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Trade Linkages and Domestic Market Concentration: An Empirical Exploration for Malaysia

(Hubungan Perdagangan dan Penumpuan Pasaran Domestik: Satu Penerokaan Empirikal untuk Malaysia)

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ABSTRACT

This paper examines the univariate relationship between global linkages of the Malaysian manufacturing sector in the form of export intensity and intra-industry trade, respectively, on inter-industry concentration. The recently developed fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) panel cointegration techniques are employed. The estimated long-run coefficients reveal that intra-industry trade contributes towards more concentrated markets. However, export intensity is not significantly associated with market dominance. This suggests that domestic market structure is directly related to industries that engage in two-way trade flows or trade overlap. The structure of trade therefore deserves further attention when analyzing market dominance in the Malaysian manufacturing sector, which is globally integrated at the production level. It would thus be viable to examine why and to what extent vertically integrated industries that simultaneously facilitate not just external markets for components or final products but also the import markets for components (inputs) pose barriers to industries that are less networked globally.

Keywords: Export intensity; intra-industry trade; Malaysia; market concentration; panel cointegration.

ABSTRAK

Artikel ini meninjau hubungan univariate di antara jaringan global sektor pembuatan Malaysia, dari segi intensiti eksport dan perdagangan intra-industri, dengan konsentrasi inter-industri. Teknik kointegrasi panel yang terkini, iaitu "fully modified ordinary least squares" (FMOLS) dan "dynamic ordinary least squares" (DOLS), digunakan bagi kajian empirical. Koeffisien jangka panjang yang dinilai menunjukkan perdagangan intra-industri menyumbangkan kepada pasaran yang tertumpu. Namun, intensiti eksport tidak berkait secara signifikan dengan dominasi pasaran. Ini menunjukkan struktur pasaran tempatan berhubung secara langsung dengan industri yang terlibat di dalam perdagangan dua-hala atau perdagangan bertindan. Maka, struktur perdagangan perlu diberi perhatian bila menganalisa dominasi pasaran di dalam sektor pembuatan Malaysia, khususnya bagi sektor ini yang terikat secara global dari segi pengeluaran. Justeru itu, adalah penting untuk menilai kenapa dan sejauh manakah industri yang berintegrasi secara global dapat memasarkan komponen atau barangan akhir di pasaran antarabangsa, dan pada masa yang sama meninjau pasaran import bagi komponen (input) yang menjadi penghalang kepada industri yang mempunyai kurang jaringan antarabangsa.

Kata kunci: Intensiti eksport; kointegrasi panel; konsentrasi pasaran; Malaysia; perdagangan intra-industri.

INTRODUCTION

Malaysia has recently introduced some important policy changes to reap the benefits of increased competition in the domestic market. Key to this is the Competition Act 2010 (CA 2010) that received royal assent on June 2, 2010, and was subsequently enforced on January 1, 2012. The CA 2010 applies to any entity that carries on 'commercial activity' and the ultimate objective is to encourage Malaysian businesses to become competition-compliant. In light of this, the extent of domestic industrial concentration or market power in Malaysia has resurfaced as an important agenda in the Malaysian economy. Market power (both in terms of concentration and potential for expansion) that is positively associated with the international linkages should however not be taken to reflect market abuse. It is therefore imperative to examine if the links between market power (concentration) and trade prevail in the Malaysian context.

Following the structure-conduct-paradigm (SCP) analysis (Sawyer 1982), concentration is linked with competition, as high concentration[1] causes monopolistic or oligopolistic behaviour. Empirical research of industrial concentration is abundant in the industrial organization literature. It investigates industrial concentration in different industries as well as analyzes the relationship between concentration and some other economic variables, especially entry barriers, industry size, economies of scale and international linkages (export intensity, import penetration and foreign direct investment). This study however focuses exclusively on international linkages, as it has been recognized that the analysis of domestic market concentration should take into account these effects (see Kumar 1985). Malaysia is indeed a good case study for analyzing international influences on industrial concentration since export-led growth in manufactures drives this highly trade dependent economy.

In relation to the above, international linkages have been generally examined through foreign direct investment (FDI) and export orientation (intensity) and import penetration of industries. Whilst the former has been well studied (Lall 1979; Rugayah 1993; Bhattarchaya 2002; Adam and Khalifah 2012), the role of trade linkages on concentration has not been given comprehensive coverage in Malaysia. Beyond export intensity and import penetration, the structure of trade (or trade overlap) has been largely ignored. The domestic market concentration effects of trade structure are particularly relevant for Malaysia, whose manufacturing sector is networked globally (Jensen and Kara 2011). Namely, the two-way exchange of parts and components following from vertical integration, has led to extensive trade overlap or increasing intra-industry trade (trade within the same industry, including the trade in intermediate goods at various stages of production) in the Malaysian manufacturing sector. Vertical integration[2] of industries globally, in turn, may have influenced industry structure (Porter 1980). Firms that are vertically integrated may be able to achieve economies of scale through shared operations and functions that extend beyond the domestic market. Scale economies may therefore form a particularly significant entry barrier if the companies in an industry are vertically integrated (operate in successive stages of production and distribution). It may thus be the case that firms that gain extensive domestic market shares are those that are successfully linked with the global production networks, particularly the multinational corporations (MNCs[3]) (see Lall 1979), through vertical FDI.

