Numerous literatures have documented the relationship between exports and economic growth of a nation but not so many on the one between exports of an economic sector and national growth. This paper examines the latter relationship with evidence from fishery exports of Vietnam during 1997 to 2008. The contribution of fishery sector in Vietnamese Gross Domestic Products (GDP) may be mathematically calculated with statistical figures. However, the effects of fishery exports on the economic growth are yet to be thoroughly studied in an econometric approach. An econometric approach with stationary and co-integration tests and vector error correction models used in this study allows forecasting a persistence of the effects of fishery exports on Vietnamese GDP despite of different seasonal business. For the long run estimation, a double increase in national fishery exports revenue would raise the GDP by 7%. This has a great economic meaning in developing process of Vietnamese economy. In reverse direction, Vietnamese fishery exports would increase by 5.2% with a 10% increase in its GDP. Confirming the role of fishery exports in national economic growth, it is necessary for the sector to improve its competitive capacity.

Keywords: sectoral export, growth, trade, fishery, vector error correction model

I. Introduction

The relationship between economic growth and international trade was argued by many economists when trade comes into being. Trade indeed promotes economic growth of a country. The classical economic theories by Adam Smith, David Ricardo, Torrens, James Mill and John Stuart Mill stated that trade promoted economic growth. Evidence for a positive contribution of free trade to the productivity of nations has been widely discussed and is well documented in the economic literature (Corden 1972, Bhagwati, 1978; Krueger, 1978, Romer, 1986; Lucas, 1988; Levine and Renelt, 1992; Edwards, 1998).

In international trade, there were also some industries enjoying an international comparative advantage, recently. These sectors could produce world class commodities for modest export sectors. The sectors communicated and traded with buyers in other countries. Markets are speedily globalized. The modern theory of trade has been designed and proponed by Paul Krugman, who suggested that trade trends in countries are developing key industries for export in order to get economic gain or growth. The key industries produced sectoral exports of the countries.

Sectoral exporting is an economic development strategy of many countries. Tourism service exports in Greece are an example (Thompson and Thompson, 2010). With its thousands-year culture and birthplace of philosophy, famous tourist hotspots as its capital Athens, the northern Chalkidiki peninsula, the Ionian island of Corfu and the island resorts of Myconos, Santorini, Paros and Crete, Greece is one of the best destinations for global tourists and tourism was found to be a long run factor to economic of the country (Dritsakis, 2004). The Philippines is the paradigmatic
example of a state that deliberately constructed policy for its exports of labor abroad. Yang (2004) has demonstrated that Philippine families with migrant members abroad fared considerably better than family member without migrants. The Philippines have succeeded in developing a large scale labor export regime that provides significant level of remittances to the Philippine economy. Remittances from abroad labor are seen as a particularly stable source of its finance (Ratha, 2003; Kapur, 2004) so that the Philippines try to keep labor exports as more as possible. For its important role in an economic growth of developing countries, sectoral exports are also considered one of important economic development strategy in Vietnam.

Since joining into ASEAN in 1985, Vietnam has boosted and diversified its trade significantly, reflecting a globalization process of the Vietnamese economy. Its trade openness (aka exports revenue plus imports expenditure and then divided by GDP) increased from 84.5 percent in 1999 to about 170 percent in 2009, indicating a rapidly increasing integration of the country into global economy. Although crude oil still stands on the first position in export revenues, products from agricultural and aquatic products are playing increasingly critical role in the structure of Vietnam’s exports (Duc and Hong, 2009).

Fishery exports, according to Cunningham (2000), Schmidt (2003), and FAO (2007), can act as an engine of growth for developing countries endowed with large fish resources. In addition, fishery exports revenue can contribute to economic growth in developing countries by providing an important source of cash revenue (Valdimarsson, 2003, Ahmed, 2003, and Bostock et al., 2004). Fishery exports not only contribute indirectly to economic development through new employment creation but also via increased incomes from the sector and secondary flow on effects such as migrant workers sending remittances to their dependents (Kurien, 2005). Contributing approximate 10% of whole national export revenues, fishery exports make an ongoing contribution to economic growth, poverty alleviation and people well-being as well (Duc, 2008, 2009a). Although the Vietnamese fishery sector contributes to national GDP typically varied by 2.5–4.0 percent, it also generates a wide range of tax revenues, contributing to the national budget. Moreover, the major share of fishery exports has strong backward linkages with the other sectors both in terms of primary and value added commodities. However there are lack of empirical studies on a clear relationship between Vietnamese fishery exports and its economic growth although Vietnamese government has tried in practice to promote fishery export growth to boost up its economy.

