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Validating a second-order model for oil and gas projects’ investment climate scale

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Abstract
Purpose – The investment climate is one of the key factors considered by foreign investors while deciding their investment destination. This paper aims to attempt at validating the second-order model of oil and gas projects’ investment climate. Examination of the relationship between the dimensions of oil and gas projects’ investment climate; strategy, participants/operating environment and risk/return; and the overall latent construct was conducted. The study also evaluates the goodness of fit of the second-order model using relevant fit indices.

Design/methodology/approach – Oil and gas experts in Malaysian marginal oil fields subsector were deployed, through whom responses were collected that formed the data set used in the analysis. Then, the data were used for confirmatory factor analysis, evaluation of the second-order model through path analysis and for model fit evaluation.

Findings – The finding revealed that the second-order model of oil and gas projects’ investment climate is valid and reliable. It also revealed that all the three dimensions, strategy, participants/operating environment and risk/return, have significant effects on the formation of the oil and gas projects’ investment climate. Finally, the goodness of fit of the second-order model satisfied the relevant fit indices.

Research limitations/implications – The findings present valuable insights to policymakers on the extent of the influence each of the dimensions has on the overall latent construct. The validity and reliability analysis suggests the measurements of the second-order model of oil and gas projects’ investment climate construct, and its dimensions are valid, reliable and fit for future empirical research. Thus, it calls for replication in other oil and gas settings.

Originality/value – The findings from the results of this study are pioneering. Extant literature falls short in attempting the validation of the second-order oil and gas projects’ investment climate scale, as well as relating each of the dimensions with the overall latent construct.

Keywords Confirmatory factor analysis, Path analysis, Model fits, Oil and gas development projects, Path modelling

Paper type Research paper

1. Introduction
Extant literature has comprehensively examined the relevance of the investment climate in attracting foreign direct investment (FDI), influencing total factor productivity (TFP) and firms’ performance (FP). Available evidence put it that investment climate strongly predicts inflow of FDI into a country. In fact, investment climate was recognized as the third most

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important factor that influence investment location decision in about 30,000 FDI projects recorded in FDI markets’ database (Hornberger et al., 2011). This point stressed that facilitating FDI inflow in developing and transition economies required investment climate favorable to potential investors. Categorically, it was stated that a positive association exists between investment climate and an increase in FDI inflow (Phillips, 2006). Investment climate has been described as one of the important factors that matters most in investment location decisions of foreign investors (Mukim and Numnenkamp, 2012). When determining appropriate policy direction for attracting FDI in developing countries, consideration needs to be made to country’s investment climate. In a specific term, the influence of investment climate was found to be higher than that of other determinants of FDI. In that, it was found that the influence of tax reduction on FDI inflow was eight times greater in countries with favorable investment climate (James, 2009). Sekkat and Veganzones-Varoudakis (2007) in their analysis stressed that investment climate is a particular construct that enhances the attraction of FDI into a particular nation. A synthesis of data from Sekkat and Veganzones-Varoudakis revealed that a greater openness is less essential in increasing FDI compared economic and political risks as well as an infrastructural endowment which are investment climate indicators. A finding from a firm-level data in about 77 nations revealed that financing constraints, infrastructures and institutional problems that cumulatively measure investment climate have adverse effects on the inflow of FDI (Kinda, 2010). This finding could not be surprising, as it comes mainly from developing countries with weaker investment climate indicators compared to transition and developed nations. In his analysis, Bayraktar (2013) reported that attracting investors is more likely by countries with good records of “doing business” than otherwise. Thus, inferences can be made that when business is made easier in developing countries, it could have partial explanatory power in predicting higher FDI inflows. It was also asserted that investment climate is a predictor of firm’s TFP (Trung and Cuong, 2010; Kinda et al., 2011; Escribano and Guasch, 2012; Escribano and Guasch, 2005). It also predicts FP (Tran and Keishiro, 2012; Hallward-Driemeier et al., 2006). Notwithstanding its relevance in predicting firms’ TFP and performance, only recently, investment climate was given the required attention by researchers through empirical and theoretical examination (Sekkat and Veganzones-Varoudakis, 2007), thus needing further exploration.

