity on brand attitude <i>S. Gunawan & R.T. Ratnasari</i>	201
The effects of good/bad news on consumer responses toward higher education <i>G.C. Premananto & M.H. Hanafiah</i>	207
Examining leadership style and advertising evaluation on employees' customer focus <i>R.A. Aisyah & N.A. Arina</i>	211
The effect of airline sale promotion types on consumers' attitudes toward brand and purchase intentions <i>M. Kurniawati</i>	217
The influence of celebgrams, e-WOM, and pictures on impulse buying <i>Hartini, Sri & Uswatun</i>	221
Value propositions of supermarkets <i>R. Rinawati</i>	225
Empirical study of perceived quality information and perceived information security impact on online purchasing in Indonesia <i>L. Lisnawati, L.A. Wibowo & P. Andi</i>	231
Measuring religiosity and its effects on attitude and intention to wear a hijab: Revalidating the scale <i>H.A. Wibowo & M.R. Masitoh</i>	237
 <i>Management and economics education</i>	
Communication skills of accountants and managers in Indonesia <i>Y.L. Rudianto & A.R. Sridadi</i>	243
Factors knowledge management and the work motivation of lecturers <i>Rino</i>	249
The role of talent management in student performance in higher education <i>D. Purwaningsih</i>	253
Strategy to build universities <i>P. Dewi Dirgantari, B. Widjajanta & L. Lisnawati</i>	257
Factors affecting the improvement of students' Grade Point Average (GPA) <i>A.B. Santoso, E.C.M. Simatupang & R.H. Sofyandi</i>	261

<i>Innovation, operations and supply chain management</i>	
Analysis of the small segment credit business process at Bank ABC Indonesia <i>A.C. Saifullah & R.D. Kusumastuti</i>	267
The identification of defects in rubber slipper production using the six sigma method <i>T.A. Auliandri & M.A. Setiani</i>	271
The design of service quality improvement in a library by using LibQUAL model and fishbone diagram <i>F. Wurjaningrum & A. Kurniawan</i>	277
The strategic role of Indonesia in Global Value Chains (GVC) <i>M.A. Esquivias, D.W. Sari & R.D. Handoyo</i>	283
Service innovation: The moderating effects of environmental contingencies <i>N. Anridho</i>	289
Efficiency and total-factor productivity in the manufacturing industry in 33 provinces of Indonesia <i>Muryani</i>	295
Academic excellence and total quality supply chain management in higher education <i>I. Usman & Windijarto</i>	301
<i>Financial management and accounting</i>	
The influence of usage accounting information on small medium enterprise's perception <i>S. Mintarti, D.M. Sari & T. Fitriastuti</i>	307
Determinants of banks' net interest margin in five South East Asian countries <i>M. Gitanadya & R. Setiawan</i>	311
The effect of monetary policy and macroeconomic variables on foreign portfolio investment in Indonesia <i>N.F. Anne & R. Purwono</i>	317
Internal factors, external factors, and bank liquidity in Indonesia <i>I.M. Sudana & A.F. Akbar</i>	325
The obstacles in developing Indonesia's sovereign <i>sukuk</i> <i>N. Laila, F.F. Hasib & M. Anshori</i>	329
The effect of trading volume changes on JKSE's market return <i>M. Madyan, S. Hasan & D.F. Putri</i>	335
The influence of the profitability indicator, capital and performing loans on the liquidity of the bank in the Indonesian stock exchange <i>O.V.B. Nainggolan</i>	341
Corporate governance performance evaluation of banks operating in Indonesia <i>F. Budhijono</i>	345
What drives finance pattern debt companies to pay dividends in Indonesia? <i>L. Gestanti & G. Memarista</i>	349
Diversification, firm value and government ownership <i>S.A. Usman & C. Sulistyowati</i>	355
Do operating costs, investment returns and claims have an effect on contributions? <i>D.F. Septiarini</i>	361
Crowdfunding new paradigm for financing: Operational pattern of crowdfunding in Indonesia <i>S.R. Arifin & Wisudanto</i>	365
Different ways to solve the liquidity problem of Indonesian Islamic microfinance <i>I. Mawardi & T. Widiastuti</i>	369

Preface

International Conferences provide an excellent opportunity to bring together academics from different countries and backgrounds for the purpose of presenting their research results, critically discussing methodology and findings and improving the quality of research and the impact of the research on society and science. Furthermore, conferences enable the scientific community to create new networks, to foster relationships and extend their visibility.