This study examines causality relationship between the fishery export and economic growth based on a time series analysis with quarterly data from 1997 to 2008 and hence explores the role of fishery exports in Vietnamese economy. The national policy makers may use results in this study when making policies and strategies for economic development. The findings are also able to contribute to literature on relationship between sectoral exports and economic growth.

II. Methodology

Model specifications

To investigate the association between the growth of exports and economic performance, some theoretical models were considered. The first is the neo-classical growth model

\[ Y = f(K, L) \]  

where \( Y \) is aggregate real output, \( K \) and \( L \) represent capital and labor, respectively.

The second theoretical base is from the framework suggested by Feder (1982) in which the economy consists of export
and non-export production. However, output in the export production generates an externality effect in the non-export sector, such as efficient management and competitive environment, improved production techniques, better quality management and workers, and continuous flow of imported inputs. Feder’s model of economic growth can be shown as:

\[ N = f ( K_N, L_N, X ), \]
\[ X = g ( K_X, L_X ), \]

(2) (3)

where \( N \) - domestic non-export production

\( X \) - domestic export production

\( K_N, K_X \) = capital stocks, respective for non-export and export production

\( L_N, L_X \) = labor forces, respective for non-export and export production

\( f, g \) are conventional production functions

Several authors have tested the effect of exports on the economic growth in the following production function, which is referred to as the Balassa approach (1978, cited by Sheehey, 1990)

\[ \Delta Y = \alpha_0 + \alpha_1 \Delta K + \alpha_2 \Delta L + \alpha_3 \Delta X + e \]

(4)

where \( Y \) is the real GDP, \( K \) is the real capital stock, \( L \) is the labor force, and \( X \) is merchandise real exports. The symbol \( \Delta \) indicates annual percentage rates of growth.

This model is based on a hypothesis that marginal productivities are higher in export production due to the scale effects and externalities associated with export production. Given the labor force and capital stock, expansion of the export sector will raise GDP growth (Ngoc et al., 2003). In addition, not only has the economic literature adopted a supply-side approach as the basic framework to test empirically the relationship between export and growth, but also nearly all the studies mentioned have specified a linear relation.

Consequently, as fishery exports can act as an engine of economic growth (Cunningham, 2000, Schmidt, 2003, FAO, 2007), this study follows a conceptual model based on an augmented Cobb–Douglas production function as followings

\[ Y_t = f ( L_t, X_t, EXR_t ) \]

(5)

where \( Y, L, EXR \) are real gross domestic product, labor force, and real exchange rate, respectively. Variable \( X \) represents fishery exports revenue in an effort to explore its effect on national economic growth.

Because tra/basa catfish and shrimp are the most important products for Vietnamese fishery export and demand for their exports is seasonal (Kinnucan and Miao, 1999), dummy variables for quarters in a year are added in the model (5) with the first quarter is used as base variable. The dummy variable for yearly quarters, \( QD_t \), gets value of ‘1’ if the value is of quarter (i), otherwise it gets value of ‘0’.

The Bilateral Trade Agreement signed in 2001 between the US and Vietnam as well as the US antidumping measures against to Vietnamese fishery products (such as frozen catfish and shrimp) since 2003 may have an effect on Vietnamese fishery exports. Two binary dummy variables, \( BTA \) and \( AD \), therefore were employed into econometric models to isolate the possible effects of the trade policies.

Subsequently, the model (5) is modified to become an empirical model:

\[ Y_t = f ( L_t, X_t, EXR_t, QD_{2t}, QD_{3t}, QD_{4t}, BTA_t, AD_t ) \]

(6)

Data description

The data for this study are obtained quarterly from the first quarter of 1997 to the last quarter of 2008 including GDP, fishery exports revenue, consumer price index, labor force of Vietnam, the exchange rate VN dong against to US dollar, and the US consumer price index.

The quarterly gross domestic products of Vietnam, \( Y_t \), is the real GDP with the base year of 1994. The value of GDP is billion VND. The three month summation
of fishery exports value is considered as the value of fishery exports in respective quarter in USD, $X_t$. Labor variable, $L_t$, gets quarterly data of Vietnam labor force, collected from data of GSO (2009). Getting daily data from the website www.oanda.com, the quarterly data of exchange rate of VND against USD, $EXR_t$, is average value of three months of a quarter. The quarterly data of CPI, $CPI_{VN}$, and US Consumer Price Index, $CPI_{US}$, is the average value in three months of a quarter, collected from GSO and the US Bureau of Labor Statistics, respectively. Descriptive statistics of the variables are described in Table 1.