Being a modern-day determinant of FDI, only recently, investment climate was integrated into FDI estimation models (Sekkat and Veganzones-Varoudakis, 2007). As a construct, investment climate has no precise definition (Hallward-Driemeier et al., 2006). Early scholars such as Stern and Stern (2002) defined it as a prevailing and expected behavioral, policy and institutional factors that affect investment’s risks and returns. Exchange rate, monetary and fiscal procedures are what refer to as policy factors. Bureaucracy, legal and financial and systems are what classified as institutional factors, whereas issues relating to basic infrastructures such as communication, electricity and transport networks that shape investors’ behavior are categorized as behavioral factors. The concept of investment climate has also been explained in broader term with many factors covering legal, physical and political issues that make a country preferred investment destination by foreign investors, and also encourage domestic entrepreneurs irrespective of their sizes to invest at home (Phillips, 2006). In a World Bank’s report, investment climate was described as location-specific factors that motivate investors through incentives and opportunities to profitably invest, develop and create jobs opportunities (Mundial, 2004). Inferences can be made from this definition that investment climate leads to increased investment resulting from incentives and opportunities it proffered to potentials investors, which in essence may result to rise in profitability and expansion of benefited firms. For Hallward-Driemeier (2005), investment climate was
considered critical factors relating to access to finance, bureaucracy, corruption and infrastructure. Differently, Ho (2006) considered investment climate as a construct measured with two dimensions comprising policy and resources. From Ho’s definition, resources may be regarded as infrastructures such as communication, electricity and transport as well as other important factors that influence investment location, while policy, on the other hand, refers to as the regulations and procedures that govern the conduct of investors. More recently, 11 indicators were explored in understanding the investment climate in the bio-based industry. These indicators cover consortium structures, food safety regulation, investors’ enlightenment, infrastructure, public procurement, policy, research and development funding, federal financing, regulations, standards and tax policy (Dammer and Carus, 2014). Therefore, a conclusion can be made that investment climate is a construct operationalized with some dimensions mainly relating corruption, infrastructure, policy and regulations.

Although many have written on the influence of investment climate on FDI, TFP, and FP, only a few comprehensive measures exist in the extent literature (Hallward-Driemeier et al., 2006), and still with inconsistency. In fact, the claim has been made that while comprehensive range measures of investment climate exist, the approaches for measuring the construct are divergent (Silva-Leander, 2005; Smith and Hallward-Driemeier, 2005, Hallward-Driemeier et al., 2006). Toward developing measures of the investment climate, World Bank can be said to be the first that carried a survey in 2001 which covered more than 50,000 firms in about 70 countries globally (Hallward-Driemeier, 2005). Onward, the World Bank carries additional 15-20 surveys every year. The original questionnaire contains 82 standard questions on investment perceptions relating to four main dimensions including access to finance, governance, infrastructure and regulations. Following the World Bank survey, Hallward-Driemeier carried out investment climate survey in 2005 that covered five indicators: corruption, government efficiency, political stability, regulatory quality and the rule of law. The World Bank empirical evidence in that year revealed that investment climate can be measured using 14 indicators in a survey which covered about 26,000 firms in 56 countries. The indicators are accessed to finance and cost of doing business, crime, corruption, economic instability, policy uncertainty, land access, the legal system, regulations, tax rate, transportation and telecommunication (Smith and Hallward-Driemeier, 2005). In the following year, some criticisms were made by Hallward-Driemeier et al. (2006) on the measures used in World Bank report. First, it was criticized that elicitation of honest responses may seem difficult considering the sensitivity of some questions relating to bribery and corruption. Second, some measures relate to individual firms instead country-level investment climate; thus, aggregation become necessary as firms have the varying pace of growing. Finally, the measures were designed on the implicit assumption that the measurement of investment climate is uniform among countries which in reality is not the case. In resolving the aforementioned criticisms, Hallward-Driemeier et al. (2006) developed firm-level measurement of investment climate with four dimensions:

