

DAFTAR PUSTAKA

- Alfredsson, E., Månsson, J., & Vikström, P. (2016). Internalising External Environmental Effects in Efficiency Analysis: The Swedish Pulp and Paper Industry 2000–2007. *Economic Analysis and Policy* 51 22–31.
- Arabi, B., Munisamy, S., Emrouznejad, A., & Shadman, F. (2014). Power Industry Restructuring and Eco-Efficiency Changes: A New Slacks-Based Model in Malmquist–Luenberger Index Measurement. *Energy Policy* 68 132–145.
- Assaf, A., Barros, C.P., & Josiassen, A. (2010). Hotel Efficiency: A Bootstrapped Metafrontier Approach. *International Journal of Hospitality Management* 29, 468–475.
- Badan Pusat Statistik – BPS. (2018) (online) diakses pada <https://www.bps.go.id/subject/11/produk-domestik-bruto--lapangan-usaha-.html#subjekViewTab3>
- _____. (2015). *Statistik Industri Manufaktur 2015*. Jakarta: BPS.
- _____. (2011). *Tabel Kesesuaian lapangan Usaha KBLI 2009 KBLI 2005*. Jakarta: BPS.
- _____. (2009). *Peraturan Kepala Badan Pusat Statistik Nomor 57 Tahun 2009 Tentang Klasifikasi Baku Lapangan Usaha Indonesia*. Jakarta: BPS.
- Bai, Y., Deng, X., Zhang, Q., & Wang, Z. (2017). Measuring Environmental Performance of Industrial Sub-Sectors in China: A Stochastic Metafrontier Approach. *Physics and Chemistry of the Earth* 101 3-12.
- Baltagi, B.H. (2001). *Econometrics Analysis of Panel Data*, second edition. England: John Wiley & Sons, Ltd.
- Battese, G.E., & Rao, D.S.P. (2002). Technology Gap, Efficiency, and a Stochastic Metafrontier Function. *Int. J. Bus. Econ.* 1, 87–93.
- Battese, G.E., Rao, D.S.P., & O'Donnell, C.J. (2004). A Metafrontier Production Function for Estimation of Technical Efficiencies and Technology Gaps for Firms Operating under Different Technologies. *J. Product. Anal.* 21, 91–103.
- Boyd, G.A., Tolley, G., & Pang, J. (2002). Plant Level Productivity, Efficiency, and Environmental Performance of The Container Glass Industry. *Environmental and Resource Economics* 23: 29–43.
- Brizga, J., Feng, K., & Hubacek, K. (2013). Drivers of CO2 emissions in the former Soviet Union: A country level IPAT analysis from 1990 to 2010. *Energy*, 59, 743-753.
- Chambers, R.G., Chung, Y.H., & Färe, R. (1996). Benefit and Distance Function. *Journal of Economic Theory* 70, 407-419.
- Chang, M-C., & Hu, J-L. (2018). A Long-term Meta-frontier Analysis of Energy and Emission Efficiencies between G7 and BRICS. *Energy Efficiency*, 1-15.

- Chen, L., & Jia, G. (2017). Environmental Efficiency Analysis of China's Regional Industry: A Data Envelopment Analysis (DEA) Based Approach. *Journal of Cleaner Production* 142 846-853.
- Chen, C-Y, Lin, S-H, Chou, L-C, & Chen, K-D. (2018). A Comparative Study of Production Efficiency in Coastal Region and Non-coastal Region in Mainland China: An Application of Metafrontier Model. *THE JOURNAL OF INTERNATIONAL TRADE & ECONOMIC DEVELOPMENT*.
- Cheng, G. (2014). *Data Envelopment Analysis: Methods and MaxDEA Software* [in Chinese]. Beijing: Intellectual Property Publishing House Co., Ltd.
- Cheng, S. Xie, J., Xiao, D., & Zhang, Y. (2019). Measuring the Environmental Efficiency and Technology Gap of PM2.5 in China's Ten City Groups: An Empirical Analysis Using the EBM Meta-Frontier Model. *International Journal Environmental Resource and Public Health*, 16 675.
- Cherniwchan, J. (2012). Economic Growth, Industrialization, and the Environment. *Resource and Energy Economics* 34, 442-467.
- Chiu, Y-H, Lee, J-H, Lu, C-C, Shyu, M-K, & Luo, Z. (2012a). The Technology Gap and Efficiency Measure in WEC Countries: Application of the Hybrid Meta frontier Model. *Energy Policy*, 51 349–357.
- Chiu, C-R, Liou, J-L, Wu, P-I, & Fang, C-L. (2012b). Decomposition of the Environmental Inefficiency of the Meta-Frontier with Undesirable Output. *Energy Economics* 34 1392–1399.
- Choi, Y., Zhang, N., & Zhou, P. (2012). Efficiency and Abatement Costs of Energy-Related CO₂ Emissions in China: A Slack-Based Efficiency Measure. *Applied Energy* 98 198-208.
- Chung, Y.H., Färe, R., & Grosskopf, S. (1997). Productivity and Undesirable Outputs: A Directional Distance Function Approach. *Journal of Environmental Management* 51, 229-240.
- Chung, Y., & Heshmati, A. (2015). Measurement of Environmentally Sensitive Productivity Growth in Korean Industries. *Journal of Cleaner Production* 104 380-391.
- Coelli, T., Estache, A., Pereleman, S., & Trujillo, L. (2003). *A Primer on Efficiency Measurement for Utilities and Transport Regulators*. Washington, D.C.: The World Bank.
- Coelli, T., Rao, D.S.P., O'Donnell, C.J., & Battese, G.E. (2005). *An Introduction to Efficiency and Productivity Analysis*, Second Edition. New York: Springer
- Cooper, W.W., Park, K. S., & Pastor, J.T. (1999). RAM: A Range Adjusted Measure of Inefficiency for Use with Additive Models, and Relations to Other Models and Measures in DEA. *Journal of Productivity Analysis* 11: 5-42.
- Cooper, W.W., Seiford, L.M., & Zhu, J. (2011). *Handbook on Data Envelopment Analysis*. Second edition. New York: Springer Science + Business Media.

