Fishery Sector Investment in Maluku Province, 2004-2008 (*Panel Data Dynamics Approach*)

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Abstrak

Tujuan utama dari penelitian ini adalah untuk menganalisis dan menguji variabel-variabel yang mempengaruhi investasi sektor perikanan antar kabupaten/kota di Provinsi Maluku periode tahun 2004-2008 dengan menggunakan metode data panel dinamis (*Panel Data Dynamics Method*). Faktor-faktor yang mempengaruhi investasi sektor perikanan di Maluku adalah *market size* dengan proksi PDRB; infrastruktur dengan proksi panjang jalan dalam kondisi baik dan sedang; sumber daya manusia diproksi dengan tenaga kerja.

Hasil penelitian menunjukkan bahwa pengujian panel kointegrasi dengan pendekatan parametrik menghasilkan nilai *group rho-statistic* 5,24 sedangkan *group PP-statistic* memiliki koefisien kointegrasi -3,65 sementara koefisien kointegrasi dengan menggunakan *group ADF-statistic* -7.53. Probabilitas masing-masing pengujian mengindikasikan bahwa variabel dengan aplikasi kointegrasi signifikan pada level 1%. Dari tujuh model panel, didapatkan hasil bahwa semua variabel penelitian berkointegrasi, dalam jangka pendek *market size* memiliki arah negatif terhadap investasi yang berarti bahwa *market size* yang besar tidak menjamin kepastian masuknya investasi sedangkan dalam jangka panjang semua variabel memiliki arah pergerakan yang sama.

Kata Kunci: Sektor Perikanan, Investasi, Panel Dinamis

I. INTRODUCTION

Growth of economics in a region could not dissociate of role of investment. With investment in various economic sectors hence will increase product, which can cause up earnings. In this effort hence every area or region create climate able to excite investment dynamics, this condition started with regulation which released Law No. 1 year 1967 about foreign investment and Law No. 6 year 1968 about domestic investment.

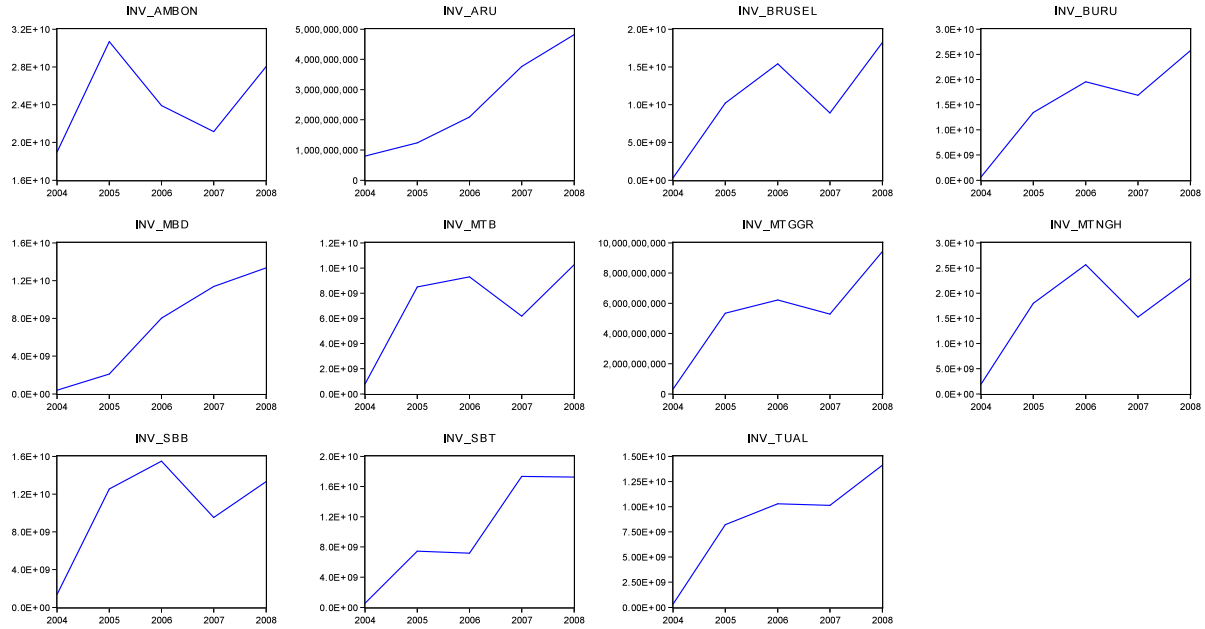
Study of JETRO (Japan External of Trade Organization) indicates that Indonesia investment climate much more ugly compared to Chinese, Thailand, Vietnam and nations of other ASEAN. Problem of investment climate in Indonesia according to survey of United Nations Conference Trade Development which poured in World Investment Report 2008 placing Indonesia at most second class formation under 140 states seen from investment performance index.