1. infrastructure measured using loss caused by lack of power or transport, and employees that have access to the computer;
2. firm regulatory burden measured by time spent dealing with the government inspectors;
3. corruption measured using bribe paid as a percentage of sales or bribe paid to secure contract; and
4. access to finance measured using firm’s access to bank loan.
Dollar et al. (2006) also used the four dimensions of Hallward-Driemeier et al. (2006) in their investment climate measurement with little modification in the application of the measurement proxies. Infrastructure was measured using losses occurred due to power losses. The regulation was measured using days to clear goods through customs. Corruption was measured using inefficient government services, and finally, access to overdraft was used as a proxy to access to finance. Likewise, Escribano and Guasch (2005) also used similar dimensions in measuring investment climate:

- red-tape, corruption and crime (four indicators);
- infrastructure (three indicators);
- indicator, quality, innovation and labor skills (five indicators); and
- finance and corporate governance (two indicators).

Differently, Sekkat and Veganzones-Varoudakis (2007) measured investment climate using three indicators: infrastructure measured by the telephone network, political risks measured by country political stability risks and economic risks measured by country’s current economic strength and weaknesses. Specific measures of investment climate were used by Kinda et al. (2011) in manufacturing sector using six dimensions proposed in World Bank Report. However, lack of data limits Kinda’s (2010) analysis of only four dimensions:

1. infrastructural quality measured by electricity, transport, telecommunication and internet;
2. business–government relationship measured by tax rate, administration, regulation, licensing, corruption;
3. financial constraints measured using access to capital financing, cost and queueing in accessing credit and overdraft; and
4. human capacity was measured using proxies such as education level, skill, training and experience.

In the following year, Escribano and Guasch (2012) used a more robust measure of investment climate by updating the study of Escribano and Guasch (2005). Though the dimensions remained the same, however, indicators used for each of the dimensions were increased. Improvements were made to measures used in each of the four dimensions used in 2005. For instance, red-tape, corruption and crime which was measured using four indicators were improved to six indicators. Infrastructure which was measured using three indicators was upgraded to seven indicators. Quality, innovation and labor skills which were measured using five indicators was transformed to ten indicators. Finally, finance and corporate governance which was measured using two indicators was upgraded to six indicators.

To explore whether a difference exists between objective and subjective measures of the investment climate, Aterido and Hallward-Driemeier (2007) used the combination of objective and subjective measures. In each case, four dimensions were considered: access to finance, corruption, infrastructure and regulation. Interestingly, no significant statistical difference was found in the results of both subjective and objective measures. Thus, it can be deduced that both measures can be used in analyzing investment climate.

Review of extant literature showed that measures of investment climate can be industry or sector specific, with each industry or sector having its appropriate measurements. Most of the measures discussed above are of general application more especially services and manufacturing sectors. However, other industries and sectors have their particular measures of investment climate as evidenced in the literature. For instance, in the agricultural
subsector, Trung and Cuong (2010) used seven items in measuring investment climate: administrative clearance time; the age of the firm; certification of clean production, educated labor, infrastructure and utility services; market competition; and time of land rent allowed. Similar measures with different proxies with little modification were used in ago-enterprises subsector by Tran and Keishiro (2012) in measuring investment climate. Dammer and Carus (2014) used 11-point indicators in measuring investment climate in the bio-based industry, including consortium structures, food safety regulation, public funding, investors’ enlightenment, research and development funding, government procurement, policy, standards, regulations tax policy and infrastructure. Four dimensions were used in measuring investment climate in European real estate property subsector (Union Investment, 2014). These dimensions cover market expectation, public environments, location factors and market structures. The conclusion can be made that measures of investment climate are sector specific with each having relatively proper measurements.