- Cuesta, R.A., Lovell, C.A.K., & Zofío, J.L. (2009). Environmental Efficiency Measurement with Translog Distance Functions: A Parametric Approach. *Ecological Economics*, 68(8-9), 2232-2242.
- Cuesta, R.A., & Zofío, J.L. (2005). Hyperbolic Efficiency and Parametric Distance Functions: With Application to Spanish Savings Banks. *Journal of Productivity Analysis*, 24, 31-48.
- Dewan Ekonomi Nasional – DEN. (2020). Bauran Energi Nasional 2020. Jakarta: Sekretariat Jenderal
- Domazlicky, B.R., & Weber, W.L. (2004). Does Environmental Protection Lead to Slower Productivity Growth in The Chemical Industry? *Environmental and Resource Economics* 28: 301–324.
- Dietz, T., & Rosa, E. (1994). Rethinking The Environmental Impacts of Population, Affluence and Technology. *Human Ecology Review*, 1.
- Dietz, T., & Rosa E. (1997). Effects of Population and Affluence on CO₂ Emission. *Proceedings of The National Academy of Sciences* 94(1), 175-179.
- Dinda, S. (2004). Environmental Kuznets Curve Hypothesis: A Survey. *Ecological Economics*, Vol. 49, pp. 431-455.
- Du, K. Huang, L., & Yu, K. (2014). Sources of the Potential CO₂ Emission Reduction in China: A Nonparametric Metafrontier Approach. *Applied Energy*, 115 491–501.
- Du, L. Hanley, A., & Zhang, N. (2016). Environmental Technical Efficiency, Technology Gap and Shadow Price of Coal-Fuelled Power Plants in China: A Parametric Metafrontier Analysis. *Resource and Energy Economics*, 43 14–32.
- Dyckhoff, H., & Allen, K. (2001). Measuring Ecological Efficiency with Data Envelopment Analysis (DEA). *European Journal of Operational Research* 132, 312–325.
- Egli, H. (2004). The Environmental Kuznets Curve: Evidence from Time Series Data for Germany. *Working Paper 03/28*, WIF-Institute of Economic Research.
- Ehlich, P., & Holdren, J. (1971). Impact of Population Growth. *Science* 171, 1212–1217
- Emrouznejad, A., & Yang, G-L. (2016). CO₂ Emissions Reduction of Chinese Light Manufacturing Industries: A Novel RAM-based Global Malmquist–Luenberger Productivity index. *Energy Policy* 96 397–410.
- Eskeland, G.S., & Harrison, A.E. (2003). Moving to Greener Pastures? Multinationals and the Pollution Haven Hypothesis. *Journal of Development Economics* 70 1–23.
- Fan, Y., Bai, B., Qiao, Q., Kang, P., Zhang, Y., & Guo, J. (2017). Study on Eco-Efficiency of Industrial Parks in China based on Data Envelopment Analysis. *Journal of Environmental Management* 192 (2017) 107-115.
- Färe, R., & Grosskopf, S. (2010). Directional Distance Functions and Slacks-Based Measures of Efficiency. *European Journal of Operational Research* 200, 320-322.