Table 1
Descriptive statistical spreadsheet of all variables

|                | GDP (billion VND) | Labor (million persons) | Fishery exports revenue (million USD) | Exchange rate (VND/USD) | CPI - VN | CPI - US |
|----------------|-------------------|-------------------------|----------------------------------------|-------------------------|----------|----------|
| Mean           | 84996.60          | 40.08                   | 547                                    | 6.88E-05                | 106.79   | 184.30   |
| Median         | 80340.00          | 40.08                   | 533                                    | 6.73E-05                | 107.00   | 182.10   |
| Maximum        | 144873.00         | 47.40                   | 143                                    | 8.86E-05                | 126.00   | 219.30   |
| Minimum        | 47270.00          | 34.52                   | 137                                    | 6.03E-05                | 96.00    | 159.57   |
| Std. Dev.      | 24409.37          | 3.80                    | 306                                    | 6.49E-06                | 6.03     | 17.30    |

For accuracy in modeling, values of variables of the model would be adjusted. First, real values of GDP with the base year of 1994 were divided by amount of labor force to get GDP per capita values for the variable of $Y_{CAP}$. Second, the real exchange rate variable, $REXR$, gets data from the nominal exchange rate divided by the ratio between Vietnamese CPI ($CPI_{VN}$) and the United States CPI ($CPI_{US}$) when the United States CPI is collected from website of the US Department of Labor. Data for fishery exports was collected from Fistenet (2009), divided by Vietnamese CPI to get their real values before being divided by amount of Vietnamese labor to obtain values for the variable of $X_{CAP}$—fishery exports per capita. For stationary test, unit root tests for all series of variables $Y_{CAP}, REXR, X_{CAP}$ were implemented with Dickey-Fuller and Augmented Dickey-Fuller tests. Johansen Test was used to test cointegration between the datasets.

III. Results And Discussion

Results of unit root tests for variables $Y_{CAP}, REXR, X_{CAP}$ show that these variables are trend stationary time series in their logarithm. The datasets of $Y_{CAP}$ and $X_{CAP}$ are suspected to be cointegrated. However, Johansen test indicates a cointegration between the two datasets of $lnY_{CAP}$ and $lnX_{CAP}$, allowing for an application of Error Correction Modeling method to reconcile the short-run behavior of these variables with their long-run behavior. In the method, Vector Error Correction estimation is conducted to capture a possible endogeneity between $lnY_{CAP}$ and $lnX_{CAP}$ datasets. The estimation results are presented in Table 2.
Effects of fishery exports on Vietnamese GDP

The regression estimated that, in short-run, fishery exports affect much on GDP (absolute value of t-stat is 3.386) but the sign of this relationship is minus. Values of both GDP and fishery exports in all three quarters 2, 3 and 4 increase relative to that in quarter 1 because annual quarter 1 is the holiday season of Vietnamese people. Most of the people are likely to relax and get fun after one working hard year, leading to a decease in the productivity in Vietnamese economy and a reduction in GDP values. Further, in the first quarter of each year, most of Vietnamese fishery outputs are prioritized to serve domestic market, thus, there is no much surplus in fishery production to export. Values of fishery exports in second quarters are higher than that in first quarters because all production activities in Vietnam start in normal operation after holiday. The figures are improved well in third and fourth quarters in efforts to achieve annual export targets of fisheries enterprises.

Real exchange rate and the bilateral trade agreement between Vietnam and the US seem to decrease Vietnamese GDP and increase fishery exports but these effects are not statistically significant. The results are unlikely to favor the recent argument that a devaluation of Vietnam dong against to US dollar would increase exports and in its turn, increase GDP. The US anti-dumping
measures since 2003 against to fishery imports from Vietnam seem to depress Vietnamese fishery exports but the effects have not enough significance to derive an economic implication.

With the Vector Error Correction estimation, the empirical model for \( dlnYCAP \) is estimated as following

\[
dlnYCAP_t = 0.19*(\lnYCAP_{t-1} - 0.35*\lnXCAP_{t-1} - 4.42) + 0.15*\lnYCAP_{t-2} - 0.08*\lnXCAP_{t-2} - 0.92 + 0.65*QD_2 + 0.27*QD_3 + 0.52*QD_4 + e
\]

(1)

Expanding the differences, the long run equation for \( \lnYCAP \) is derived as:

\[
\lnYCAP_t = 0.96*\lnYCAP_{t-1} - 0.15*\lnYCAP_{t-2} - 0.01*\lnXCAP_{t-1} + 0.08*\lnXCAP_{t-2} - 0.08 + 0.65*QD_2 + 0.27*QD_3 + 0.52*QD_4 + e
\]

(2)

The result in Equation 2 estimates an increase in GDP of Vietnam during all three quarters 2, 3, and 4 relative to the first quarter annually. The BTA between Vietnam and the USA seems not to give a significant effect (\( P>0.05 \)) on the growth of Vietnam as expected (Table 2).