Therefore, similar to others, oil and gas sector has its appropriate investment climate measures which initially emerged from the study of Zanoyan (2005) who first presented the idea in an oil and gas conference in 2004. Vahan Zanoyan, who was a President/CEO of a Washington-based Petroleum Finance Company, proposed a 10-point indicators for evaluating investment climate oil and gas sector projects in a country. The 10-point measure developed by Zanoyan includes energy policy, sector strategy, the effectiveness of National Oil Company (NOC), the role of International Oil and Gas Companies (IOGC), NOC/IOGC linkage, investment motivation of IOGC, clarity and transparency, bureaucracy, fiscal regime and realistic geological potentials. While Zanoyan made a reasonable effort in developing the criteria for evaluating oil and gas project investment climate, an extensive review of the literature showed that academic validation of such measures using second-order model lacks in the extant literature. However, industry effort has been made by experts in improving Zanoyan’s measures. The most notable effort in improving the Zanoyan’s measures was made by South East Asian energy consulting company known as Risco Energy Investments Limited. The company conducted four surveys over the period of 2005 to 2013 among South East Asian Oil Producing Countries using the 10-point indicators proposed by Zanoyan, which comprehensively defined oil and gas project investment climate (Graham, 2013). It is worth noting that a significant improvement made by Risco Energy was dividing Zanoyan’s 10-point indicators into four dimensions. The dimensions are:

1. strategy measured by energy policy, strategy, effectiveness of NOC and role of IOGC;
2. participation measured by NOC/IOGC linkage and investment motivation of IOGC. These are followed by;
3. operating environment measured by clarity and transparency and bureaucracy; and
4. risk and reward measured by the fiscal regime and geological potentials.

Despite this remarkable improvement, it is important to note that the second-order model of Zanoyan’s ten-point indicators, which can explain the extent to which each of the dimensions contributes to the overall latent construct (oil and gas projects’ investment climate) is yet to be empirically validated.

In line with the preceding discussions, three factors motivate this study. First, evaluation of investment climate can be made using either subjective and objective measures or both. The use of subjective or perception-based measures can be supported by the assertion of Graham’s (2013) that “perceptions drive investment decisions in oil and gas industry” which implied the appropriateness of perception-based measures in evaluating oil and gas projects’
Despite the suitability of perception-based measurements in evaluating investment climate, many earlier researchers used objective measures (Hallward-Driemeier et al., 2006; Escribano and Guasch, 2012; Escribano and Guasch, 2005; Dollar et al., 2006). Only a few, such as Dammer and Carus (2014) who used subjective measures, thus imply the need for more additional evidence on subjective measures of investment climate. Second, evidence has been witnessed in the literature that measures of investment climate are industry specific; this implied the need for validation of oil and gas projects’ investment climate so that it can have its different measurements in academic literature. Finally, dimensions have been proposed by Graham (2013) for oil and gas sector projects’ investment climate. However, a second-order model which can explain the contribution of each dimension to the overall latent construct using standardized regression weight (Botetzagias et al., 2015) is not yet empirically validated. Thus, there is a need for validation of a second-order model of oil and gas projects investment climate scale.

In line with three motivations mentioned above, the objectives of the paper are threefold. First, to evaluate the reliability and validity of the second-order oil and gas projects’ investment climate scale through internal consistency reliability, and convergent and discriminant validities (Hair et al., 2013, 2007). Second, to evaluate the contribution of each of the dimensions of oil and gas projects’ investment climate to the overall latent construct of investment climate to enable the understanding of which of the dimensions has the greatest contribution to the overall latent construct (Botetzagias et al., 2015). Finally, to evaluate the model goodness of fit for the second-order oil and gas projects’ investment climate scale using relative fit indices in line with Jöreskog (1967, 1969).

2. Materials and methods

2.1 Instrumentation and data collection

Ten items developed by Zanoyan (2005) that measure oil and gas projects’ investment climate was used. The items were modified in line with their operationalization by Graham (2013). The items form part of a questionnaire that contained 69 items for a Malaysian Fundamental Research Grant Scheme (FRGS) number 12,930 on marginal oil fields development projects. For all the ten items, seven-point Likert scale was used as measurement format. These ranges from (1) strongly disagree, (2) disagree, (3) somewhat disagree, (4) neutral, (5) somewhat agree, (6) agree and, finally, (7) strongly agree.

The instrument was then sent to 361 potential respondents who are relevant in responding to the questionnaires. Specifically, Oil and Gas Accountants, Auditors, Tax Consultants, Business Development Managers and Contract Managers formed the categories of the respondents in 16 institutions in three clusters (i.e. government, industry and practitioners). For the government cluster, four government institutions were considered. For industry, eight private oil companies were considered. Finally, for practitioners, four accounting firms that audit the accounts of marginal oil fields investors were used. It is important noting that all the institutions are related to marginal oil fields, directly or indirectly. The response of 120 valid questionnaires was collected of 361 distributed.