The 2nd Global Conference on Business Management and Entrepreneurship (GCBME) 2017 is an annual conference co-hosted by Department of Management, Faculty of Economics & Business, Universitas Airlangga and Business Management Education Program, Faculty of Business and Economics Education, Universitas Pendidikan Indonesia. The theme of GCBME 2017 is increasing management relevance and competitiveness.

The theme inspired by the concern of Sumantra Ghoshal that bad management theories are destroying good management practices. Before that, the dichotomy between rigor and relevance is always becoming a hot topic in the management field. This conference aims to answer the following question: How might we accomplish a reconciliation of rigor (academic) and relevance (practitioner) standards to offer organizational competitiveness?

I expect this conference raises two important things in the discussion room and proceedings (based on Corley and Gioia, 2011): First, theories used in this conference should be problem driven—that is addressing a problem of direct, indirect, or long-linked relevance to practice, rather than narrowly addressing the (theoretical) “problem.” Second, the fact that we are a profession (academia) studying another profession (management), therefore it needs balancing between theoretical contribution managerial implications. By doing that, I believe that our research and discussion in this conference could offer something useful for practitioners (thus increase its competitiveness) while at the same time contribute to the development of our management field.

I am looking forward to seeing you in GCBME in the near future.

With warmest regards,
Prof. Badri Munir Sukoco, PhD
GC-BME 2017 Conference Chair

Acknowledgements

Badri Munir Sukoco, *Universitas Airlangga, Indonesia*
Ratih Hurriyati, *Universitas Pendidikan Indonesia*
Ade Gafar Abdullah, *Universitas Pendidikan Indonesia*
Praptini Yulianti, *Universitas Airlangga, Indonesia*
Muhammad Madyan, *Universitas Airlangga, Indonesia*
Didi Sukyadi, *Universitas Pendidikan Indonesia*
Wann-Yih Wu, *Nanhua University, Taiwan*
John Nowland, *Illinois State University, USA*
Ikuro Yamamoto, *Kinjo Gakuin University Nagoya, Japan*
Jon Lovett, *University of Leeds, UK*
John Paul, *Kedge Business School, France*
Ranbir Malik Singh, *Curtin University, Australia*
Nobuhide Otomo, *Kanazawa University, Japan*
Mohamed Dahlan Ibrahim, *Universiti Malaysia Kelantan, Malaysia*
Dadang Kurnia, *GIZ, Germany*

Organizing committees

ADVISORS

Prof. John Paul
Prof. Ranbir Malik Singh
Prof. Dr. Nobuhide Otomo
Prof. Dr. Mohamed Dahlan Ibrahim
Prof. Dr. Anis Eliyana
Prof. Dr. Muslich Anshari
Prof. Dr. Fendy Suhariadi
Prof. Dr. Sri Iswati
Prof. Dr. Bambang Tjahjadi
Prof. Dr. Nanang Fattah
Prof. Dr. Agus Rahayu
Prof. Dr. Tjutju Yuniarsih
Prof. Dr. Disman
Prof. Dr. Suryana
Prof. Dr. Eeng Ahman
Prof. Dr. Ratih Hurriyati
Prof. Ina Primiana

Prof. Lincoln Arsyad
Prof. Gunawan Sumodiningrat
Dr. Phil Dadang Kurnia
Assoc. Prof. Arry Akhmad Arman
Assoc. Prof. Dwilarso
Assoc. Prof. Hardianto Iristidi
Assoc. Prof. Rachmawaty Wangsaputra
Assoc. Prof. Teungku Ezni Balkiah
Assoc. Prof. Ruslan Priyadi
Assoc. Prof. Sri Gunawan,
Assoc. Prof. Dr. Indrianawati Usman
Assoc. Prof. Yudi Aziz
Assoc. Prof. Lili Adiwibowo
Assoc. Prof. Vanessa Gaffar
Assoc. Prof. Chaerul Furqon
Vina Andriany MEd, PhD
Tutin Ariyanti, PhD

CONFERENCE CHAIR

Prof. Badri Munir Sukoco, Ph.D

COMMITTEES

Dr. Tanti Handriana
Rahmat Heru Setianto, SE, M.Sc.
Nidya Ayu Arina, SM, MSM.
Dr. Masmira Kurniawati
Made Gitanadya, SE, MSM.
Ratri Amelia Aisyah, SM, MSM.