Although fishery exports depress Vietnamese GDP in its first lag, it is estimated to increase the GDP in its second lag with larger effect. The negative effect in short-run of fishery exports on Vietnamese GDP may be explained by the increasing contribution of aquaculture production on fishery exports revenue but the farming sector is increasingly depending on imported inputs such as feed ingredients, medicals and chemicals (Thanh, 2011). In long run, with summation of the two lags, fishery exports are likely to increase the GDP. For the long run estimation, a conclusion can be pointed out that Vietnamese GDP will increase 0.7% with a 10% c.p. increase in its fishery exports revenues. In other words, if other variables did not vary or their effects on Vietnamese GDP were not isolated, as value of fishery export revenue doubles, Vietnamese GDP would increase by 7%, it is so meaningful. This finding has a great economic meaning in the developing process of Vietnamese economy. The estimation results also confirm the role of sectoral exports in national economic growth, consistent with previous findings by Awokuse (2003), Anh (2008), Dritsakis (2004), and Thompson and Thompson (2010). In further implication, the results have also confirmed the contribution of exports to economic growth as documented in lots of literature. Vohra (2001), for instance, finds exports have a positive impact on economic growth when a country achieves some level of development, examining India, Pakistan, the Philippines, Malaysia, and Thailand from 1973 to 1993. In another study, Lee and Pan (2000) provide evidence of Granger causal relations from exports to GDP in Hong Kong, Indonesia, South Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand.

Effects of GDP on Vietnamese fishery exports

In similar derivation, the empirical estimation for the equation of Vietnamese fishery exports is expressed as follows:

\[
dlnXCAP = 0.52*(\lnYCAP_{t-1} - 0.35*\lnXCAP_{t-1} - 4.42) + 0.73*\lnYCAP_{t-2} - 0.44*\lnXCAP_{t-2} + 1.35 + 0.99*QD_2 + 0.56*QD_3 + 0.64*QD_4 + e
\]

(3)

The above equation is expanded and calculated as below:

\[
LNXCAP = 0.38*\lnXCAP_{t-1} + 0.44*\lnXCAP_{t-2} + 1.25*\lnYCAP_{t-2} - 0.73*\lnYCAP_{t-2} + 1.35 + 0.99*QD_2 + 0.56*QD_3 + 0.64*QD_4 + e
\]

(4)

The long run estimation derived in Equation 4 confirms an increase in fishery exports of Vietnam in all three yearly quarters 2, 3, and 4 relative to the first quarter. Vietnamese GDP was likely to raise fishery exports in its first lag. Although fishery exports were estimated to be lowered by GDP in second lag, with a summation for two-lag effects, the GDP would increase the fishery exports in long run. Vietnamese fishery exports would increase by 5.2% with a 10% increase in its GDP.
The estimated result is likely to be consistent with the findings of Siddique and Selvanathan (2002) mentioning about a positive effect of an economic growth on exports in Thailand during 1953-1993 through cointegration and Granger causality tests for exports, imports, and economic growth. The US antidumping measures against to Vietnamese frozen catfish fillets and shrimp was estimated not to give a significant effect on Vietnamese GDP growth nor fishery exports revenues, consistent with the previous finding of Duc (2010) working specifically on catfish trade.

IV. Conclusion and Suggestion

As data values of Vietnamese fishery exports and its GDP presents a co-integration, Vector Error Correction Modeling was an appropriate alternative. The long run estimation confirms an increase in fishery exports of Vietnam in all three last quarters (2, 3, and 4) relative to the first quarter yearly. The regression results also exhibit an economic impact of fishery exports in Vietnam. Although causing an estimated decrease in economic growth in short time, Vietnamese fishery exports, generally, are estimated to raise its national GDP in long time with its positive effects in accumulated two lags, during the period 1997–2008. For the long run estimation, a conclusion can be pointed out that Vietnamese GDP would increase 7% with a double ceterus parabus increase in its fishery exports value. This finding has a great economic meaning in developing process of the economy. An increase in exports of a sector like fishery is likely to create a growth in economy and in its turn, economic growth also boosts up a growth of a sector. Vietnamese fishery exports would increase by 5.2% with a 10% increase in its GDP. Confirming the role of export-led growth strategy in development economics, this study merits contributing to academic literature on international trade and economics with its empirical time series analyses.

Vietnam became a WTO’s member since 2007 and it would remove or reduce import tariff imposed on foreign aquatic products and also on aquaculture inputs leading to a forecasted increase in fishery import expenditure. Further analyses which include the expenditure, therefore, should be implemented to confirm the findings of this study.

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