2.2 Operationalization of measures

Item one is energy policy which was operationalized as whether key stakeholders were engaged in formulating a policy for marginal fields’ development projects. The fact is that engagement of key stakeholders can be a signal to investors that openness exists in the policy making procedures. Item two is sector strategy which was operationalized as the extent to which marginal oil fields development strategy is coherent, i.e. it is consistent over time to enable stability in projects’ development. Item three is the effectiveness of NOC
measured as the extent to which the NOC is effective in implementing projects’ development strategy. Item four is role play by POCs in the strategy which was operationalized as the extent to which POCs are clearly stated in the oil and gas projects’ development strategy. The fifth is NOC/POC linkage which was operationalized as the extent to which clarity exist the project’s operating linkage between NOC and POCs. Item six is investment motivation of POC, which was measured as the degree to which investors are motivated to invest in marginal oil fields development projects. Item seven is clarity and transparency by operating arrangement which was measured as the extent to which the processes in projects’ operating arrangement are clear and transparent. Item eight is bureaucracy which was measured as the degree to which officialdom hurdle are simplified or eliminated in the marginal oil fields’ projects’ contractual arrangements. Item nine is a fiscal regime which was operationalized as the extent to which the NOCs offer competitive economic terms to encourage investment into marginal oil fields’ development projects. Finally, item ten is a realistic assessment of geological potential measured as the extent to which NOC made a realistic evaluation and publication of the commercial prospects of the marginal oil fields’ development projects. Full measures are contained in Appendix.

2.3 Data screening methods
The study used our steps in screening the data which include identification and replacing missing data and test of normality. Others steps are test for response bias and one-way ANOVA to examine whether there is a difference in the mean responses of the three respondent’s groups (government, industry and practitioners).

The outcome of the above steps showed that all the missing data were identified and replaced using series mean in line with Sekaran (2003). Test of normality using skewness and kurtosis showed that the data are normally distributed, as the values are all less than ±1 (Hair et al., 2013). The response-bias test conducted in line with Armstrong and Overton (1977) showed that there is no difference between early and late responses. Finally, the result of one-way ANOVA indicated that there are no significant mean differences among the three groups of respondents (government, industry and practitioners).

2.4 Analytical procedures
Validity and reliability of the second-order model, as well as the evaluation of the significant contribution of each dimension to the overall latent construct (investment climate) using standardized regression weight, were performed via PLS-SEM version 3.0. The model fit evaluation of the second-order oil and gas projects’ investment climate scale was analyzed using Amos version 22.0.

3. Analysis and results
The validity and reliability of the second-order model for oil and gas investment climate scale which was evaluated using PLS-SEM version 3.0 are presented. By fitting the second-order confirmatory factor analysis (CFA) model and estimating the standardized regression weights, we are able to understand the particular effect of each dimension to the overall latent construct. This was performed through PLS-SEM version 3.0 and presented here. Finally, the model fit of the second-order model was also evaluated by suitable goodness-of-fit measures using Amos version 22.0 as presented below.

3.1 Validity and reliability of the second-order oil and gas projects’ investment climate scale
To further confirm the factorability of oil and gas projects’ investment climate into three dimensions, validity and reliability analysis were performed. Reliability of the dimensions was evaluated using composite reliability (CR) while validity assessed using convergent and
discriminant validities. For assessing convergent validity, average variance extracted (AVE) was used, while square-root of AVE was used for the evaluation of discriminant validity. The result is presented in Table II.

From Table I, it is evident that the square root of AVE of each of the overall latent construct and the three dimensions are higher than the constructs' highest correlation with any other latent construct, thereby satisfying the discriminant validity requirement in line with Hair et al. (2011). It is also evident that both the latent construct as well as its dimensions satisfied the convergent validity requirement, as the AVE of each is higher than the required minimum value of 0.50. Specifically, the AVE of strategy is 0.739, participants/operating environment is 0.743, risk/reward is 0.777 and that of overall oil and gas project investment climate latent construct is 0.550. Moreover, the internal consistency reliability measured by CR is also good, as it is higher than the minimum value of 0.70. Specifically, the CR of strategy is 0.850 that of participants/operating environment 0.935, risk/rewards 0.913 and overall oil and gas project investment climate 0.923. In essence, all the dimensions, as well as the overall latent construct, can be said to meet the required validity and reliability requirements.