Efficiency and total-factor productivity in the manufacturing industry in 33 provinces of Indonesia

Muryani

Universitas Airlangga, Surabaya, Indonesia

ABSTRACT: This study emphasizes the importance of controlling escalation of emissions in the current decade. In addition, the study focuses on efficiency techniques and the Total-Factor Productivity (TFP) of manufacturing industry in 33 provinces in Indonesia. This research was conducted by utilizing Data Envelopment Analysis (DEA). The input variables were labor, energy consumption and investment, and the output variables were GDP, SO₂ and NO₂. The Malmquist–Luenberger (ML) productivity index was used to measure changes in productivity of observation data using undesirable variables as input or output. The result is based on operational efficiency; at the end of the observation (2015), 17 provinces were in a state of operational inefficiency with efficiency scores in the range of 0.750–0.999. Meanwhile, in the results for technical efficiency, there was a trend for increasing technical efficiency in manufacturing industry in 19 provinces. Thus, it can be concluded that the majority of manufacturing industries in Indonesia are efficient, while only a few provinces can increase their productivity by increasing desirable output while reducing the growth rate of undesirable output production.

Keywords: Efficiency, Productivity, Industry, DEA

1 INTRODUCTION

Energy use in the industrial sector contributes to emissions in many countries, especially developing countries. The greater the energy use, the greater the amount of emissions produced. At first, the relationship between this energy and the environment was not a major concern. Now, however, environmental conditions are making their own demand for all countries to pay attention to energy utilization in the process of economic development in order to achieve economic sustainability. Hence, all of them can be regarded as an integrated process, which will implicitly encourage growth in the production and consumption of energy.

Sustainable economic development itself is a balance between the factors of energy, economy and environment. Among these three factors, energy is the most influential factor in economic growth, and economic growth also depends on the use of energy for economic development of the country. When economic growth is accelerating and maximizing all possible energy sectors, then, in the process of this economic growth, natural resources, including energy resources, are used on a large scale and create emissions on a large scale too. Therefore, the existence of economic development policy that takes into account environmental conditions is very necessary.

Previous studies concerning energy have been varied: one area has been efficiency measurement. Thus, previous studies have attempted to measure the magnitude of energy efficiency in terms of output produced. However, the research, such as that by Korhonen and Luptacik (2004), Sueyoshi and Goto (2010), and Sueyoshi et al. (2010, 2013), has only covered particular provinces in some countries. Therefore, the study of energy efficiency in relation to output in each province in a country needs to be far more prolific.

The present research focuses on the operational efficiency and efficiency of technique in the manufacturing industry in 33 provinces in Indonesia. Analysis of an industry will be more effective if the Total-Factor Productivity (TFP) is also assessed. In essence, TFP is the growth in output that cannot be explained by the growth in inputs. TFP is assessed through the use of the Malmquist–Luenberger (ML) productivity index, which measures environmentally sensitive changes in productivity through the use of undesirable variables as inputs and/or outputs within Data Envelopment Analysis (DEA). The input variables are labor, energy consumption and investment, and the output variables are GDP, SO₂ and NO₂. Thus, this research formulates the following research questions: what are the operational efficiency levels, technical efficiency levels and TFP of manufacturing industries in 33 provinces in Indonesia when undesirable outputs exist?

2 RESEARCH METHODOLOGY

2.1 Operational efficiency

Operational Efficiency (OE) is designed using non-radial measurement models. Thus, the level of inefficiency is determined through the slack of each Decision-Making Unit (DMU). OE ignores the undesirable output in the measurement (Sueyoshi et al., 2013). The non-radial mathematical model used in the measurement of OE is as follows:

$$\begin{aligned} \text{Maximize } & \sum_j^m = {}_1R_i^x d_i^x + \sum_r^s = {}_1R_r^g d_r^g \\ \text{such that } & \sum_R^S = {}_1X_{ij,g} + d_j^x = X_{ik} \quad (i=1, \dots, m), \\ & \sum_j^n = {}_1g_{rj} \lambda_j - d_r^g = g_{rk} \quad (r=1, \dots, s), \\ & \sum_j^n = {}_1\lambda_j = 1, \\ & \lambda_j \geq 0 \quad (j=1, \dots, n), d_i^x \geq 0 \quad (i=1, \dots, m), \\ & d_r^g \geq 0 \quad (r=1, \dots, s) \end{aligned} \quad (1)$$