- _____. (2004a). Modeling Undesirable Factors in Efficiency Evaluation: Comment. *European Journal of Operational Research* 157, 242–245.
- _____. (2004b). *New Directions: Efficiency and Productivity*. Boston: Kluwer Academic Publishers.
- _____. (2000). Theory and Application of Directional Distance Functions. *Journal of Productivity Analysis*, 13, 93–103
- Färe, R., Grosskopf, S., Lovell, C.A.K., & Pasurka, C. (1989). Multilateral Productivity Comparisons when Some Outputs are Undesirable: A Non-Parametric Approach. *Review Economics and Statistics* 71:90–98.
- Färe, R., Grosskopf, S., Lovell, C.A.K., & Yaisawarng, S. (1993). Derivation of Shadow Prices for Undesirable Outputs: A Distance Function Approach. *The Review of Economics and Statistics* 75 (2), 374-380.
- Färe, R., Grosskopf, S., Noh, D., & Weber, W. (2005). Characteristics of a Polluting Technology: Theory and Practice. *Journal of Econometrics* 126, 469–492.
- Färe, R., Grosskopf, S., & Pasurka, C.A.K. (2007). Environmental Production Functions and Environmental Directional Distance Functions. *Energy* 32, 1055–1066.
- Färe, R., Grosskopf, S., & Tyteca, D. (1996). An Activity Analysis Model of the Environmental Performance of Firms - Application to Fossil Fuel-Fired Electric Utilities. *Ecological Economics* 18, 161–175.
- Färe, R., & Primont, D. (1995). *Multi-Output Production and Duality: Theory and Applications*. Boston: Kluwer Academic Publishers, Boston.
- Fauzi. (2006). *Ekonomi Sumberdaya Alam & Lingkungan: Teori & Aplikasi*. Jakarta: Gramedia.
- Feng, C., Huang, J-B., Wang, M. 2018. Analysis of Green Total-Factor Productivity in China's Regional Metal Industry: A Meta-frontier Approach. *Resources Policy*, Volume 58, Pages 219-229.
- Field, B.C., & Olewiler, N.D. (2002). *Environmental Economics*. USA: McGraw-Hill.
- Fujii, H., Cao, J., & Managi, S. (2016). Firm-Level Environmentally Sensitive Productivity and Innovation in China. *Applied Energy* 184 (2016) 915–925.
- Fujii, H., & Managi, S. (2013). Determinants of Eco-Efficiency in the Chinese Industrial Sector. *Journal of Environmental Sciences*, 25(Suppl.) S20–S26.
- Fukuyama, H., & Weber, W.L. 2009. A Directional Slacks-Based Measure of Technical Inefficiency. *Socio-Economic Planning Sciences* 43 274287.
- Giambona, F., Jacono, V. L., & Scuderi, R. (2005). The IPAT model: An empirical evidence. *Convegno Intermedio Della Società Italiana di Statistica (SIS)*, 125-128.

- Grossman, G., & Krueger, A. (1991). Environmental Impacts of a North American Free Trade Agreement. National Bureau of Economics Research *Working Paper* No. 3194, NBER, Cambridge.
- Gujarati, D., & Porter, D.C. (2009). *Basic Econometrics*, fifth edition. USA: McGraw-Hill.
- Gunawardena, A. Hailu, A., White, B., & Pandit, R. (2017). Estimating Marginal Abatement Costs for Industrial Water Pollution in Colombo. *Environmental Development* 21 26–37.
- Hailu, A. & Veeman, T.S. (2001). Non-Parametric Productivity Analysis with Undesirable Outputs: An Application to the Canadian Pulp and Paper Industry. *American Journal of Agricultural Economics*, 83(3), 605-616.
- Hayami, Y. (1969). Sources of Agricultural Productivity Gap among Selected Countries. *American Journal of Agricultural Economics*, 51, 564-575.
- Hayami, Y., & Ruttan, V.W. (1970). Agricultural Productivity Differences among Countries. *American Economic Review*, 60, 895-911.
- _____. (1971). *Agricultural Development: An International Perspective*. Baltimore: John Hopkins University Press.
- Haynes, K.E., Ratick, S., Bowen, W.M., & Cummings-Saxton, J. (1993). Environmental Decision Models: U.S. Experience and New Approaches to Pollution Management. *Environment International* 19, 261–275.
- He, J. (2006). Pollution haven hypothesis and environmental impacts of foreign direct investment: The case of industrial emission of sulfur dioxide (SO₂) in Chinese provinces. *Ecological Economics* 60 228 – 245
- Hernandez-Sancho, F., Picazo-Tadeo, A.J., & Reig-Martinez, E. (2000). Efficiency and Environmental Regulation. *Environmental and Resource Economics* 15, 365–378
- Hoang, V-N., & Alauddin, M. (2012). Input-Orientated Data Envelopment Analysis Framework for Measuring and Decomposing Economic, Environmental and Ecological Efficiency: An Application to OECD Agriculture, *Environmental and Resource Economics*, 51, 431–452.
- Hoang, V-N., & Rao, D.S.P. (2010). Measuring and Decomposing Sustainable Efficiency in Agricultural Production: A Cumulative Exergy Balance Approach. *Ecological Economics*, 69(9) 1765–1776.
- Huang, Y.J., Chen, K.H., & Yang, C.H. (2010). Cost Efficiency and Optimal Scale of Electricity Distribution Firms in Taiwan: an Application of Metafrontier Analysis. *Energy Economics* 32, 15–23.
- Huang, J., Xia, J., Yu, Y., & Zhang, N. (2018). Composite Eco-Efficiency Indicators for China based on Data Envelopment Analysis. *Ecological Indicators* 85 674–697.
- Huppes, G., & Ishikawa, M. (2007). An Introduction to Quantified Eco-Efficiency Analysis. *Quantified Eco-Efficiency*, 1–38.

