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ON THE ROLE OF EXPORTS IN THE ECONOMIC GROWTH OF MALAYSIA: A MULTIVARIATE ANALYSIS

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In recent years a number of studies have attempted to examine the export-led growth hypothesis in the Malaysian context. The evidence is, however mixed and inconclusive. This might be attributed to the fact that previous studies are bivariate in that they only focus on the relationship between exports and economic growth. Therefore, in the present paper we reexamine the relationship between exports and economic growth in the Malaysian context using a multivariate model in which other relevant factors (exchange rate, labor, and capital) are allowed to exert their influence on the two basic variables (exports and economic growth). Our results are supportive of the export-led growth as a short-run phenomenon in Malaysia. Over the long-run, however, our results support, instead, the internally generated growth hypothesis. [O47]

1. INTRODUCTION

The debate on the role of exports in ecnomic growth has shifted in recent years in favour of the export-growth strategy. A number of empirical studies have documented a strong and positive relationship between exports and economic growth.[1] This positive relationship has been explained in terms of the positive effects that trade has on factor productivity through the introduction of improved production techniques, the training of highly skilled labour and the development of internationally competitive management.

In recent years, Malaysia has been growing very rapidly with a widely held view that such growth is export-led. The empirical evidence, however, is mixed and inconclusive. For example, Dodaro (1993) concluded that export growth has had a negative effect on the Malaysian economic development, while Bahmani-Oskooee and Alse (1993) contended that there is no long-run relationship between exports and economic development in the Malaysian context. Still, in a more recent paper, Doraisami (1996) claimed that her results show a two way causality between export growth and economic development.

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[1]See, among others, Balassa (1985), Tyler (1981), Ram (1987), Krueger (1990), Khan and Saqib (1993), Sengupta and Espana (1994), and Al-Yousif (1997).

Although useful and illuminating, previous studies on export-led growth on the case of Malaysia (some of which were cited above) are biased due to the omission of-variable phenomenon. In other words, they are bivariate in that they only focus on the relationship between exports and real economic growth. Economic theory indicates, however, that three other variables are very important in the determination of the two basic variables; namely, exchange rates (for exports) and capital and labor (for real output). Thus, bivariate models are potentially misspecified and may be flawed due to the omission-of-variable phenomenon. As a result, one would expect that both causality and cointegration tests would yield biased or at best mixed results in these models (see Miller, 1991 and Darrat, 1994). Therefore, in the present paper, our intention is to reexamine the relationship between exports and economic growth in the Malaysian context using a multivariate model in which other relevant factors (exchange rates, labor, and capital) are allowed to exert their influence on the two time series (exports and economic growth). Consequently,our model explores the relationship between five variables, namely, real GDP (X), real exports (RE), the employment index to represent labor (L), real gross fixed capital (RK), and the real effective exchange rate of the Malaysian ringett per U.S dollar (RH). Our sample covers the period 1955-1996 and all data on the variables come from the IMF, *International Financial Statistics Data Tape.*

The rest of the paper is organized as follows. Section II reports the empirical results from the unit root tests. Section III presents the results from the Johansen test of cointegration. Section IV discusses the Granger causality tests and their implications, Section V concludes.

2. UNIT ROOT TEST RESULTS

For our results to be reliable and unbiased, we need to establish that the variables of our model are stationary (free from unit roots) since non-stationarity of the variables can cause the "spurious regression" problem discussed in Granger and Newbold (1974) and Phillips (1986). Furthermore, Stock and Watson (1989) have shown that when a model includes non-stationary variables, the usual test statistics (t, F, and Adjusted R-square) would not have the standard distributions. According to Granger (1986), a non-stationary time series (Z) can achieve stationarity if differenced appropriately. This appropriate number of differencing is called the order of integration. Hence, a time series, Z, is said to be integrated of order d (contains d unit roots) if it becomes stationary after being differenced d times, denoted by Z~I(d). To find out the proper order of integration for each variable in our model, we use two testing procedures. They are the Augmented Dickey Fuller (ADF) test and the weighted-symmetric (WS) methods (for details, see Maddala, 1992 and Pantula et.al. 1994). The results from the two tests indicate that all five variables are stationary in first-differences [i.e., each is~I(1)].[2]

3. COINTEGRATION TEST: THE JOHANSEN METHOD

In the preceding section we found that the five variables of the model should enter the causality test in first-differences. However, we need to find out whether these variables are co-integrated before turning to the test of causality. Extensive work (e.g. Granger, 1987 and Toda and Philips, 1993) have shown that ignoring cointegration when it exists, can lead to serious model misspecification. A widely used test of cointegration is the two-step procedure suggested by Engel and Granger (1987). However, this procedure is appropriate only for bivariate models. Therefore, we employ the Johansen method (1988) which is a more efficient maximum-likelihood method to test for cointegration in a multivariable setting. We apply this test in two stages. In the first stage, the test is performed on the bivariate model to see if the two basic variables (exports and output) are cointegrated (i.e have a long-run relationship). Then, in the second stage, the bivariate model is expanded to incorporate other theoretically relevant variables and retest for cointegration in a multivariate model context. Table 1, panel A reports the results for the bivariate model, and panel B depicts the results for the multivariate model.