3.2 Evaluation of second-order model
Having identified three dimensions of oil and gas projects’ investment climate scale that meet the required validity and reliability requirements, the study proceeded with the examination of the extent to which each of the dimension associated with or contributed to the overall latent construct (oil and gas projects investment climate) which is in line with Botetzagias et al. (2015). The second-order model is presented in Figure 1.

From the standardized regression coefficients in Figure 1, it can be seen that all the three dimensions contributed significantly to the formation of oil and gas projects’ investment climate scale at 0.001 level of significance.

3.3 Model fit evaluation
It is evident that the second-order oil and gas projects’ investment climate scale is valid and reliable. Moreover, model-fit of the second-order model was evaluated using relevant indices as contained Table II. Fitting the model was performed by correlating the three dimensions of oil and gas projects investment climate.

The result of the model fit for the second-order model revealed an adequate fit that RMSEA for model fit is 0.086, which is within the threshold of 0.00 to 0.1 (Planing, 2014). TLI and CFI for model comparison are 0.936 and 0.955, respectively, which are higher than the minimum threshold of 0.9 (Planing, 2014). NC ratio for model parsimony is 1.886 which is within the threshold of 1-5 (Schermelleh-Engel et al., 2003). Therefore, the conclusion can be made that the second-order model for oil and gas project investment climate scale satisfied the required validity and reliability requirements.

<table>
<thead>
<tr>
<th>Construct/dimensions</th>
<th>Investment climate</th>
<th>Discriminant validity</th>
<th>Convergent validity</th>
<th>Reliability</th>
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<td>Participants/operating</td>
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<td>environment</td>
<td>Risk/Return</td>
<td>AVE CR</td>
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<tr>
<td>Investment climate</td>
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<td>0.862</td>
<td>0.743 0.935</td>
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<tr>
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<td>0.869</td>
<td>0.882</td>
<td>0.777 0.913</td>
</tr>
<tr>
<td>Risk/Return</td>
<td>0.694</td>
<td>0.559</td>
<td>0.458</td>
<td>0.739 0.850</td>
</tr>
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the model goodness of fit indices in line with the available minimum requirements (Schermelleh-Engel et al., 2003; Planing, 2014).

4. Discussions
It can be recalled that the study intended to achieve three key objectives. First, testing the reliability and validity of second-order oil and gas projects’ investment climate scale through internal consistency reliability as well as convergent and discriminant validities; second, to evaluate the second-order model of oil and gas projects’ investment climate to enable the understanding of the contribution of each of the dimensions to the overall latent construct; and finally, to evaluate the model fit of the second-order oil and gas projects’ investment climate scale using relevant model fit indices.

Therefore, the result validity and reliability revealed a good construct convergent validity using AVE. The result of the constructs’ discriminant validity is also good, as the square root of AVE of each dimension is higher than its cross-loadings. Nevertheless, the overall latent construct and the dimensions also revealed good internal consistency reliability.
The result of the second-order model evaluation in Figure 1 presents interesting findings. The first dimension which is strategy was found to have a strong effect on the formation of oil and gas projects’ investment climate as revealed by the standardized regression coefficient (0.193). The implication of this finding is that engaging key stakeholders in formulating policy for marginal oil fields development projects will have the likelihood of enhancing oil and gas project investment climate. The fact is that investors may perceive stakeholders’ engagement as an initiative by the government in ensuring openness in the policy formulation process. Moreover, having a coherent sector development strategy may also mean that the stakeholders can perceive that the strategic plan for marginal oil development project is consistent enough to enhance the formation of fair oil and gas projects’ investment climate. Moreover, as revealed by outer weights of the observed variables, the contribution of this dimension (strategy) to the overall latent construct (investment climate) is reflected more on a coherent sector development strategy (IC2, 0.601) compared to engaging key stakeholders in formulating policy for marginal oil fields development projects (IC1, 0.552). This depicts a specific relevance of a coherent sector development strategy in formulating a strategy for enhancing the investment climate of marginal oil fields in Malaysia.

