NATIONAL AND REGIONAL COMPETITIVENESS

COUNTRY
COMPETITIVENESS:
AN EMPIRICAL STUDY

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What makes countries competitive? What economic policies effectively influence country competitiveness? The aim of this research paper is to analyse country competitiveness empirically, in order to explore the factors that make countries competitive. This can allow governments to structure their business environment differently, and to elaborate strategies aimed at improving their countries' overall competitiveness. Economic size and trading conditions have proven important for economic success throughout history. Individual competitiveness and business competitiveness are commonly talked about. The author analyses the overall economic competitiveness of countries. The author argues that trade is subject to various factors, including entrepreneurship and economic openness. Competitiveness is analysed in this current research, using IMD World Competitiveness Yearbook data for 55 countries in the estimation sample. This unique research applies a Multinomial Logistic procedure, and a Heckman Two-Step procedure in its accountancy for market size, exports, openness, and foreign direct investment. The business environment factors for estimation are highlighted. Also, several macro-economic modifications of the basic model specification are tested, providing further empirical analysis. Results indicate that the ten most competitive countries tend to be driven by foreign direct investment, exports and entrepreneurship.

Key words: competitiveness, foreign direct investment, multinomial logistic procedure, Heckman two-step procedure

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1. Introduction

The aim of this research paper is to analyze country competitiveness empirically, in order to analyze the factors that make countries competitive. This can allow governments to structure their business environment differently, and the strategy to improve overall competitiveness. What is competitiveness? It is common to talk about individuals being competitive and business competitiveness [13], and the overall country competitiveness is the focus of this current research, allowing for economies of scale of countries [19].

Throughout history, economic size and trading conditions have proven important for economic success [18], with trade being subject to various factors [6] including entrepreneurship and economic openness. An interesting question is if increased flexibility and adaptability of people, with more female labor force participation [13], has made modern society more competitive? What about theories indicating that some economies are more dependent on trade [18]? Are they more competitive?

In recent times economies have been said to be competitive, if they scale high in reasonable corporate tax and low inflation [13]. Is it possible to analyze the determinants of competitiveness further? Can the results obtained be useful for successful macro policy applications in other countries? This current research seeks to explain further some of the main determinants of the country competitiveness, in an international setting.

The 2008 financial crisis shocked the world economic system in various ways, mixing up some of the conventional economic measures [14]. This made people question some of the conventional economic welfare questions, with the crisis effects still visible in the economic global system [17; 34]. Therefore, this particular research focuses specifically on international competitiveness of various countries during the time period before the crisis [2; 11; 21; 24].

There are plenty of possible competitiveness speculations, and this current research seeks to provide an empirical measure for these speculations. The Gravity model by Bergstrand [1] is applied for in the empirical analysis, since it accounts for economic size and market expansion, together with a modified version of that model. Features from the Knowledge Capital Model [26] are also added to the specification, bringing in other common competitiveness factors, like the proxies for human capital. The data is obtained from the IMD (2016) World Competitiveness Yearbook [13].

This current research is unique, since the modeling set of competitiveness data from the Switzerland international IMD, in various ways, including use of the Heckman's two-step procedure and additional multinomial logistic approach applied [12].

There is a lot to choose from, since this group of countries ranks high when considering several social and economic factors. For example, technology is more easily accessible, the labor markets flexible, and female labor

participation quite high [13]. Various factors promote female labor market participation and employment. Those include low relative taxation of second earners in a household and the extent of childcare subsidization which, among all OECD countries. Also, the labor is generally skilled, with majority of the population having at least a secondary school education that results in a strong middle class. Some theories suggest that a strong middle class generally results in more dynamic labor market and economic society, stimulating increased competitiveness. In Europe, the trend has been towards more integrated countries, yet also with increasing labor market flexibility for all countries. Something more generally associated with the American economy [33].

This is all tested here, with a research application using a Multinomial Logistic procedure, and a Heckman Two-Step procedure in its accountancy for market size, exports, openness, and foreign direct investment.