After calculating Model (1), the OE can be obtained by the calculation:

$$OE = 1 - \left(\sum_{i=1}^m R_i^x d_i^{x*} + \sum_{r=1}^s R_r^g d_r^{g*} \right) \quad (2)$$

Thus, the slack of each DMU in OE measurement can be obtained by calculating Model (1). This model calculates the inputs and desirable outputs, but does not include undesirable output variables.

2.2 Total-Factor Productivity Change (TFPC) and Technical Efficiency Change (TEC)

The approach used in this research is a quantitative one using DEA and determining TFP Change (TFPC) and Technical Efficiency Change (TEC) of inputs and outputs in each country using the ML productivity index, which is the measurement of productivity and technical efficiency when DMUs produce undesirable output. Chung et al. (1997) used this index to measure marginal productivity from observational data that uses undesirable variables as input or output. If $ML > 1$ it means that efficiency increases and DMUs generate desirable output and reduce production of undesirable outputs. If $ML = 1$, the productivity is constant and there is no change; if $ML < 1$, it indicates declining levels of DMU productivity (Aparicio et al., 2013). Based on the model of previous research, the authors use a slightly adapted version of the model of Aparicio et al. (2013). The change involves adding the following element to the model:

$$Y^{1,b} \lambda \geq y^{2,b}_o - \beta y^{2,b}_o$$

Thus, the Malmquist model used in this study is:

$$\begin{aligned} & \text{Maximize } \beta, \lambda \\ & \text{such that } X^1 \lambda \leq X^2 o \\ & Y^{1,g} \lambda \geq y^{2,g}_o + \beta y^{2,g}_o \\ & Y^{1,b} \lambda \geq y^{2,b}_o - \beta y^{2,b}_o \\ & \text{Max} \{ y^{t,u}_i \} \geq y^{2,b}_o - \beta y^{2,b}_o \\ & \lambda \geq 0 \end{aligned}$$

where $\text{Max} \{ y^{t,u}_i \}$ is the maximum number of observations of each undesirable output (SO_2 and NO_2) during the observation period (Aparicio et al., 2013, 2015).

3 RESULT

Attachment 1 (Table 1) shows the distribution of OE scores of manufacturing industry for 33 provinces in Indonesia. The table shows the names of the provinces which had an efficiency score of 1, meaning that they were in operationally efficient condition. Provinces showed inefficiency if their score was less than one (< 1), assuming Variable Return to Scale (VRS).

Attachment 1 (Table 1) shows that, in 2012, 12 of the 33 provinces in Indonesia were in operationally efficient condition, while 17 of the provinces were in optimally efficient condition to the production of manufacturing industry. The table shows that another 17 provinces have not utilized their resources, capital and human, to achieve operational efficiency in their manufacturing industry sector. In 2015, the number of provinces experiencing improved efficiency increased to 16.

Attachment 1 (Table 2) shows the distribution of the changes of technical efficiency (index of technology) for 2012–2013 from the manufacturing sector of 33 provinces in Indonesia. In the Table 2 above, efficiency is divided into three classes, namely, efficient, inefficient and very inefficient. It can be seen that there were 14 provinces classified in the efficient group for 2012–2013, increasing to 19 provinces for 2013–2015. On the other hand, the number of provinces in the inefficient and very inefficient groups showed a decline during the period of observation, 2012–2015. For example, there was a decline in the number of provinces, from ten to nine, in the inefficient category (0.750–0.999), while the level of very inefficient (0.5–0.7499) provinces also experienced a decline too, which means that several provinces in the manufacturing industry sector managed to improve their technical efficiency score.

In 2012–2013, there were nine provinces with technically inefficient conditions in the manufacturing industry sector, but this reduced to four provinces in 2013–2014 and continued to decrease until the end of the observation, when only two provinces were inefficient in the manufacturing industry sector.