The second dimension which is participants/operating environment was also found to be significant in the formation of oil and gas projects’ investment climate as revealed by the standardized regression coefficient (0.624). This finding indicated that effectiveness of NOC in implementing projects’ development strategy, clarity in the role of POCs in the oil and gas projects’ development strategy and the transparency in the project’s operating linkage between NOC and POCs are likely to form a better investment climate in oil and gas development projects. Moreover, it is also indicated that the degree to which investors are motivated to invest in marginal oil fields development projects through incentives, as well as the clarity and transparency in contractual or working arrangement between NOC and POCs, are also likely to form a sound investment climate in oil and gas projects. Furthermore, as revealed by outer weights of the observed variables the contribution of this dimension (participant/operating environment) to the overall latent construct (investment climate) is highly reflected on transparency in operating linkage between NOC and POCs in marginal oil fields’ development projects (IC5, 0.245), followed by clarity in the role of POCs in the oil and gas projects’ development strategy (IC4, 0.243), then, clarity and transparency in the operating arrangement for marginal oil fields’ development projects (IC7, 0.242), the motivation of POCs to invest in marginal oil fields development projects (IC6, 0.225), and finally, the capability of the NOC in dealing with POCs for effective implementation of marginal oil fields’ projects’ development strategy (IC3, 0.203). In essence, this highlights the specific relevance of each of the five observed variables in motivating the projects’ participants and enhancing the operating environment, which eventually will improve the investment climate of marginal oil fields in Malaysia.

Finally, the third dimension which is risk/return was also found to have a significant effect on the formation of oil and gas projects’ investment climate as depicted by the standardized regression coefficient (0.337). In essence, this implied that the degree to which officialdom hurdle are simplified or eliminated in the marginal oil fields’ projects’ contractual arrangements can be a good strategy for encouraging investment in marginal oil fields. Likewise, the extent to which the NOCs offer competitive economic terms to encourage investment into marginal oil fields’ development projects is also a useful indicator that contributes to the formation of better oil and gas projects investment climate. Finally, the extent to which NOC made a realistic assessment and disclosure of the commercial prospects of the marginal oil fields’ development projects is another important indicator of the formation of the better investment climate in oil and gas
development projects. Moreover, looking at the outer weights of the observed variables, the contribution of this dimension (risk/return) to the overall latent construct (investment climate) is reflected more on offering competitive fiscal terms (IC9, 0.404), followed by simplification and elimination of officialdom hurdle in the marginal oil fields’ projects’ contractual agreements to reduce the operating cost for the investors (IC8, 0.390), and finally realistic and objective assessment of geological potentials of the marginal oil fields’ development projects (IC10, 0.340). Therefore, it can be said that offering competitive fiscal terms to enhance the rate of returns for investors in marginal oil fields’ development projects is most important component in reducing investors’ risks and enhancing their rate of return for the formation of enhanced investment climate of marginal oil fields’ in Malaysia.

It is important to note that following the approach used by Botetzagias et al. (2015) in ranking the contribution of the exogenous constructs on the endogenous latent constructs (oil and gas projects’ investment climate), it can be said that though all the three factors have significant effect on the formation of oil and gas projects’ investment climate; however, participant/operating environment plays the most important role as revealed by its highest standardized regression coefficient. The second is risk and return and finally projects’ development strategy.

More interesting is that the results of the goodness of fit indices of the second-order oil and gas investment climate scale were also good. The requirements of the relevant model fit indices such as RMSEA for model fit, TLI and CFI for model comparison as well as NC Ratio for model parsimony were all met.

5. Conclusion, limitations and implication

In conclusion, the results of internal consistency reliability and construct convergent and discriminant validity suggest that second-order model of oil and gas projects’ investment climate scale is reliable, valid and fitted for future empirical analysis. It also found that each of the three dimensions contribute significantly to the formation of oil and gas projects’ investment climate with participant/operating environment contributing the most. Finally, the model fit indices revealed that the second-order oil and gas projects’ investment climate fits the sample used in the study.