- _____. (2005). A Framework for Quantified Eco-Efficiency Analysis. *Journal of Industrial Ecology* 9, 25-41.
- Intergovernmental Panel on Climate Change – IPCC. (2014). *Climate Change 2014: Synthesis Report*. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland: IPCC.
- Jiang, L. Folmer, H., & Bu, M. (2016). Interaction between Output Efficiency and Environmental Efficiency: Evidence from the Textile Industry in Jiangsu Province, China. *Journal of Cleaner Production*, 113 123-132.
- Karakaya, E., & Ozcag, M. (2005). Driving Forces of CO₂ Emissions in Central Asia: a Decomposition Analysis of Air Pollution from Fossil Fuel Combustion. *Arid Ecosystems Journal*, Vol. 11, No. 26-27, Pages 49-57.
- Kaya, Y., & Yokoburi, K. (1997). *Environment, Energy, and Economy : Strategies for Sustainability*. Tokyo: United Nations Univ. Press.
- Kementerian Energi dan Sumberdaya Mineral – KESDM. (2016a). *Data Inventory GRK Sektor Industri 2016*. Jakarta: Pusat Data dan Teknologi Informasi Energi dan Sumber Daya Mineral.
- _____. (2016b). *Statistik Ketenagalistrikan 2015*. Jakarta: Direktorat Jenderal Ketenagalistrikan.
- _____. (2015). *Data Inventory GRK Sektor Industri 2015*. Jakarta: Pusat Data dan Teknologi Informasi Energi dan Sumber Daya Mineral.
- Kementerian Lingkungan Hidup – KLH. (2012). *Pedoman Penyelenggaraan Inventarisasi Gas Rumah Kaca Nasional, Buku II - Volume 1 Metodologi Penghitungan Tingkat Emisi Gas Rumah Kaca*. Jakarta: KLH.
- Kementerian Lingkungan Hidup dan Kehutanan – KLHK. (2017a). *Statistik Direktorat Jenderal PPI 2016*. Jakarta: Direktorat Jenderal Pengendalian Perubahan Iklim.
- _____. (2017b). *Laporan Inventarisasi GRK dan Monitoring, Pelaporan dan Verifikasi*. Jakarta: Direktorat Jenderal Pengendalian Perubahan Iklim.
- Kementerian Perindustrian – Kemenperin. (2015). *Rencana Induk Pembangunan Industri Nasional 2015-2035*. Jakarta: Pusat Komunikasi Publik.
- _____. (2012a). *Pendalaman Struktur Industri: Efisiensi dan Efektivitas dalam Implementasi Industri Hijau*. Jakarta: Pusat Komunikasi Publik.
- _____. (2012b). *Perencanaan Kebutuhan Energi Sektor Industri Dalam Rangka Akselerasi Industrialisasi*. Jakarta: Biro Perencanaan Kementerian Perindustrian
- _____. (2012c). *Petunjuk Teknis Perhitungan Emisi Gas Rumah Kaca (GRK) di Sektor Industri*. Jakarta: Badan Pengkajian Kebijakan Iklim dan Mutu Industri Kementerian Perindustrian.

- Khalifah, N.A. & Talib, B.A. (2008). Are Foreign Multinationals More Efficient? A Stochastic Production Frontier Analysis of Malaysia's Automobile Industry. *IJMS* 15 (Bumper Issue), pp 91-113.
- Koopmans, T.C. (1951). Analysis of Production as an Efficient Combination of Activities. *Activity Analysis of Production and Allocation*, 36: 27-56.
- Korhonen, P.J., & Luptacik, M. (2004). Eco-Efficiency Analysis of Power Plants: An Extension of Data Envelopment Analysis. *European Journal of Operational Research* 154, 437-446.
- Kumar, S. (2006). Environmentally Sensitive Productivity Growth: A Global Analysis using Malmquist–Luenberger Index. *Ecological Economics* 56 280– 293.
- Kounetas, K. (2015). Heterogeneous Technologies, Strategic Groups and Environmental Efficiency Technology Gaps for European Countries. *Energy Policy*, Volume 83, Pages 277-287.
- Kuosmanen, T., & Kortelainen, M. (2005). Measuring Eco-Efficiency of Production with Data Envelopment Analysis. *Journal of Industrial Ecology* 9, 59-72.
- Lansik, A.O., & Wall, A. (2014). Frontier Model for Evaluating Environmental Efficiency: An Overview. *Economics and Business Letter* 3(1) 43-50.
- Lauwers, L. (2009). Justifying the Incorporation of the Materials Balance Principle into Frontier-Based Eco-Efficiency Models. *Ecological Economics*, 68, 1605–1614.
- Lee, J.W. (2013). The Contribution of Foreign Direct Investment to Clean Energy Use, Carbon Emission, and Economic Growth. *Journal of Energy Policy* 55 (2013) 483-489.
- Letchumanan, R., & Kodama, F. (2000). Reconciling the Conflict between The Pollution Haven Hypothesis and an Emerging Trajectory of International Technology Transfer. *Research Policy* 29 59–79.
- Li, Y., Chiu, Y-H., & Lu, C-H. (2019). Urban Energy Environment Efficiency in China: Based on Dynamic Meta-frontier Slack-based Measures. *JOURNAL OF THE AIR & WASTE MANAGEMENT ASSOCIATION*, VOL. 69, NO. 3, 320–332.
- _____. (2018). Regional Energy, CO₂, and Economic and Air Quality Index Performances in China: A Meta-Frontier Approach. *Energies* 2018, 11, 2119.
- Li, K., & Lin, B. (2015). Metafrontier Energy Efficiency with CO₂ Emissions and its Convergence Analysis for China. *Energy Economics*, 48, 230–241.
- Li, M., & Wang, Q. (2014). International Environmental Efficiency Differences and their Determinants. *Energy*, 78 411-420
- Lin, B., & Chen X. (2019). Evaluating the CO₂ Performance of China's Non-ferrous Metals Industry: A Total Factor Meta-frontier Malmquist Index Perspective. *Journal of Cleaner Production*, volume 209, Pages 1061-1077.