Table 1. Operational efficiency of manufacturing industry for 33 provinces in Indonesia.

Operational efficiency score	2012	2013	2014	2015
1.00 (Efficient)	1. Riau	1. Riau	1. Riau	1. West Sumatra
	2. Bengkulu	2. Jambi	2. Jambi	2. Riau
	3. Lampung	3. South Sumatra	3. Bengkulu	3. Bengkulu
	4. Jakarta	4. Bengkulu	4. Lampung	4. Lampung
	5. West Java	5. Lampung	5. Riau Islands	5. Jakarta
	6. Central Java	6. Riau Islands	6. Jakarta	6. West Java
	7. East Java	Jakarta	7. West Java	7. Central Java
	8. Banten	7. West Java	8. Central Java	8. East Java
	9. East Nusa Tenggara	8. Central Java	9. East Java	9. Banten
	10. North Sulawesi	9. Special Region of Yogyakarta	10. Banten	10. East Nusa Tenggara
	11. Gorontalo	10. East Java	11. East Nusa Tenggara	11. North Sulawesi
	12. West Sulawesi	11. Banten	12. Sulawesi Utara	12. Gorontalo
	13. Maluku	12. West Sulawesi	13. West Sulawesi	13. West Sulawesi
	14. North Maluku	13. Maluku	14. Maluku	14. Maluku
	15. West Papua	14. North Maluku	15. North Maluku	15. North Maluku
0.750–0.999 (Inefficient)	1. Aceh	15. West Papua	16. West Papua	16. West Papua
	2. North Sumatra	1. Aceh	1. Aceh	1. Aceh
	3. West Sumatra	2. North Sumatra	2. North Sumatra	2. North Sumatra
	4. Jambi	3. West Sumatra	3. West Sumatra	3. Jambi
	5. South Sumatra	4. Bangka Belitung	4. South Sumatra	4. South Sumatra
	6. Bangka Belitung	5. Bali	5. Bangka Belitung	5. Bangka Belitung
	7. Riau Islands	6. West Nusa Tenggara	6. Special Region of Yogyakarta	6. Riau Islands
	8. Special Region of Yogyakarta	7. West Kalimantan	7. Bali	7. Special Region of Yogyakarta
	9. Bali	8. Central Kalimantan	8. West Nusa Tenggara	8. Bali
	10. West Nusa Tenggara	9. South Kalimantan	9. West Kalimantan	9. West Nusa Tenggara
	11. West Kalimantan	10. East Kalimantan	10. Central Kalimantan	10. West Kalimantan
	12. Central Kalimantan	11. Central Sulawesi	11. South Kalimantan	11. Central Kalimantan
	13. South Kalimantan	12. South Sulawesi	12. East Kalimantan	12. South Kalimantan
	14. East Kalimantan	13. Sulawesi Tenggara	13. Central Sulawesi	13. East Kalimantan
	15. Central Sulawesi	14. Papua	14. South Sulawesi	14. Central Sulawesi
	16. South Sulawesi		15. Sulawesi Tenggara	15. South Sulawesi
	17. Papua		16. Papua	16. Sulawesi Tenggara
			17. Papua	

In the observation year 2012–2013, North Sulawesi experienced technical inefficiency, but successfully increased its efficiency score in the 2013–2015 observation to become fully technically efficient with an efficiency score of 1. Aceh also experienced a similar trend; in 2012–2013, Aceh exhibited a very inefficient condition with an efficiency score of 0.5964, but massively improved its technical efficiency scores in 2013–2014 to score 1.1632 and 1.3793 in 2014–2015. The increasing trend in technical efficiency was experienced by several provinces in Indonesia and, among the members of the inefficient or very inefficient group

that became efficient during the years of observation are DI Yogyakarta, North Sumatra, North Maluku, Sumatra Barat, East Java, West Kalimantan and Papua.

Other provinces seem able to increase their technical efficiency in the manufacturing industry sector too, but unfortunately this change was not significant and the provinces have remained technically inefficient. Such provinces include South Kalimantan, Central Kalimantan and Central Sulawesi. However, some provinces experienced a decrease in their technical efficiency score in the manufacturing industry sector. For example, in

Table 2. Technical Efficiency Change (TEC) of manufacturing industry for 33 provinces in Indonesia.