This study's objective in what remains of this paper is to analyze the effects of this trade-concentration linkage process in Malaysia using a richer and current dataset. The remainder of this paper is structured as follows. Section 2 profiles the extent of industrial concentration in Malaysian manufacturing for the period 2000-2010. Given the focus of the study is on trade linkages, the importance of outward orientation and trade overlap, are also detailed. Section 3 describes the model specification and empirical strategy. Section 4 reports and discusses the results. Section 5 concludes.

DOMESTIC MARKET CONCENTRATION AND TRADE PATTERNS

MEASUREMENT INDICES

The study employs the standard quantitative measure of market concentration (CR)[4]. The CR, the percentage of market share held by the largest firms (m) in an industry, is defined below:

$$CR_m = \sum_{i=1}^{m} s_i$$

Therefore it can be expressed as:

$CR_m = s_1 + s_2 + ... + s_m$ where s_i is the market share and m defines the i^{th} firm

For this study, *CR4* (market share of the four largest firms) are considered. The *CR4* measure ranges from 0 to 100 percent. The levels reach from low or moderate/ medium to high[5] concentration as follows: (1) No concentration: 0 means perfect competition or at the very least monopolistic competition; (2) Total concentration: 100 means an extremely concentrated oligopoly or a monopoly; (3) Extremely low concentration: $0 < CR4 \leq 20$; (4) Low to moderate concentration: $20 < CR4 \leq 40$; (5) Moderate to high concentration: $40 < CR4 \leq 60$; (6) High concentration: $60 < CR4 \leq 80$; and (7) Extremely high concentration: $80 < CR4 < 100$.

Further to market concentration, outward orientation and trade overlap are used to capture trade patterns. Export intensity (*EI*), a measure of outward orientation, is calculated as the share of exports in total output. Generally, industries are considered as export oriented if the *EI* is above 50 per cent and domestic oriented if *vice versa.* The aggregate Grubel-Lloyd (*AGL*) index in turn is used to measure the extent of trade overlap within the industry, and it is measured as:

$$AGL_i = \frac{\sum (X_i + M_i) - \sum |X_i - M_i|}{\sum (X_i + M_i)}$$

where X_i is exports of commodity *i* and M_i is imports of commodity *i*. The index ranges from 0 to 100 percent. A value of 0 indicates inter-industry trade (IT) and a value of 100 percent indicates intra-industry trade (IIT). Industries are considered to be engaged in IIT if the *AGL* exceeds 50 per cent and IT if *vice versa.*

DATA SOURCES

Industry level data on output and exports are obtained from the unpublished returns of the Industrial Surveys, canvassed by the Department of Statistics (DOS). The *CR4* is however calculated based on the gross output statistics at the firm level. The data on imports and exports for the computation of the *AGL* index is sourced from UNCOMTRADE.

There are some limitations in the DOS data that are worth noting. First, data on exports are not available from the Industrial Surveys prior to 2000 and for the year 2010. Therefore the univariate analysis of examining the bilateral relationship between industrial concentration and export intensity is confined to the period 2000-2009. Second, for 2000-2010 (latest data available at the time of study), there is a change in the industrial classification from Malaysia Standard Industrial Classification (MSIC) (2000) for the period 2000-2008 to MSIC (2008) for the year 2009. As such, the matching of both classifications requires the data to be aggregated to the 3-digit MSIC level, comprising 23 major industrial groups, for the ensuing empirical enquiry (see Appendix 1). Third, given that imports are not available from the survey data, the trade (both export and import values) data is sourced from UN COMTRADE for the calculation of the *AGL* index. The *AGL* index is computed at the 6-digit Harmonized System (HS96) and then aggregated to the 2-digit HS level to match with the industry classification (see also Appendix 1).

The empirical estimations constitute balanced panels of 230 observations (23 industries × 10 years: 2000-2009) and 253 (23 industries × 11 years: 2000-2010) observations for examining industrial concentration with export intensity and industrial concentration with trade overlap respectively.

INDUSTRIAL CONCENTRATION

Figure 1 shows that there is a declining trend in industry concentration over time (see also Nor Ghani et al. 2000). For the period of review, *CR4* peaked at 43 per cent in 2005. The 2000 era obviously displays lower industrial concentration relative to the 1980s and 1990s, where *CR4* levels were cited to be above 45 per cent (Zainal and Phang 1993).