- Lin, B., & Du, K. (2013). Technology Gap and China's Regional Energy Efficiency: A Parametric Metafrontier Approach. *Energy Economics*, 40, 529–536.
- Lin, B., & Tan, R. (2017). China's CO₂ Emissions of a Critical Sector: Evidence from Energy Intensive Industries. *Journal of Cleaner Production*, 142 4270-4281
- Lin, B. & Xu, M. (2018). Regional Differences on CO₂ Emission Efficiency in Metallurgical Industry of China. *Energy Policy*, 120 302–311.
- Lin, E. Y-Y., Chen, P.Y., & Chen, C-C. (2013). Measuring the Environmental Efficiency of Countries: A Directional Distance Function Metafrontier Approach. *Journal of Environmental Management* 119 134-142.
- Lind, D.A., Marchal, W.G., & Wathen, S.A. (2012). *Statistical Technique in Business and Economics*, Fifteenth Edition. USA: McGraw-Hill Irwin.
- Long, X., Zhao, X., & Cheng, F. (2015). The Comparison Analysis of Total Factor Productivity and Eco-Efficiency in China's Cement Manufactures. *Energy Policy* 81 61–66.
- Liu, D.Y., Chiu, C.R., & Liou, J.L. (2017). Environmental Performance Measurement with Technology Heterogeneity: Cross-Region Evidence. *ENERGY SOURCES, PART B: ECONOMICS, PLANNING, AND POLICY*.
- Lovell, C.A.K., Pastor, J.T., & Turner, J.A. (1995). Measuring Macroeconomic Performance in the OECD: A Comparison of European and Non-European Countries. *European Journal of Operation Research*. 87(3), 507–518.
- Luenberger, D.G. (1995). *Microeconomic Theory*. New York, NY: McGraw-Hill.
- Mandal S.K., & Madheswaran, S. (2010). Environmental Efficiency of the Indian Cement Industry: An Interstate Analysis. *Energy Policy* 38:1108–18.
- Manello, A. (2017). Productivity Growth, Environmental Regulation and Win–Win Opportunities: The Case of Chemical Industry in Italy and Germany. *European Journal of Operational Research* 262 733–743.
- _____. (2012). Efficiency and Productivity in Presence of Undesirable Outputs *Ph.D. Thesis*. Faculty of Engineering, University of Bergamo.
- Mardani, A., Zavadskas, E.K., Streimikiene, D., Jusoh, A., & Khoshnoudi, M. (2018). A Comprehensive Review of Data Envelopment Analysis (DEA) Approach in Energy Efficiency. *Renewable and Sustainable Energy Reviews* 70, 1298–1322.
- Margono, H., & Sharma, S. C. (2006). Efficiency and Productivity Analyses of Indonesian Manufacturing Industries. *Journal of Asian Economics*, vol. 17(6), pages 979-995.
- Martinez, C.I.P. (2013). An Analysis of Eco-Efficiency in Energy Use and CO₂ Emissions in the Swedish Service Industries, *Socio-Economic Planning Sciences* 47.
- Martinez-Zarzoso, I, & Bengochea-Morancho, A. (2003). Testing for an Environmental Kuznets Curve in Latin. *Revista de Analisis Economico* Vol 18 No 1.

- Martinez-Zarzoso, I., Bengochea-Morancho, A., & Morales-Lage, R. (2006). The Impact of Population on CO₂ Emissions: Evidence from European Countries. *Nota Di Lavoro* 98.
- Maxime, D., Marcotte, M., & Arcand, Y. (2006). Development of Eco-Efficiency Indicators for the Canadian Food and Beverage Industry. *Journal of Cleaner Production* 14, 636-648.
- Mei, G., Gan, J., & Zhang, N. (2015). Metafrontier Environmental Efficiency for China's Regions: A Slack-Based Efficiency Measure. *Sustainability* 2015, 7, 4004-4021.
- Ministry of Energy and Mineral Resource – MEMR. (2018). *Handbook of Energy & Economic Statistics of Indonesia: Final Edition*. Jakarta: Data and Information Technology on Energy and Mineral Resources.
- Munisamy, S., & Arabi, B. (2015). Eco-Efficiency Change in Power Plants: Using a Slacks-Based Measure for the Meta-Frontier Malmquist-Luenberger Productivity Index. *Journal of Cleaner Production* 105 218-232.
- Nicholson, W., & Snyder C. (2012). *Microeconomics Theory: Basic Principle and Extensions*, 11th edition. USA: Thomson South-Western.
- Neumayer, E. (2004). Examining the Impact of Demographic Factors and Air Pollution. *Population & Environment*, 26(1), 5-21.
- O'Donnell, C.J., Rao, D.S.P., & Battese, G.E. (2008). Metafrontier Frameworks for the Study of Firm-Level Efficiencies and Technology Ratios. *Empirical Economics* 34:231–255.
- Oggioni, G., Riccardi, R., Toninelli, R. (2011). Eco-efficiency of the World Cement Industry: A Data Envelopment Analysis. *Energy Policy*, 39 2842–2854.
- Oh, D-H, & Lee, J-D. (2010). A Meta-frontier Approach for Measuring Malmquist Productivity Index. *Empirical Economics* 38, 47–64.
- Organization for Economic Co-operation and Development – OECD. (1998). *Eco-Efficiency*. Paris: OECD.
- Pearce, D.W., & Turner, R.K. (1990). *Economics of Natural Resources and The Environment*, New York: Harvester Wheatsheaf.
- Panayotou, T. (1993). Empirical Test and Policy Analysis of Environmental Degradation at Different Stage of Economic Development. *Working Paper* WP238, Technology and Employment Programme, International Labor Office, Geneva.
- Perman, R., Ma, Y., McGilvray, J., & Common, M. (2003). *Natural Resource and Environmental Economics*. USA: Pearson.
- Pérez, K., González-Araya, M.C., & Iriarte, A. (2017). Energy and GHG Emission Efficiency in the Chilean Manufacturing Industry: Sectoral and Regional Analysis by DEA and Malmquist Index. *Energy Economics* 66 (2017) 290–302.