Operational efficiency score	Year 2012–2013	Year 2013–2014	Year 2014–2015
1.00 (Efficient)	<ol style="list-style-type: none"> 1. Riau 2. Jambi 3. Bengkulu 4. Lampung 5. Riau Islands 6. Jakarta 7. West Java 8. Central Java 9. Yogyakarta 10. Banten 11. EastNusa Tenggara 12. West Sulawesi 13. North Maluku 14. West Papua 	<ol style="list-style-type: none"> 1. Aceh 2. North Sumatra 3. Riau 4. Jambi 5. Lampung 6. Bangka Belitung 7. Riau Islands 8. Jakarta 9. West Java 10. Central Java 11. East Java 12. Banten 13. East Nusa Tenggara 14. North Sulawesi 15. South Sulawesi 16. Gorontalo 17. West Sulawesi 18. West Papua 19. Papua 	<ol style="list-style-type: none"> 1. Aceh 2. West Sumatra 3. Riau 4. South Sumatra 5. Lampung 6. Jakarta 7. West Java 8. Central Java 9. Yogyakarta 10. East Java 11. Banten 12. EastNusa Tenggara 13. North Sulawesi 14. South Sulawesi 15. Gorontalo 16. North Maluku 17. West Papua 18. Papua 19. West Kalimantan
0.750–0.999 (Inefficiency)	<ol style="list-style-type: none"> 1. South Sumatra 2. East Java 3. Bali 4. West Nusa Tenggara 5. South Kalimantan 6. East Kalimantan 7. North Sulawesi 8. South east Sulawesi 9. Gorontalo 10. maluku 	<ol style="list-style-type: none"> 1. West Sumatra 2. Bengkulu 3. Jogjakarta 4. Bali 5. West Nusa Tenggara 6. West Kalimantan 7. Central Kalimantan 8. East Kalimantan 9. South east Sulawesi 10. maluku 	<ol style="list-style-type: none"> 1. Jambi 2. Bangka Belitung 3. Bali 4. WestNusa Tenggara 5. Central Kalimantan 6. South Kalimantan 7. East Kalimantan 8. Central Sulawesi 9. SouthEast Sulawesi
0.5–0.7499 (very inefficient)	<ol style="list-style-type: none"> 1. Aceh 2. North Sumatra 3. West Sumatra 4. Bangka Belitung 5. West Kalimantan 6. Central Kalimantan 7. Central Sulawesi 8. South Sulawesi 9. Papua 	<ol style="list-style-type: none"> 1. South Sumatra 2. South Kalimantan 3. Central Sulawesi 4. North Maluku 	<ol style="list-style-type: none"> 1. North Sumatra 2. Maluku

observation year 2012–2013, North Sumatra was extremely inefficient with a score of 0.5015, but was classified as very inefficient for 2014–2015 with a score of 0.6479. This indicates that North Sumatra did not have a sustainable policy for determining the optimum input–output combination in the manufacturing industry production process. Had North Sumatra experienced an increasing score in 2013–2014 it would have indicated that, in these observations, the province had managed to combine the use of input–output in the manufacturing industry sector, so that it could achieve technical efficiency. However, unfortunately, in the years 2014–2015, there was a policy change by the mana-

gerial system in the use of input–output, such that it had the highest technical inefficiency. The same thing was experienced by the province of Maluku.

3.1 *The Total-Factor Productivity Change (TFPC) of manufacturing industry for 33 provinces in Indonesia*

The first TFP measurement result is technical efficiency change (TEC). TEC is the growth rate in efficiency of the DMU from the current year (t) to the next year ($t + 1$), as measured from the change in technical efficiency assuming Constant Returns to Scale (CRS). However, in the Malmquist models used

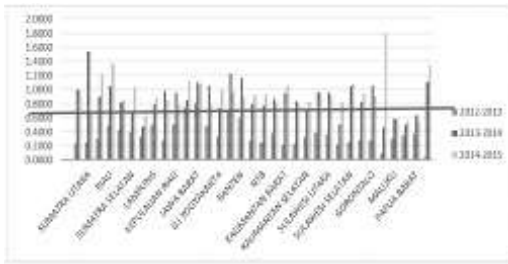


Figure 1. Total-factor productivity change (TFPC) in manufacturing industry for 33 provinces in Indonesia.

by the author, the results are divided into TFPC and TEC. In this study, the author used the Malmquist–Luenberger Index, which is a measurement of productivity and technical efficiency when a DMU produces undesirable output (Chung et al., 1997).