2. Literature Overview

Competitiveness has been analyzed before [8], however this current research offers a new approach to competitiveness analysis. This research takes into account various forces and factors, like presented by the IMF and the IMD World Competitiveness Yearbook, by the IMD International Institute for Management Development [13; 14]. This research questions if multinational investments are important factors, affecting competitiveness of nations. Within the field of international economics, it has become increasingly popular in recent years to seek explanations for what attracts multinational investment to various countries [26]. Foreign direct investment (FDI) is defined as 10% or more ownership in the stock of a foreign firm [35]. The general belief has been that FDI has primarily been from north to south, rather than from south to north. However, this has not proven to be the case, as discussed by Markusen [26].

Much research has been conducted to seek explanation for what reason multinational enterprises should choose to overcome fixed cost [7], in order to undertake foreign direct investment (FDI) in one particular country, rather than another one. Also, Razin, Rubinstein and Sadka [31] considered the process of undertaking FDI as being a twofold decision: whether to export FDI and, if so, how much. In their research, the existence of fixed cost plays an important role in the determination of FDI.

Some economists have focused their research on explaining whether multinationals choose between countries based on the taxes imposed on them in these countries [3; 4]. The choosing of multinationals between different countries based on taxes and labor cost has become a highly relevant topic, since countries rely on foreign investment as one of the bases for continued economic growth. Governments therefore have a motive to attract investment, for instance, creating a feasible tax environment. Multinationals often have to choose between exporting and making a direct investment in a particular country. For example, in the decades after the second world war,

Japanese car manufactures like Toyota had to decide whether to export cars to the US or to undertake foreign direct investment in the US by opening production facilities there [16]. The incentive for undertaking foreign direct investment is generally classified as being of either a vertical [16] or horizontal nature [25]. A model capturing the incentives for making vertical investment was put forward by Helpman [16]. Vertical investment is driven by the incentive of gaining access to cheap raw material. The model on horizontal foreign direct investment by Markusen [25] provides an explanation for horizontal incentives for undertaking investment. Horizontal investment takes place when multinationals open up facilities in foreign countries to seek market access, rather than to gain access to raw materials. The case mentioned earlier, about Toyota making an investment in the US after the war, is an example of horizontal investment rather than vertical investment.

In recent years it has been popular to develop empirical estimation models to estimate trade and investment flows, based on the international economic theory put forward by Helpman, Markusen and others [16; 25; 26]. A popular approach has been to apply the so-called Gravity Model [1] or the Knowledge-Capital Model [26] for these purposes. This paper continues this line of research by developing a model based on the features of the Knowledge-Capital and Gravity models, allowing for the inclusion of issues from both models [30].

Subject of interest in this current research is also the importance of female labor participation in the countries analyzed, which has received attention [15; 28].

Some research has sought to analyze competiton in association with the international trading environment [9; 29; 32], and the aim of this current research is to add value to the previous research with a certain empirical approach analysing competitiveness.

3. Model and Data

3.1 Hypothesis, based on the literature review

The sample is estimated with three different estimation procedures, to analyze it more thoroughly, getting different measures how competitive countries are. First of the three estimation procedure is the OLS, Ordinary Least Squares, probably most commonly known and most commonly used in economic analysis. The use of the OLS procedure implies use of two hypothesis, the H_0 and the H_1. The H_0 hypothesis suggests there is no connection, and if the H_0 is rejected by the significance level obtained, then the H_1 hypothesis is believed to be true, implying that there is indeed a relationship [10]. This is the basic approach to estimating the competitiveness of countries. Secondly, the Heckman [12] procedure is applied, since it allows to estimate if countries reach a certain threshold, when it comes to competition, which is what the first step in the procedure estimates. And then if that

threshold is reached, then the second step estimates to what degree in that threshold the country is in that threshold. Third estimation procedure, the Multinomial estimation, allows for estimating the probability of countries being among the ten most competitive countries, et cetera.

3.2 Description of variables

When thinking of the description of the variables which are used, and how they are calculated, including arguments on the choice of LN or SINH functions (based on the hypothesis), then look into Table 1. Table 1 provides a detailed description of all variables included in the research.

The variables used in this current research are treated with the Ln and Sinh functions to take about the time-trend in the variables. This is commonly used for time series analysis, when correcting for time trend. The Ln is used more conventionally when dealing with time series data, taking out the inflation factor. The Sinh function works exactly the same as the Ln, in correcting for time-trend, however also allows for treatment of zero and negative values ignored by the Ln function. Therefore the Sinh can prove useful, since export as well as FDI ratio can at times turn zero and potentially negative, when considering values for particular countries in particular years. The Sinh therefore offers a refinement of the more commonly known Ln.