- Peyrache, A., & Coelli T. (2009). A Multiplicative Directional Distance Function, *CEPA Working Paper N*, WP02/2009 1, University Of Queensland.
- Picazo-Tadeo, A.J., Beltran-Esteve, M., & Gomez-Limon, G.A. (2012). Assessing Eco-Efficiency with Directional Distance Functions. *European Journal of Operational Research* 220 798–809.
- Picazo-Tadeo, A.J., Gomez-Limon, G.A., & Reig-Martinez, E. (2011). Assessing Farm Eco-Efficiency: Data Envelopment Analysis Approach. *Journal of Environmental Management* 92 1154–1164.
- Picazo-Tadeo, A.J., Martinez-Reig., & Hernandez-Sancho, F. (2005). Directional Distance Functions and Environmental Regulation. *Resource and Energy Economics* 27, 131–142.
- Picazo-Tadeo, A.J., & Prior. (2009). Environmental Externalities and Efficiency Measurement. *Journal of Environmental Management*, 90 3332–3339
- Pittman, R.W. (1983). Multilateral Productivity Comparisons with Undesirable Outputs. *Economic Journal* 93:883–891.
- Ramli, N.A., & Munisamy, S. (2003). **Modeling Undesirable Factors in Efficiency Measurement Using Data Envelopment Analysis: A Review.** *Journal of Sustainability Science and Management* Volume 8 Number 1 126-135.
- Rao, D.S.P., O'Donnell, C.J., & Battese, G.E. (2003). Metafrontier Functions for the Study of Interregional Productivity Differences. *Working Paper Series* No. 01/2003. Centre for Efficiency and Productivity Analysis, School of Economics University of Queensland, Australia.
- Rashidi, K., & Saen, R.F. (2015). Measuring Eco-Efficiency based on Green Indicators and Potentials in Energy Saving and Undesirable Output Abatement. *Energy Economics* 50 18-26.
- Reinhard, S., Lovell, C.A.K., & Thijssen, G.J. (2000). Environmental Efficiency with Multiple Environmentally Detrimental Variables: Estimated with SFA and DEA, *European Journal of Operational Research*, 121, 287–303.
- Reinhard, S., Lovell, C.A.K., & Thijssen, G.J. (1999). Econometric Estimation of Technical and Environmental Efficiency: An Application to Dutch Dairy Farms. *American Journal of Agricultural Economics* 81, 44–60.
- Republik Indonesia. (2014). *Undang-Undang Nomor 3 Tahun 2014 tentang Perindustrian*. Jakarta: Republik Indonesia.
- _____. (2009). *Undang-Undang Nomor 32 Tahun 2009 tentang Perlindungan Pengelolaan Lingkungan Hidup*. Jakarta: Republik Indonesia.
- Revesz, R.L. (1992). Rehabilitating interstate-competition: rethinking the 'race to The bottom'. *New York University Law Review* 67, 1210–1254.
- Robaina-Alves, M., Moutinho, V., & Macedo, P. (2015). A New Frontier Approach to Model the Eco-Efficiency in European. *Journal of Cleaner Production* 103 562-573.