In Maluku Province, fishery sector as one of the agricultural sub sector expected could give an optimal contribution in improving earnings of government, especially cause of Maluku has a wide sea reaching 92 percent while the rest represent continent region. That makes territorial water of Maluku has high enough economics potential resources.

Maluku rich of natural resources potency of sea, seen from standing stock equal to 1.9 million ton/year and maximum sustainable yield (MSY) is equal to 950,000 ton/year. Catching potency pursuant to result of study fish stock in Region Catching (WPP) Province Maluku in year 2007, by Research Oceania and Fishery institute DKP working with LIPI focused at; sea of Banda 277,890 ton/year, sea of Arafura 771,500 ton/year, sea of Ceram 590,640 ton/year and total of harvesting 1,640,030 ton/year. Fishery potency catching consist of fish type; big pelagic 261,490 ton/year, small pelagic 980,120 ton/year, demersal 295,500 ton/year, fish of reef 47,600 ton/year, prawn 44.000 ton/year, lobster 800 ton/year and cutlle 10,520 ton/year.

Investment representing one of the instruments in stimulating activity of economics which can pushes growth of fishery sector. Growth of investment at fishery sector detailed by sub-province/city can be seen at graph 1, as follow.

Graph 1.1
Fishery Sector Investment By Sub-Province/City In Province of Maluku Year 2004-2008



Source: BPS Province of Maluku, 2009

Graph 1.1, showing growth of investment by sub-province/city in Maluku Province which total growth mean is equal to 22 percent. Indicating that invest

represent one of the good instrument in stimulating activity of economics especially for region which has a less source of fund but rich of natural sea resources so that triggering growth of fishery sector economics.

If we look carefully, growth of fishery sector investment in Maluku Province hence seen the condition of which is have fluctuation because movement of investment have the character of volatile where cannot be predicted correctly. Pattern of areas formed still concentration at area which are center growth, that become to draw when policy of decentralization and autonomy which cymbal where expected to more self-supporting local government but it is only 1/3 existing area economically can be self-supporting because natural resources which is coincidence on that region. Considering that fishery investment only concentration geographically in region center of growth hence becoming interesting question is: Why the mentioned happened? Why an area can draw investment at fishery sector more than other area? What factors that causes investor place fund and effort in an area? This questions that conducting of this research.

Target of this research are to know determinant factors that pushing fishery sector investment between sub-province/city.

II. THEORETICAL REVIEW

Investment represent the second biggest component of demand aggregate after consumption, but relatively hard to be reckoned because having the character of volatile or more unstable if compared to private sector consumption. Recession and/or boom in an economics happen could be effect of behavior investment. Particularly, investment is a very importance to economics growth and also improvement to work productivity. Without investment hence there will be no enlargement of effort.

Factors non economics trusted having an effect on investment. Risk factor and uncertainty of law and also the lack of infrastructure can cause investor refusing for investment. Bureaucracy and administration impressing twist and unable to guarantee investment security become separate problems. In regulation side, Indonesia has owned law about investment, but that not yet adequate for improve investment climate in Indonesia, there are some regulation that have to repair like taxation law, and labor law.

Concept given by Dunning is a little different, that explaining distribution phenomenon of FDI can comprehend through framework of Ownership-Location-Internalization (Krugman and Obsfeld, 1995).

- Ownership Theory is first condition which must have by investor that wish to inculcate capital in other state.
- Location Theory, that location take very big role in the case of cultivation of foreign direct capital.
- Internalization Theory saying that will be more advantage of multinational company to conduct transaction of within firm than between a firm, because guarantying proprietary rights of specific excellence.

Wiwin, et.al (2008) that investment climate in Indonesia is very potential but also sensitive. Factors that strength an effect is: rate of interest, mount governmental expenditure, PDB, inflation and exchange rate.