3.3 Methodology (3 steps of analysis)

First, an OLS regression is applied for estimation of the whole sample. Secondly, the research proceeds by estimating a Heckman two-step procedure, allowing for sample selection of the ten most competitive countries, in two steps. In other words, the Heckman two-step procedure first estimates the likelihood that a country is in a certain rank, with a Probit-likelihood estimation, and then the OLS as the second step. Thirdly, multinomial logistic estimates are received for the sample. Results indicate that foreign direct investment is found to positively impact the probability that countries are ranked among the ten most competitive, even when controlled for the ten most competitive countries.

The procedure allows for estimating what is the likelihood that a particular variable, like an Export increase makes it more likely that a country is competitive. Also how likely is it that countries, having strategies that attract women to work outside the home, are competitive? Countries active in exporting, are they likely to rank on one of the top seats, as being competitive economies? This is what the ranking measure with the Multinomial Logistic Regression in Table 4 shows, classifying countries dependent on how competitive they are.

The relation between the logarithm function and the Inverse Hyperbolic Sine function is the following as shown in Equation (1):

$$sinh^{-1}(x) = ln(x + \sqrt{(1 + x^2)}) \tag{1}$$

The reason why the IHS function is used is because it allows for transformation of not only positive values, like the logarithm function does, but also zeros and negatives. The model specification applied for estimation is firstly based on Equation (2) which can be considered to be related to a gravity model, since it accounts for factors such as population, openness and exchange ratio. FDI and exports are also accounted for, but one of these two last factors is normally the dependent variable in the gravity model. The Knowledge Capital Model features in the model provide a proxy for endowments can be considered to be female labor supply. Table 1 provides variable definition for the variables used.

Table 1

Variable Definition

$RANK_{i,t}$	Overall IMD competitiveness rank.
$FDI\_RATIO_{i,t}$	Foreign Direct Investment stock, as a ratio of GDP.
$POP_{i,t}$	Population, millions.
$FEMALE\_PART_{i,t}$	Female labor force participation, percentage of total labor force.
$EXP_{i,t}$	Exports of Goods, measured in USD billions.
$OPEN_{i,t}$	Openness ratio. Trade to GDP ratio. Sum of exports and imports divided by GDP.
$INF_{i,t}$	Average annual consumer price inflation. Measured as percentage change in prices.
$COR\_TAX_{i,t}$	Real corporate taxes. Real corporate taxes do not discourage entrepreneurial activity. IMD WCY Executive Opinion Survey, based on an index running from 0 to 10.
$EX\_RATE_{i,t}$	Exchange rates. Exchange rates support the competitiveness of enterprises. Executive opinion Survey, index 1—10.
$EN\_SHIP_{i,t}$	Entrepreneurship of managers. Rank comes from the Opinion Survey, based on an index running from 0 to 10.
$FLEX\_AD_{i,t}$	Flexibility and adaptability of people when faced with new challenges. Rank comes from the Executive Opinion Survey, based on an index running from 0 to 10.

Variables in Equation (2) are presented either in levels, or transformed using logarithms or an Inverse Hyperbolic Sine (IHS) function. The two additional equation results are presented in Table 3, and Table 4. Table 3 includes estimation results from the Heckman two-step procedure, while Table 4 includes estimation results from the multinomial logistic regression.

$$
\begin{aligned}
RAN_{i,t} = \beta_0 &+ \beta_1 \sinh^{-1}(FDI_{RATIO_{i,t}}) + \beta_2 \ln(POP_{i,t}) \\
&+ \beta_3 \ln\left(FEMALE_{PART_{i,t}}\right) + \beta_4 \sinh^{-1}(EXP_{i,t}) \\
&+ \beta_5 \ln(OPEN_{i,t}) + \beta_6 \sinh^{-1}(INF_{i,t}) \\
&+ \beta_7 COR_{TAX_{i,t}} + \beta_8 EX_{RATE_{i,t}} + \beta_9 EN\_SHIP_{i,t} \\
&+ \beta_{10} FLEX\_AD_{i,t} + \epsilon_{i,t}
\end{aligned}
\tag{2}
$$

The World Competitiveness Yearbook (IMD, 2016), covering 55 countries, explains competitiveness as the Overall Competitiveness Ranking, based on 323 criteria, grouped into four main factors, broken down further into five sub-factors. Two-thirds of the results are hard data taken from international, national and regional organizations, and one-third are drawn from the annual Executive Opinion Survey.