Figure 1 shows that for the period 2012–2013, none of the provinces in Indonesia could reach $ML > 1$. This means that, during the period, the Indonesian manufacturing industry was degraded, mainly in terms of suppressing the production of emissions. This was caused by incorrect use of technology to optimize productivity in Indonesia’s manufacturing industry. In the period 2013–2014, eight provinces were able to increase productivity and achieve $ML > 1$; the best of these was North Sumatra with a ML score of 1.5395. This indicates that North Sumatra, in these observations, managed to increase productivity by suppressing the production of emissions and improving good outputs in its manufacturing industry.

Unfortunately, in the period 2014–2015, 23 provinces in Indonesia degraded their productivity in the manufacturing industry sector. North Sumatra was one of them, experiencing a drastic reduction in its ML with a final score of 0.6677. In contrast to Sumatra, West Sulawesi experienced a significant productivity improvement. In the period 2012–2013, West Sulawesi only achieved a score of 0.0966, but this rose to 0.4605 in the period 2013–2014, and then increased rapidly with the highest productivity score of all at 1.7978. This indicates that West Sulawesi has been precise in its use of technology in the production process of the manufacturing industry sector, as supported by the high ML index, which indicates that the province succeeded in increasing desirable output along with reducing undesirable output production.

4 CONCLUSION

There were 17 provinces observed in a state of operational inefficiency, with scores in the range 0.750–0.999. This indicates low optimal control of

provincial governments in relation to the manufacturing sector. However, in technical terms, the majority of manufacturing industries are efficient; in fact, only a few provinces can increase their productivity by increasing desirable output while reducing undesirable output. This indicates that the implementation and control (law enforcement) by local government in relation to the implementation of environmental policy in the manufacturing industry need to be further improved.

This suggests that the government can encourage the majority of industries to achieve efficiency in technical issues by increasing the use of proper technology and environmentally friendly production processes. Furthermore, investment in the technology sphere is important. Nevertheless, capital insensitivity can diminish the volume of labor through dismissal; hence, investment is assumed to be a balance between capital insensitivity and labor insensitivity. Ultimately, productivity can also be increased as well as reducing unemployment.

REFERENCES

- Aparicio, J., Pastor, J.T. & Zofio, J.L. (2013). On the inconsistency of the Malmquist–Luenberger index. *European Journal of Operational Research*, 229(3), 738–742.
- Aparicio, J., Pastor, J.T. & Zofio, J.T. (2015). How to properly decompose economic efficiency using technical and allocative criteria with non-homothetic DEA technologies. *European Journal of Operational Research*, 240(3), 882–891.
- Charnes, A., Cooper, W. & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, 2(6), 429–444.
- Chung, Y., Fare, R. & Grosskopf, S. (1997). Productivity and undesirable outputs: A directional distance function approach. *Journal of Environmental Management*, 51(3), 229–240.
- Korhonen, P.J. & Luptacik, M. (2004). Eco-efficiency analysis of power plants: An extension of data envelopment analysis. *European Journal of Operational Research*, 154(2), 437–446.
- Kost, F.E. & Rosenzweig, J.E. (1979). *Organization and management: A system and contingency approach*. New York, NY: McGraw-Hill.
- Page, J.M. (1980). Technical efficiency and economic performance: Some evidence from Ghana. *Oxford Economic Papers*, 32(2), 319–339.
- Sueyoshi, T. & Goto, M. (2010). Should the US Clean Air Act include CO₂ emission control? Examination by data envelopment analysis. *Energy Policy*, 38(10), 5902–5911.
- Sueyoshi, T., Goto, M. & Ueno, T. (2010). Performance analysis of US coal-fired power plants by measuring three DEA efficiencies. *Energy Policy*, 38(4), 1675–1688.
- Sueyoshi, T., Goto, M. & Snell, M.A. (2013). DEA environmental assessment: Measurement of damages to scale with unified efficiency under managerial disposability or environmental efficiency. *Applied Mathematical Modelling*, 37, 7300–7314.