Panel A indicates that exports and real output are not cointegrated if tested within a bivariate model, a result that accords with that of Bahmani-Oskooee and Alse (1993). However, as shown in panel B, such an inference is incorrect since the two variables do have a reliable long-run relationship if considered in the more appropriate multivariate model. As the Johansen test in panel B indicates, the null hypothesis of no cointegration is strongly rejected at the 5% level by both the trace and the maximum-eigenvalue versions of the Johansen approach. Both versions indicate the existence of one non-zero stable cointegrating vector linking the two variables with the other three variables in the model. These results underscores the possibilities of biases from restrictive bivariate models and the need to specify and estimate broader models.

4. GRANGER-CAUALITY INFERENCES: SUR ESTIMATIONS

Having found one non-zero cointegrating vector in our multivariate model, we now procede to test for causality among the variables. This is done by first specifying an equation for each of the five variables by means of Akaike's final prediction error (FPE) criterion which has become quiet popular in recent applied

[2]For the ADF test, the test statistics for the first-differences of X, RE, L, RK, RH respectively -3.01, -3.13, -4.22, -3.79, -3.61 each of which is significant at the 10 percent level. For the WS test , these statistics are -3.34, -5.87, -3.92, -3.50, and -3.61 which, except for X, are all significant at the 5 percent level. The statistics for X is significant at the 10 percent level. The proper lags in both tests where chosen using Akaike's Information Criterion.

Table 1. Cointegration Test Results
(The Johansen Approach)

Null Hypothesis (Number of Cointegrating Vectors)	Trace Statistics	C.V (95%)	λ-Max Statistics	C.V (95%)
A. Bivariate Model (X, RE)				
r = 0	6.89	15.41	4.68	14.07
r ≤ 1	2.21	3.76	2.21	3.76
B. Multivariable Model (X, L,RE, RH, RK)				
r = 0	77.37**	68.52	39.34**	33.46
r ≤ 1	32.03	47.21	20.06	27.07
r ≤ 2	11.97	29.68	9.72	20.97
r ≤ 3	2.24	15.41	2.24	14.07
r ≤ 4	0.01	3.76	0.01	3.76

Notes: An * indicates rejection of the null hypothesis of no cointegration at 10% level of significance, while ** indicates rejection at 5% level.

X = Real GDP; L = emplyment Index to represent the labor force; RE = real exports ; RH = real effective exchange rate [H = ringgit per U.S $ and RH = H/ (domestic P/U.Sprices)]; RK = Real gross fixed capital.

All variables enter the testing equations in log- levels. Based on the Akaike Information Criterion (AIC), one annual lag and five annual lags were deemed optimal for the Johansen VAR Model in panels A and B, respectively. The test statistics are corrected for the small sample bias using Reimer's (1992) approach. The critical values are obtained from Osterwald-Lenum (1992, Table 1).

work for specifying optimal lags. We add a once-lagged error correction term (EC) derived from the Johansen efficient maximum likelihood estimations to represent long-run causality from the independent variables to the dependent variable. The short-run causality, on the other hand, is reflected by lagged coefficients on the indpendent variables. The five equations thus specified are then pooled and estimated as a vector-error-correction model (VECM) using Zellner's seemingly unrelated regression (SUR) method. Table 2 reports the likelihood ratio statistics (χ^2) obtained from this method.

It is clear from the real output equation (DX) that exports do exert a significant short-run causal effect on real output at least at the 5% level of significance (χ^2 = 12.79, the 5% critical value = 11.07 with 5 degrees of freedom). In sharp contrast, the export equation (DRE) shows that real output does not Granger -cause exports (χ^2 = 0.001, the 5% critical = 3.84 with one d.f). The FPE procedure suggests excluding real output from the export equation altogether since it fails to improve (reduce) the

Table 2. Granger- Causality Test Results: A VECM Approach
SUR Likelihood Ratio Statistics

Dependent Variables	ΣDX	ΣDL	ΣDRE	ΣDRH	ΣDRK	EC-1
DX	3.49 (1)*	0.82 (1)	12.79 (5)**	7.66 (2)**	6.5 (4)	0.02
DL	0	4.04 (1)**	0	0	0	8.31**
DRE	0	0	24.73 (2)**	36.78 (5)**	0	23.50**
DRH	0	1.92 (1)	0	0.60 (1)	0	0.09
DRK	0	0	0	0	23.58 (1)**	3.16*

Notes: See notes to Table 1. EC is the error-correction term extracted from the following equation :

$$EC = X - 2.090^{*}RE + 2.713^{*}RK - 4.516^{*}L - 2.130^{*}RH$$

The lag structures in parenthesis for each equation is determined by the FPE criterion. Some of the cells in the VECM are zero since the corresponding variables were unable to reduce the FPE value from the previous stage.