- Rosa, E.A., & York, R. (2002). Internal and External Sources of Environmental Impacts: A Comparative Analysis of The EU with OTHER Nation Groupings. *National Europe Centre Paper* No. 22.
- Sari, D.W., Khalifah, N.A., & Suyanto, S. (2016). The Spillover Effects of Foreign Direct Investment on the Firms' Productivity Performances. *Journal of Productivity Analysis* 46:199–233.
- Schaltegger, dalam Zhang, B., Bi, J., Fan, Z., Yuan, Z., & Ge, J. (2008). Eco-Efficiency Analysis of Industrial System in China: A Data Envelopment Analysis Approach. *Ecological Economics* 68 306-316.
- Scheel, H. (2001). Undesirable Outputs in Efficiency Valuations. *European Journal of Operational Research* 132, 400-410.
- Seiford, L.M., & Thrall, R.M. (1990). Recent Developments in DEA: The Mathematical Programming Approach to Frontier Analysis. *Journal of Econometrics* 46, 7–38.
- Seppälä, J., Melanen, M., Mäenpää, I., Koskela, S., Tenhunen, J., & Hiltunen, M.R. (2005). How Can the Eco-Efficiency of a Region be Measured and Monitored? *Journal of Industrial Ecology* 9,117–130.
- Setiawan, M., Emvalomatis, G., & Lansink, A.O. (2012). The Relationship between Technical Efficiency and Industrial Concentration: Evidence from the Indonesian Food and Beverages Industry. *Journal of Asian Economics* 23 466-475.
- Shao, Y., & Wang, S. (2016). Productivity Growth and Environmental Efficiency of the Nonferrous Metals Industry: an Empirical Study of China. *Journal of Cleaner Production* 137 1663-1671.
- Shephard, R.W. (1970). *Theory of Cost and Production Functions*. Princeton: Princeton University Press.
- Shephard, R.W., & Färe, R. (1974). The Law of Diminishing Returns. *Zeitschrift für Nationalökonomie* 34, 69–90.
- Shiwanthi, S., Lokupitiya, E., & Peiris, S. (2018). Evaluation of the Environmental and Economic Performances of Three Selected Textile Factories in Biyagama Export Processing Zone Sri Lanka. *Environmental Development* 27 70–82.
- Song, M., An, Q., Zhang, W., Wang, Z., & Wu, J. (2012). Environmental Efficiency Evaluation based on Data Envelopment Analysis: A review. *Renewable and Sustainable Energy Reviews* 16 4465–4469.
- Stern D. (2004). The Rise and Fall of the Environmental Kuznets Curve. *World Development* Vol.32, n.8, pp.1419-38
- _____. (2002). Analysis Explaining Changes in Global Sulfur Emissions: An Econometric Decomposition Approach. *Ecological Economics* 42 201-220.

- Sueyoshi, T., & Goto, M. (2011). Methodological Comparison between Two Unified (Operational and Environmental) Efficiency Measurements for Environmental Assessment, *European Journal of Operational Research* 210, 684-693.
- Sueyoshi, T., Goto, M., & Ueno, T. (2011). Performance Analysis of US Coal-Fired Power Plants by Measuring Three DEA Efficiency. *Energy Policy* 38, 1675-1688.
- Sun, S. (2006). Technical Efficiency and Its Determinants in Gansu, West China. *Pacific Economic Papers* No. 355, 2006. Canberra: Australia-Japan Research Centre.
- Suyanto, Salim, R.A., & Bloch, H. (2009). Does Foreign Direct Investment Lead to Productivity Spillovers? Firm Level Evidence from Indonesia. *World Development* Volume 37, Issue 12, Pages 1861-1876.
- Taskin, F., & Zaim, O. (2001). The Role of International Trade on Environmental Efficiency: a DEA Approach. *Economic Modelling* 18 1-17.
- Tone, K. (2001). A Slacks-Based Measure of Efficiency in Data Envelopment Analysis. *European Journal of Operational Research*, 130: 498-509.
- Tyteca, D. (1997). Linear programming Models for The Measurement of Environmental Performance of Firms-Concepts and Empirical Results, *Journal of Productivity Analysis*, 8, 183-197.
- _____. (1996). On the Measurement of the Environmental Performance of Firms: A Literature Review and a Productive Efficiency Perspective, *Journal of Environmental Management*, 46, 281-308.
- United Nations Development Programme – UNDP. (2018). Sustainable Development Goals. (online) diakses pada <http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-13-climate-action.html>.
- Villano, R., Boshraadi, H.M., & Fleming, E. (2010). When Is Metafrontier Analysis Appropriate? An Example of Varietal Differences in Pistachio Production in Iran. *Journal of Agricultural Science and Technology*, Vol. 12: 379-389 379.
- Wang, J., & Zhang, K. (2014). Convergence of Carbon Dioxide Emissions in Different Sectors in China. *Energy* 65 605-611.
- Wang, Q., & Poh, K.L. (2014). A Survey of Integrated Decision Analysis in Energy and Environmental Modeling. *Energy* 77 691-702.
- Wang Q, Chiu, Y-H, Chi, & C-R. (2017). Non-radial Metafrontier Approach to Identify Carbon Emission Performance and Intensity. *Renewable and Sustainable Energy Reviews* 69 664-672.
- Wang, Q., Su, B. Sun, J., Zhou, P., & Zhou, D. (2015a). Measurement and Decomposition of Energy-Saving and Emissions Reduction Performance in Chinese Cities. *Applied Energy*, 151 85-92.