5.1 Practical implication

The study proposed some important implication to the policymakers for marginal oil fields development projects in Malaysia. The finding implies that conducive and transparent operating business environment is the most important factor that forms a better investment climate for oil and gas development projects. This is followed by risk and return associated with the projects’ development and, finally, the stakeholders’ engagement in projects’ development strategy. Thus, if the government is keen on improving oil and gas projects’ investment climate in Malaysia consideration need to be given first to improving operating business environment. Followed by offering attractive return and reduced risk in projects’ development, and as well as engaging key stakeholders in the formulation of projects development plan to ensure openness and transparency.

5.2 Limitation and future research

The study had associated with some limitations. The major one is a small sample. Only 120 cases were used. Other studies on scale development and validation used the larger sample (Johari et al., 2011; Sasso, 2013; Thien et al., 2014). However, the issue of the small sample could be context-specific. In oil and gas setting, many studies reported low sample size. In a survey interview for oil and gas experts in the United Kingdom, Nakhle (2004) managed to get only 19 respondents. In Nigeria, Kyari (2013) in a study relating to petroleum taxation in
oil and gas industry end up with only 92 usable responses. In Asian perspective, Risco Energy opens their investment climate surveys obtained only 40 respondents in each country of study (Risco Energy, 2013). In essence, this justified our low sample size.

This study only serves as the foundation for continued conceptual and empirical analysis of oil and gas projects’ investment climate and its dimensions using second-order model. Researchers should explore the factorability of oil and gas project investment climate construct in various settings so as to validate further and compare findings. The fact is that oil and gas projects’ investment climate is an important construct that can be used as a dependent or independent variable based on researchers’ notion. For instance, the construct can be used as a dependent variable when considering independent variables such as fiscal regime, legal certainty and political stability. It can equally be used as an independent variable when considering dependent variables such as FDI, TFP and FP. Therefore, this study has contributed in validating its second-order measures for universal application within oil and gas producing countries.

References


Appendix

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Item</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy</td>
<td>IC1</td>
<td>Engaging key stakeholders in oil and gas industry in formulating a policy for marginal fields’ development projects</td>
</tr>
<tr>
<td></td>
<td>IC2</td>
<td>Coherent marginal oil fields development strategy, i.e. the strategy is consistent over time to enable stability in projects’ development as well willingness of NOC to take major exploration risk</td>
</tr>
<tr>
<td></td>
<td>IC3</td>
<td>The capability of the NOC in dealing with POCs for effective implementation of marginal oil fields’ projects’ development strategy</td>
</tr>
<tr>
<td></td>
<td>IC4</td>
<td>The clarity in the role of POCs in the marginal oil fields projects’ development strategy</td>
</tr>
<tr>
<td>Participants/operating environment</td>
<td>IC5</td>
<td>Transparency in operating linkage between NOC and POCs in marginal oil fields’ development project</td>
</tr>
<tr>
<td></td>
<td>IC6</td>
<td>The motivation of POCs to invest in marginal oil fields development projects</td>
</tr>
<tr>
<td></td>
<td>IC7</td>
<td>Clarity and transparency in the operating arrangement for marginal oil fields’ development projects</td>
</tr>
<tr>
<td></td>
<td>IC8</td>
<td>Simplification and elimination of officialdom hurdle in the marginal oil fields’ projects’ contractual agreements to reduce the operating cost for the investors</td>
</tr>
<tr>
<td>Risk/return</td>
<td>IC9</td>
<td>Offering competitive fiscal terms to enhance the rate of returns for investors in marginal oil fields’ development projects</td>
</tr>
<tr>
<td></td>
<td>IC10</td>
<td>Realistic and objective assessment of geological potentials of the marginal oil fields’ development projects</td>
</tr>
</tbody>
</table>

Table AI

Notes: Respondents were asked to state the extent of their agreement with the statement relating to each of the ten criteria in relation to marginal oil development projects in Malaysia; NOC = National Oil Company; POCs = private oil companies
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