III. METHODOLOGY

3.1 Type and Source of Data

Data used in this research is secondary data in the form of panel data; covering eleven region which consist of two town and nine sub-province in year 1998 – 2008. Source of data are Statistical Center Institute, Oceania and Fishery Institution of Maluku Province.

3.2 Definition and Measurement Variables

Dependent variable, Investment (Y) by using cultivation of foreign capital (PMA) and domestic capital (PMDN) in fishery sector (Rupiah).

Independent variables, Gross Domestic Regional Product (GDRP) fishery sector (X_1), selecting of this variable because representing the most near proxy in seeing market size potency where representing most important motivation behind investment (Rupiah). Infrastructure (X_2), as proxy of infrastructure which owned by an area used by the condition of goodness and length of road (km), the selecting of this variable because infrastructure represent one of the important factor in influencing investor for being invest. Labor fishery sector (X_3), usage of this indicator pursuant to various study concerning investment expressing that FDI more interest to come to an area with availability of labor source which more and cheap (Hayter, 2000).

3.3 Model Specification

Model that used in this research is panel data and using natural log model [Dees, (1998); Fung, et.al (2000 & 2002)] which can be written as follow:

$$\mathbf{lnY_{it} = \beta_i + \Sigma\, \beta_k\, lnXk_{it} + \varepsilon_{it}} \quad \text{.....…….. (1)}$$

Where Y_{it} is value of investment, X_{it} is determinant of investment, ε_{it} is individual effect that constant between time of *t* and specific to each unit of cross section *i*. *i* = 1,2,….,n referring at unit of cross section, and *t* = 1,2,…..,t referring at set of time. While determinant of investment, X_{it} consist of GDRP, infrastructure and labor. So that determinant of fishery sector investment with input all variable can be written down as follows:

$$\mathbf{lnY_{it} = b_0 + b_1 lnX_{1it} + b_2 lnX_{2it} + b_3 lnX_{3it} + e_{it}} \quad \text{.....(2)}$$

where:

t	=	time (1998-2008)
i	=	sub-province/town (11 sub-prov./city)
Y	=	investment
X_1	=	Gross Domestic Regional Product
X_2	=	Infrastructure
X_3	=	Labor
e	=	error term

In this research examination to determine whether there are component of time effect and individually effect or only individually effect will be conducted through Hausman test (Baltagi, 2003).

3.4 Panel Root Test

Recent literature suggest that panel-based unit root test have higher power than unit root test based on individual time series. Levin, Lin and Chu (2002) start panel unit root test by consider the following basic ADF specification

$$:DY_{it}\ \alpha Y_{it-1} + \sum_{j=1}^{pi} \beta_{it} DY_{it-j} + X^*_{it}\delta + \varepsilon_{it} \quad \text{.....(3)}$$

where:

DY_{it} = difference term of Y_{it}

Y_{it1} = Panel data

α = $\rho - 1$

pi = the number of lag order for difference terms

X^*_{it} = exogenous variable in model such as country fixed effect and individual time trend

ε_{it} = the error term

LCC (2002) panel unit root test has null hypothesis as panel data has unit root as well as can present below that:

H_0 : null hypothesis as panel data has unit root (assumes common unit root process).

H_1 : panel data has not unit root.

If the standard statistic is significant then conclusion that reject null hypothesis or panel data has not unit root. Otherwise if the standard statistic is not significant then conclusion that accept null hypothesis or panel data has unit root.

3.5 Panel Co-integration Test

Important matters which deal with this examination method is null hypothesis have a meaning of all co-integrating form or all relation form do not co-integrating.

Kao (1999) uses both DF and ADF to test for co-integration in panel as well as this test similar to the standard approach adopted in the EG-step procedures. Also this test start with the panel regression model as set out in equation 4.

$$Y_{it} = X_{it}\beta_{it} + Z_{it}\gamma_0 + \varepsilon_{it} \quad \text{.....(4)}$$

where Y and X are presumed to be non-stationary and: (see equation 5)

$$e\hat{}_{it} = \rho\, e\hat{}_{it} + v_{it} \quad \text{.....(5)}$$

where $e\hat{}_{it} = (Y_{it} - X_{it}\beta_{it} - Z_{it}\gamma\hat{})$ are the residuals from estimating equation 4. To test the null hypothesis of no co-integration amounts to test $H_0 : \rho = 1$ in equation 5 against the alternative that Y and X are co-integrated (i.e., $H_1 : \rho < 1$). Kao (1999) developed both DF-Type test statistics and ADF test statistics were used to test co-integration in panel also both DF-Type test statistics and ADF test statistics can present below that:

$$ADF = \frac{t_{ADF} + \sqrt{6N}\sigma_v/2\sigma_{0u}}{\sqrt{\sigma^2_{0v}/2\sigma^2_v + 3\sigma^2_v + 10\sigma^2_{0v}}} \quad \text{.....(6)}$$