- Wang, Q., Zhao, Z., Shen, N., & Liu, T. (2015b). Have Chinese Cities Achieved the Win-Win between Environmental Protection and Economic Development? From the Perspective of Environmental Efficiency. *Ecological Indicators*, 51, 151–158.
- Wang, Q., Zhou, P., Ge, S., & Zhao, Z. (2013). An International Comparison of Carbon Dioxide Emission Performance Using the Nonparametric Metafrontier Approach. *Pol. J. Environ. Stud.* Vol. 23, No. 3, 923-931
- Watanabe, M., & Tanaka, K. (2007). Efficiency Analysis of Chinese Industry: A Directional Distance Function Approach. *Energy Policy* 35 6323–6331.
- Winarno, O. T. (2013). *Panduan Perencanaan Energi*. Bandung: Pusat Kajian Kebijakan Energi Institut Teknologi Bandung.
- _____. (1992). *World Development Report 1992*. Washington D.C: International Bank for Reconstruction and Development.
- World Business Council for Sustainable Development – WBCSD. (2000). *Measuring Eco-efficiency: A Guide to Reporting Company Performance*. Geneva: WBCSD.
- World Resources Institute – WRI. (2018). (online) diakses pada <https://www.climatewatchdata.org/>.
- Wu, R., Zhang, J., Bao, Y., Lai, Q., Tong, S., & Song, Y. (2016). Decomposing The Influences Factors of Industrial Sector Carbon Dioxide Emissions in Inner Mongolia Based on The LMDI Method. *Sustainability* 8, 661 1-14.
- Wursthorn, S., Poganietz, & W.R., Schebek, I. (2011). Economic–Environmental Monitoring Indicators for European Countries: A Disaggregated Sector-Based Approach for Monitoring Eco-efficiency. *Ecological Economics* 70 487–496.
- Xie, H., Shen, M., & Wei, C. (2016). Technical Efficiency, Shadow Price and Substitutability of Chinese Industrial SO₂ Emissions: A Parametric Approach. *Journal of Cleaner Production* 112 1386-1394.
- Xing, C., & Kolstad, Y. (2002). Do Lax Environmental Regulations Attract Foreign Investment? *Environmental and Resource Economics* 1–22.
- Yang, L., & Pollitt, M. (2009). Incorporating both Undesirable Outputs and Uncontrollable Variables into DEA: The Performance of Chinese Coal-Fired Power Plants. *European Journal of Operational Research* 197 1095–1105.
- Yang, L., & Wang, K.L. (2013). Regional Differences of Environmental Efficiency of China’s Energy Utilization and Environmental Regulation Cost based on Provincial Panel Data and DEA Method. *Mathematical and Computer Modelling* 58 1074–1083.
- Yao, X., Zhou, H., Zhang, A., & Li, A. (2015). Regional Energy Efficiency, Carbon Emission Performance and Technology Gaps in China: A Meta-frontier Non-radial Directional Distance Function Analysis. *Energy Policy*, 84, 142–154.

- Yu, C., Shi, L., Wang, Y., Chang, Y., & Cheng, B. (2016). The Eco-Efficiency of Pulp and Paper Industry in China: an Assessment based on Slacks-Based Measure and Malmquist-Luenberger index. *Journal of Cleaner Production* 127 511-521.
- Yuan, P., Cheng, S., Sun, J., & Liang, W. (2013). Measuring the Environmental Efficiency of the Chinese Industrial Sector: A Directional Distance Function Approach. *Mathematical and Computer Modelling* 58 936-947.
- Zaim, O. (2004). Measuring Environmental Performance of State Manufacturing through Changes in Pollution Intensities: A DEA Framework. *Ecological Economics* 48 37-47.
- Zhang, N., & Choi, A. (2014). Note on the Evolution of Directional Distance Function and Its Development in Energy and Environmental Studies 1997-2013. *Renewable and Sustainable Energy Reviews* 33 50-59.
- _____. (2013). Environmental Energy Efficiency of China's Regional Economies: A Non-Oriented Slacks-Based Measure Analysis. *Social Science Journal* 50:225-34.
- Zhang, N., & Choi, Y. (2013a). Total-Factor Carbon Emission Performance of Fossil Fuel Power Plants in China: A Metafrontier Non-radial Malmquist Index Analysis. *Energy Economics*, 40, 549-559.
- _____. (2013b). A Comparative Study of Dynamic Changes in CO₂ Emission Performance of Fossil Fuel Power Plants in China and Korea. *Energy Policy*, 62, 324-332.
- Zhang, B., Bi, J., Fan, Z., Yuan, Z., & Ge, J. (2008). Eco-Efficiency Analysis of Industrial System in China: A Data Envelopment Analysis Approach. *Ecological Economics* 68 306-316.
- Zhang, N., Zhou, P., & Choi, Y. (2013). Energy Efficiency, CO₂ Emission Performance and Technology Gaps in Fossil Fuel Electricity Generation in Korea: A Meta-Frontier Non-Radial Directional Distance Function Analysis. *Energy Policy* 56:653-62.
- Zhou, P., Ang, B.W., & Poh, K.L. (2008). A Survey of Data Envelopment Analysis in Energy and Environmental Studies. *European Journal of Operational Research* 189 (2008) 1-18.
- _____. (2006). Slacks-Based Efficiency Measures for Modeling Environmental Performance. *Ecological Economics*, 60: 111-118.
- Zhou, P., Ang, B.W., & Wang, H. (2012). Energy and CO₂ Emission Performance in Electricity Generation: A Non-Radial Directional Distance Function Approach. *European Journal of Operational Research* 221:625-35.
- Zofio, J.L., & Prieto, A.M. (2001). Environmental Efficiency and Regulatory Standards: The Case of CO₂ Emission from OECD Industries. *Resources and Energy Economics* 23 63-83.