4. Data

The data used in this current research is obtained from the IMD (2016) World Competitiveness Yearbook (WCY) [13], which is the leading annual report on the competitiveness of nations. It has been published since 1989 and it ranks and analyzes how a nation's environment sustains the competitiveness of enterprises. IMD stands for the Institute for Management Development and is recognized as one of the world leaders in executive education.

The IMD WCY ranks the competitiveness of 55 countries, based on more than 300 criteria. It focuses mostly on conventional data (two-thirds come from international, regional and national sources).

The IMD, the World Economic Forum (WEF) construct their own competitiveness indices. Competitiveness is the ability to sustain a high/growing GDP per capita, or "well-being" of a nation's citizens. The term is also used to refer to the economic competitiveness of countries, regions or cities. The reason the WCY is used for the analyses is that the data is easily accessible and well organized. Data or 11 year period is applied, running from 1997 to 2007, that is the time period before the world financial crisis.

There were 51 countries ranked by IMD in 2003, 51 countries in 2004, 51 countries in 2005, 53 countries in 2006 and 55 countries in 2007. This increase in the database is something accounted for. The Overall Competitiveness of nations is categorized into four main criteria by IMD. Those are the Economic Performance, the macro-economic evaluation of the domestic economy; Government Efficiency, the extent to which government policies are conducive to competitiveness; Business Efficiency, the extent to which the national environment encourages enterprises to perform in an innovative, profitable and responsible manner; and, Infrastructure, the extent to which basic, technological, scientific and human resources meet the needs of business. These categories are then sub-categorized, since they are based on various components.

This current research focuses Foreign Direct Investment (FDI), defined as "investment made to acquire lasting interest in enterprises operating outside of the economy of the investor". Inward and outward FDI is driven by

different incentives. Foreign Direct Investment is foreign direct investment stock data (Balance of Payments current US$). During the period estimated, FDI as well as some other variables used in the sample, occasionally turn negative within particular years. Concerning FDI, this can happen if dividend payment from the host country to the source country is higher than the investments made in a particular year. Generally FDI is believed to give an indication of the long-term incentives of an investor, and can therefore potentially be considered to give an indication of the competitiveness of countries.

5. Estimation Results

The regression results are presented in three steps. First the plain OLS regression is estimated, then the Heckman two-step procedure is applied to account for sample selection, and finally multinomial logistic regression estimation is provided.

The regression results from estimating Equation (2) with the OLS procedure are presented in Table 2.

Table 2

OLS Empirical Findings

Regressors	
$\sinh^{-1}(FDI\_RATIO_{i,t})$	0.765 (0.61)
$\ln(POP_{i,t})$	6.232∗∗∗ (17.40)
$\ln(FEMALE\_PART_{i,t})$	− 8.961∗∗∗ (− 2.86)
$\sinh^{-1}(EXP_{i,t})$	− 7.629∗∗∗ (− 22.02)
$\ln(OPEN_{i,t})$	7.271∗∗∗ (11.31)
$\sinh^{-1}(INF_{i,t})$	0.329 (1.09)
$COR\_TAX_{i,t}$	− 3.629∗∗∗ −12.53)
$EX\_RATE_{i,t}$	− 2.346∗∗∗ (− 9.86)
$EN\_SHIP_{i,t}$	− 1.049∗∗∗ (− 2.60)
$FLEX\_AD_{i,t}$	− 1.308∗∗∗ (− 3.31)
Constant	96.901∗∗∗ (7.41)
Observations	358
R- squared	0.8759

Note: t-statistics are in parentheses below the coefficients. ***, ** and * denote significance levels of 1%, 5% and 10%, respectively.

The estimates indicate that competitiveness is not significantly affected by FDI. Population size and market size, are found to positively affect competitiveness, however FDI is negatively affected by female labor participation. Competitiveness is found to be negatively affected by exports, but posi-

tively affected by openness. Competitiveness is not affected by inflation, but negatively affected by an increase in corporate tax as well as an increase in exchange rates, flexibility and adaptability of people, and entrepreneurship of managers (obtained from an Executive Opinion Survey, based on an index from 0 to 10).