FPE value over the autoregressive process. To provide further evidence we force two lagged coefficients on real output in the export equation (over-fitting). The likelihood ratio statistic obtained from the system estimation continues to indicate no significance (χ^2 = 1.07, the 5% critical value = 5.59 with two degrees of freedom). Together, these results, indicate that exports unidirectionally causes real output. This finding is supportive of the export-led growth hypothesis.

As mentioned earlier, lagged coefficients on the independent variables in a VECM context represent short-run causal effects, while the coeficient of the error-term is reflective of long-run causality. In the real output equation, this coefficient is not significant, (χ^2 = 0.02, the 5% critical value = 3.84 with one degree of freedom) implying the absence of any significant long-run causal impact of exports on real output. On the other hand, the coefficient on the EC term in the export equation is highly significant (χ^2 = 23.5 with one d.f) indicating the presence of a significant long-run causality running from real ouput to exports in Malaysia.

The preceding results are supportive of the export-led growth theory in Malaysia *but only as a short-run phenomenon.* Over the longer-run horizon (two years or more) this positive impact of exports on economic growth tend to die down as attested to by the insignificant coefficient of the error-correction term in the real output equation. Our results also show that while real output does not Granger-cause *short-run* changes in exports, it appears that there is a strong *long-run* causality in Malaysia running from real output to exports.

To sum up, our VECM results show some support for the export-led growth hypothesis in Malaysia as a *short-run* process whereby exports have contributed to economic growth through short -run shocks that do not last for more than one year. In the longer-run, however, support is found for the alternative internally-generated growth hypothesis (see Darrat, 1987). According to this hypothesis, exports tend to grow in response to a growing economy over the long-run. The growth of the economy may be attributed to gains from non-export variables such as technological advancements, the accumulation of business skills, and perhaps also financial deepening. The consequent increase in production is generated internally without any direct contribution from export promotion policies. The expanding nonexport sectors would likely seek to broaden their markets by turning to foreign markets, and hence resulting export expansion. Finally, it is worth noting that among the three additional variables considered in the present model, the exchange rate variable plays an important role in determining both exports and real output in Malaysia. Therefore, previous studies in this area that overlook exchange rate in their models for Malaysia are likely to suffer from a serious omission-of-variable bias.[3]

5. CONCLUSIVE REMARKS

The objective of the present paper is to reexamine the relationship between exports and economic growth in Malaysia. The reasons for the choice of Malaysia as a case study are threefold. First, the Malaysian economy has grown very rapidly in recent years, and thus there is a great deal of interest in her experience. Second, previous empirical literature on the role of exports in the economic growth of Malaysia is mixed and inconclusive. Finally, most previous studies seem to suffer from an omission-of-variable phenomenon for they study the relation between exports and economic growth in a bivariate setting, possibly resulting in biased causality and cointegration inferences. Therefore, in this paper we reexamine the relationship between exports and economic growth in the Malaysian context using a vector-error-correction-model (VECM) in which labor, capital, and the exchnge rate are allowed to exert their potential influence on exports and economic growth.

Our findings from the Johansen test show that the five variables of the model (real GDP, labor, capital, exports, and the exchange) are cointegrated and thus have a long-run relationship. This implies that most previous studies in the Malaysian context that ignore cointegratedness between exports and real output are misspecified

[3]Since the stability of the estimated model is an important condition for its plicy usefulness, we have applied the chow test on each of the five equations using two alterntive breaking dates; namely 1973 and 1982 as gratefully suggested by a refree. The results, available upon request, generally indicate no signifant shift in the model.

for they ignore this important long-run information. While Bahmani-Oskooee and Alse (1993) examined cointegration in the Malaysian data, they did so in a restrictive bivariate model that is known to give biased results. Our results from the expanded (multivariable) model strongly indicate the presence of one non-zero cointegrating relationship between exports and real output in Malaysia. Another important result is that real exports tend to exert unidirectional impact on real output in the short-run, but over time this influence tends to die out. These findings are supportive of the export-led growth hypothesis, though only as a short-run explanation. Over the long-run, however, our results support, instead, the internally-generated growth hypothesis whereby economic growth in Malaysia appears to have been the outcome of non-export factors such as technical progress and the accumulation of business skills.

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