Pedroni (1995) provides a pooled Phillips Perron-Type test and these test have the null hypothesis of no co-integration. The panel autoregressive coeficient estimator, $\hat{\gamma}N,T$ can be constructed as follow:

$$\hat{\gamma}N,T^{-1} = \left[\Sigma_{i=1}^{N}\Sigma_{t=2}^{T}(\hat{e}_{i,t-1}\Delta\hat{e}_{i,t-1} - \hat{\lambda}_i)\right]/\Sigma_{i=1}^{N}\Sigma_{t=2}^{T}(\hat{e}^2_{i,t-1})$$

.....(7)

where : N = cross section data

T = time series data

e_{it-1} = error term of model

$\lambda\hat{}_i$ = a scalar equivalent to correlation matrix and also Pedroni (1995) provides the limiting distributions of two test statistics as well as can be written in equation 7:

$$PP\text{-}statistic=[T\sqrt{N}(\gamma\hat{}_{N,T}-1)]/\sqrt{2} \rightarrow N(0,1) \quad \text{.....(8)}$$

And this research focus on ADF test statistic based on residual-based test follow concept of Kao (1999) to test co-integration in panel and also this research focus on PP-test statistic based on concept of Pedroni (1995) to test co-integration in panel. Both ADF-statistics and PP-statistic have same null hypothesis of no co-integration in panel.

IV. EMPIRICAL RESULT

4.1 Test To Chosen Used Panel Data

Panel data regression to estimate investment of fishery sector by sub province/city in Maluku Province using three approach to estimate panel data model, that are *common effect*, *fixed effect* and *random efffect*.

To determine most appropriate technique to regress panel data used three tests. First, statistical *F-test* to chosen between *common effect method* and *fixed effect method*. Second, *Lagrange Multiplier test* (LM test) used to chosen between technique *common effect* and *random effect*. Third, to chosen between *fixed effect* and *random effect* used a test proposed by Hausman.

Pursuant to result by using F-test obtained value of F-result 346.7 > value of F-table 4.02 so that test *fixed effect* more precise. By using of LM test obtained result of LM test is equal to 46.1599 > 13.2767 critical value tables of distribution of chi-square at 1%, so that model *random effect* more precise. By using Hausman test to look for the best model between *fixed effect* and *random effect*, obtained by result that Hausman statistical value is 366.15. Critical value of chi-squares is 13.2767. Because statistical value of Hausman test is bigger than its critical value hence the most appropriate model to analysis panel data is *fixed effect method*. Result of estimation with panel data using method of *fixed effect* approach shall be as follows:

Table 4.1
Fixed Effect Method Result

Variable	*Period 2004-2008*		
	Coef.	*t-stats*	*Prob.*
LN_GDRP	-	-1.293923	0.0700*
LN_INFRAS	0.06934	2.879728	0.0496**
LN_L	0.09973	2.435788	0.0422**
	0.10285		
R squared		0.683760	
Adj. R squared		0.659275	
S.E. Regression		5.37E+09	
DW-Statistic		1.599631	
F-Statistic		33.19364	
(Prob. F-Statistic)		0.000000	

Resource: data processed
Enclosure: ***significant 1%; ** significant 5%; * significant 10%

According to estimation result known that indicator GDRP representing reference to see market size have an effect on by significant 10% and has a negative direction. This matter indicates that high rates of growth GDRP is not guarantee to pull investor for invest. The infrastructure indicator that is length road in a good and medium condition has an effect on at level of significant 5%, meaning that length road in a good and medium condition has a significant influence of investment inflow and has a positive direction.

Indicator of Labor significant and positive means that labor has an effect on direction to choice investment. This is according to study hit investment expressing that investor more interested to come to the state owning availability of source of power which is a lot and cheap (Hayter, 2000).

4.2 Unit Root Test of Panel Data

Panel data unit root test to variables used in this research is seen at tables 2, as follow.