Next the so-called Heckman Selection Model is applied. The Heckman estimation procedure provides me with two-step estimation opportunities, by being a regression model with sample selection. The first step results represented in Table 3 provides the opportunity to use the Probit estimation of the equation in question, based on 1 or 0 values dependent on if the country is among the ten most competitive or not, here referred to as "Top 10" country.

Then the research proceeds with using the set-up such that a particular year's data for "Top 10" country gets the value of 1, but the year data for countries out of the ten most competitive get values of 0. The second step by provides OLS estimates for the sample selection of the "Top 10" countries. In other words, Stage 2 estimates driving factors of competition, controlling for the estimated probability of countries being ranked in the rank containing the "Top 10" countries, based on competitiveness.

Table 3

Heckman Two-Step Empirical Findings

Regressors	
First Step Probit Results	**Full Sample**
$\sinh^{-1}(FDI\_RATIO_{i,t})$	$2.307**\,(2.08)$
$\ln(POP_{i,t})$	$-0.957***\,(-3.05)$
$COR\_TAX_{i,t}$	$-1.675***\,(-4.82)$
$EN\_SHIP_{i,t}$	$1.059*\,(1.72)$
Constant	$9.109\,(1.55)$
Second Step OLS Results	**10 Most Competitive Countries**
$\sinh^{-1}(FDI\_RATIO_{i,t})$	$1.535***\,(3.26)$
$\ln(FEMALE\_PART_{i,t})$	$8.278***\,(4.50)$
$\sinh^{-1}(EXP_{i,t})$	$0.305***\,(3.73)$
$\ln(OPEN_{i,t})$	$-0.098\,(-0.40)$
$EN\_SHIP_{i,t}$	$0.834***\,(5.73)$
Constant	$-39.119***\,(-5.20)$
Observations	359
Censored Observations	287

Note: Heckman's consistent Z — values are in parenthesis below coefficients.
***, ** and * denote significance levels of 1 %, 5 % and 10 % respectively.

First step Probit estimates for Table 3 indicate that FDI and entrepreneurship of managers have significant positive effects on whether countries are ranked as the "Top 10" most competitive countries. However, the coun-

tries' market size (measured as population size) and corporate tax are esti-
mated to significantly negatively affect the likelihood that countries appear
in the "Top 10" competitiveness ranking.

The second step results indicate that, when controlled for the estimated
probability of countries being ranked as the "Top 10" countries, FDI, female
labor participation, good exports and entrepreneurship are all estimated to
have significant positive effects on competitiveness.

Table 4

Multinomial Logistic Regression

Regressors	Rank 1—10	Rank 11—20	Rank 21—30	Rank 31-
$\sinh^{-1}(FDI\_RATIO_{i,t})$	1.75e−06 (0.31)	0.082 (0.72)	0.681∗ (1.89)	−0.764∗∗ (−2.13)
$\ln(POP_{i,t})$	−0.00002 (−0.45)	−0.379∗∗∗ (−2.95)	0.033 (0.22)	0.346∗∗∗ (4.11)
$\ln(FEMALE\_PART_{i,t})$	0.00001 (0.38)	189 (0.60)	−0.027 (−0.08)	−0.162 (−0.60)
$\sinh^{-1}(EXP_{i,t})$	0.00002 (0.45)	0.413∗∗∗ (3.05)	0.018 (0.11)	−0.432∗∗∗ (−4.48)
$\ln(OPEN_{i,t})$	−0.00002 (−0.45)	−0.387∗∗∗ (−3.07)	−0.126 (−0.80)	0.513∗∗∗ (4.55)
$\sinh^{-1}(INF_{i,t})$	−1.60e−06 (−0.47)	0.002 (0.08)	−0.093∗ (−1.83)	0.090∗ (1.90)
$COR\_TAX_{i,t}$	4.11e−06 (0.43)	0.120∗∗∗ (2.72)	0.119∗∗ (2.00)	−0.240∗∗∗ (−5.10)
$EX\_RATE_{i,t}$	4.82e−06 (0.45)	0.058∗∗∗ (2.66)	0.119∗∗ (2.39)	−0.177∗∗∗ (−3.87)
$EN\_SHIP_{i,t}$	2.23e−06 (0.44)	0.013 (0.32)	0.128∗∗ (2.17)	−0.141∗∗ (−2.46)
$FLEX\_AD_{i,t}$	5.98e−06 (0.43)	0.084∗ (1.80)	−0.139∗∗ (−2.27)	0.056 (1.18)

Number of Observations 358.
Note: t-statistics are in parentheses below the coefficients. ***, ** and * denote
significance levels of 1 %, 5 % and 10 %, respectively.

The multinomial logit estimates are presented in Table 4. Estimates indi-
cate that an increase in FDI does not increase the probability that a country
ranks in competitiveness in the top seats 1—10, or 11—20. However, an FDI
increase positively affects the probability of a country ranking in seats 21—30
and negatively affects the probability that a country ranks in seat 31 or low-
er. Market size increase, measured by population increase, positively affects
the probability that countries rank in the bottom seats of 31 or below, how-
ever it positively affects the probability that countries rank in seats 11—20.
Female participation in the labor market is not found to affect the probability

of countries entering any of the ranking intervals. Export increase is found to positively affect the probability that countries are ranked on the interval between 11 and 20, however it negatively affects probability that they enter the interval of 31 and below. Openness is found to significantly decrease the probability that countries are on the 11—20 competitiveness interval, however increase the probability that they are in the lowest competitiveness interval. Inflation is estimated to negatively affect the probability that countries are in the competitiveness interval from 11—20, however positively that they enter the lowest interval. Corporate tax, exchange rates and entrepreneurship are all estimated to positively affect the probability that countries enter into the intervals of 11—20 and 21—30, however negatively affect the probability that countries enter the lowest interval of seat 31 or higher. Finally, flexibility and adaptability of people is estimated to positively affect the probability that countries are in the competitiveness interval of 11—20, however negatively affect the probability that they are in the interval of 31 or higher seat.

Overall the regression results estimates suggest that some factors are more important than other, when it comes to making countries competitive. This helps with formulating a successful political strategy, for both small and large countries along the lines of previous research [9; 18; 20; 22; 23; 27].

Finding that small economies can be more competitive, is in line with some previous research, including a research by Fedyunina [9] discussing the formulating of successful policy issues for export oriented economies.

6. Summary and Conclusions

This aim of this research is to seek to explain why some countries have proven to be among the most competitive countries in the world. Hopefully this research provides new perspectives on how the competitive factors work in an economic setting.

The IMD World Competitiveness Yearbook, is applied to shed light on the factors causing this high competitiveness. The specification used for analysis is based on features from the Gravity Model and a Knowledge-Capital Model, since these models have proven to be useful when determining the macro-economic flows between countries.. Although population size is found to positively affect competitiveness when estimated for the whole sample, it is not driving the competitiveness of the ten top-ranking countries. Female labor participation does not impact the probability that countries are among the ten most competitive, however once controlled for the estimated probability of being among the ten most competitive, *female labor participation* is found to positively impact competitiveness. The same holds for goods exports and entrepreneurship. *Openness* is found to positively affect only the lowest ranking interval of countries. However, *inflation* is found to negatively affect only countries in the ranking interval between 21—30, and *corporate tax* those in the lowest interval. *Exchange rate* is found to positively affect the probability that countries are ranked in somewhere between

11 and 30, however negatively impact the probability they are in the lowest ranking interval. Finally, *flexible administration* is found to positively affect the probability that countries rank in between 11—20, but negatively impact the probability that they are ranked in the interval from 21—30. Taken together, results indicate that the driving forces of competitiveness are in line with what could be expected in the international economic environment, which may be useful for macro policy management.

Discussion of results must start with emphasizing how useful it is to be able to estimate competition empirically, implying that when testing empirically for country competitiveness, various factors seem to be driving the competitiveness. The approach applied allows for ranking countries on the basis of how competitive they are in the business environment. The empirical analysis indicate that the business environment is generally favorable for business competitiveness. In particular some labor market issues seem to support the competitiveness of countries.

Political recommendations, based on this current research, are that in order to improve business environment, it is useful to encourage several factors. When it comes to country competitiveness, some factors tend to more important than others. These factors are flexible administration, low inflation, openness, moderate female labor participation, and moderate tax rate, as well as exchange rate and economic openness supported with exports of goods and entrepreneurship, also needs to be considered as valuable factors for country competitiveness.

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