Table 4.2
All Method Unit Root Test of Panel Data

Pool unit root test: Summary
Newey-West bandwidth selection using Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.57030	0.0000	11	44
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.81464	0.0348	11	44
ADF - Fisher Chi-square	32.2632	0.0130	11	44
PP - Fisher Chi-square	53.2634	0.0002	11	44

Resource: data processe

Tables 4.2 shows result of panel data stationary use LLC (Levin, Line & Chu), IPS (Im, Pesaran & Shin), ADF Fisher and PP Fisher. Seen by all method used to indicate that data have stationary at level because has a value of probability smaller than 5%.

Table 4.3
Unit Root Test of Panel Data Using LCC Method

Panel Unit Root Method: Levin, Lin & Chu t*		
Variable	Stats.	Prob. **
INV	-11.2026	0.0000
GDRP	-4.10102	0.0000
INFRAS	-10.6991	0.0000
L	-13.5943	0.0000

Resource: data processed

Tables 3 showing one of method (LCC) units root test with more specific variables. Stationary indicates that variable of investment has a coefficient equal – 11.202 meanwhile GDRP coefficient equal to – 4.101 with probability smaller than 0.05 reject null hypothesis. Infrastructure variable and labor has a level of the coefficient each – 10.699 and – 13.594 with probability smaller than 5%, thereby reject null hypothesis. So conclusion of all variable used in this research have a stationary at level (I0) or has same degree.

4.3 Pedroni Co-integration Test

After all variable in this research have stationary or same integration degree, the examination existence of long-term (co-integration) conducted with of Pedroni of panel co-integration method.

Table 4.4
Result of Pedroni Co-integration Test

Pedroni Residual Co-integration Test
Sample: 2004 2008
Included observations: 5
Cross-sections included: 11
Null Hypothesis: No co-integration
Newey-West bandwidth selection with Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	7.58E+18	0.0000	4.20E+16	0.0000
Panel rho-Statistic	3.671415	0.0005	3.671439	0.0005
Panel PP-Statistic	-9.949412	0.0000	-9.949937	0.0000
Panel ADF-Statistic	-3.910327	0.0002	-3.910895	0.0002

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	5.245019	0.0000
Group PP-Statistic	-3.652105	0.0005
Group ADF-Statistic	-7.531827	0.0000

Resource: data processed

Test result of panel co-integration with approach of non-parametric indicates that panel of v-statistic coefficient of co-integration is 7.58E+18 meanwhile panel of rho-statistic coefficient of co-integration equal to 3.671415. Coefficient of co-integration by using panel of PP-Statistic equal -9.949412 and coefficient of panel of ADF-Statistic equal -3.910327. Probability of each method of examination indicates that variable that used co-integrated at level of significant 1%.

Result examination of panel co-integration with approach of parametric indicates that group rho-statistic has a coefficient of co-integration 5.245019 while group PP-Statistic coefficient of co-integration equal to -3.652105. Meanwhile coefficients of co-integration using group ADF-Statistic equal to -7.531827. Probability of each method of examination indicate that variable used co-integrated at level with 1% significant.

From seven examinations panel got a result that all variable of research co-

integrated. In the short-run variable GDRP has a negative effect on which its meaning that high value GDRP in Maluku do not directly give an impact which are positive to entry of the investment, proven with the result obtained by GDRP and Investment in Maluku have a negative correlation, this matter proportionally inverse with result obtained from research conducted by Sodik (2008) with case study of Indonesia which result obtained that GDRP correlate positive with investment. In the long term variables of research has a movement with the same direction.

V. CONCLUSION AND SUGGESTION

5.1 Conclusion

Pursuant to result analyses with method fixed effect obtained result that from indicator used to investment fishery sector, namely indicator GDRP significant at 10% and has a negative direction, infrastructure indicator (length road in a good and medium condition) has a significant 10% with direction which are positive its meaning that good condition of road has the same direction with growth of investment, and the labor indicator level significant 5% its meaning that labor more have an effect in this research period compared to two other indicator which indication that labor which relative a lot of and cheap very influence entry of investment in fishery sector.

5.2 Suggestion

Local government expected to make and release a new policy that pushing investment of fishery sector, foreign and domestic investment so that can improve growth regional.

Local government also require to conduct law and regulation coordination vertical level (central government – province – sub. province/city) and the horizontal level (inter department and related department), that can obtained information in bearing elementary reform together climate investment repair, export and business area sub province/city in fishery sector.

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