CR4 for Malaysian manufacturing over three years (2000, 2005 and 2010) are presented in Table 1. On average, the four largest firms account for 34 per cent of the total output of industries in 2010, a significant decline from the 61 per cent recorded in 2005. It can be seen that instances of no concentration do not prevail. However, there is a significant rise in the percentage of industries that are considered as low concentration. At the opposite extreme, a decline is noted in the percentage of industries classified as extremely concentrated, whilst a rise is observed in the number of industries that are highly concentrated. On the whole, the 2010 data indicates that only 24 per cent of the industries have *CR4* above 60 per cent, much lower than that recorded in 1986 and 1996 at 48 per cent and 42 per cent respectively (Bhattacharya 2002; see also Rugayah 1993). Notwithstanding that, the high concentration levels recorded for 2000 and 2005 corroborate earlier findings that the manufacturing sector is still oligopolistic in nature.

There is considerable diversity in concentration across industries. As such, concentration within industries does not shift in the same way as that for total manufacturing. There are many industries that did not see declines in concentration levels between 2005 and 2010. This is possible as industry level concentration and aggregate concentration are quite different in principle.

Interestingly, industries that are concentrated (*CR4* of more than 60 per cent) are not confined to those that are capital intensive such as scientific and measuring equipment, transport equipment and petroleum industries. High concentration levels are also identified with industries that are less capital intensive, such as leather and textiles. A possible reason for this is that the relatively small size of the domestic market and requires the firms to be large to gain the benefits of economies of scale

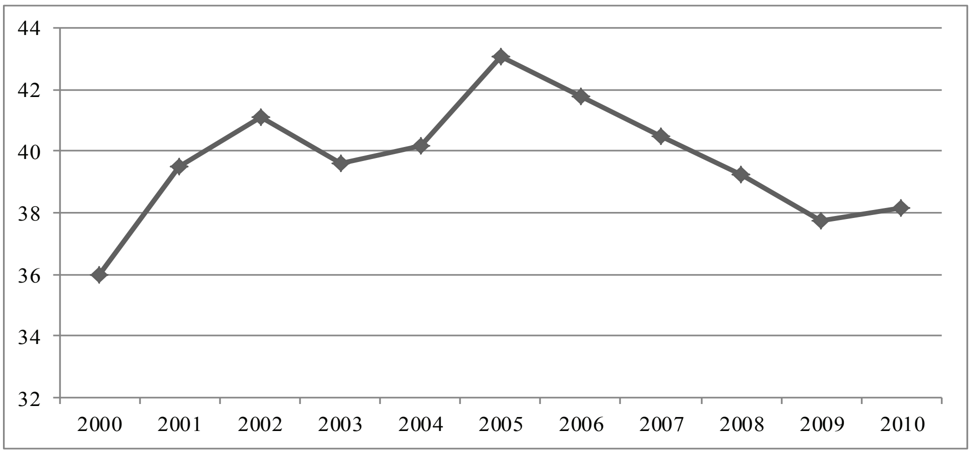

FIGURE 1. *CR4* for Manufacturing in Malaysia, 2000-2010 (in percent)

Source: CR4 calculated from the firm-level data obtained from the Department of Statistics for the years for 2000, 2005, 2008, 2009 and 2010. For the remaining years, the data is sourced from Ramstetter (2009).

TABLE 1. Distribution of *CR4* for Manufacturing, 2000-2010

	2000		2005		2010	
CR4 Levels	No.	%	No.	%	No.	%
Low concentration: $0 < CR4 \leq 20$	14	8.00	6	4.96	118	47.01
Low to moderate concentration: $20 < CR4 \leq 40$	36	20.57	18	14.88	51	20.32
Moderate to high concentration: $40 < CR4 \leq 60$	43	24.57	36	29.75	21	8.37
High concentration: $60 < CR4 \leq 80$	42	24.00	28	23.14	23	9.16
Extremely high concentration: $80 < CR4 < 100$	38	21.71	33	27.27	16	6.37
Total concentration: $CR4 = 100$	2	1.14	0	0	22	8.76
Mean (*CR4*)	57.47		61.37		34.29	
Std. deviation (*CR4*)	24.81		24.77		32.94	
Total no. of industries	175	100.00	121	100.00	251	100.00
Total no. of plants	20,445		28,257		38,752	

Source: Calculated from firm-level data obtained from DOS.

and compete internationally. In the case of the transport equipment and petroleum industries more specifically, the high levels of concentration mainly reflect the special interests of the government in these segments. As for beverages and tobacco, entry of firms is prohibited on religious and health grounds respectively. Low concentration is noted for furniture, plastic, fabricated metal, wood, rubber and non-metallic mineral products. It is estimated that 80-90 per cent of the companies in these industries comprise small and medium-size (SME) establishments.

The concentration levels are consistent with the number of plants in that industry. For example, there is 63, 74 and 298 number of plants in the tobacco, leather and beverages industries based on the 2010 data, respectively. In contrast, the number of plants in the low concentrated industries such as furniture, plastic and wood is 1932, 1456 and 1559 respectively.

TRADE PATTERNS

Figure 2 provides indication on the extent of integration of the manufacturing sector from the trade perspective. The extent of the outward orientation of this sector has declined from 53 per cent to 33 per cent between 2000 and 2009, recording some volatility. Unlike that of outward orientation, the IIT patterns have been on an upward trend over the period of review.

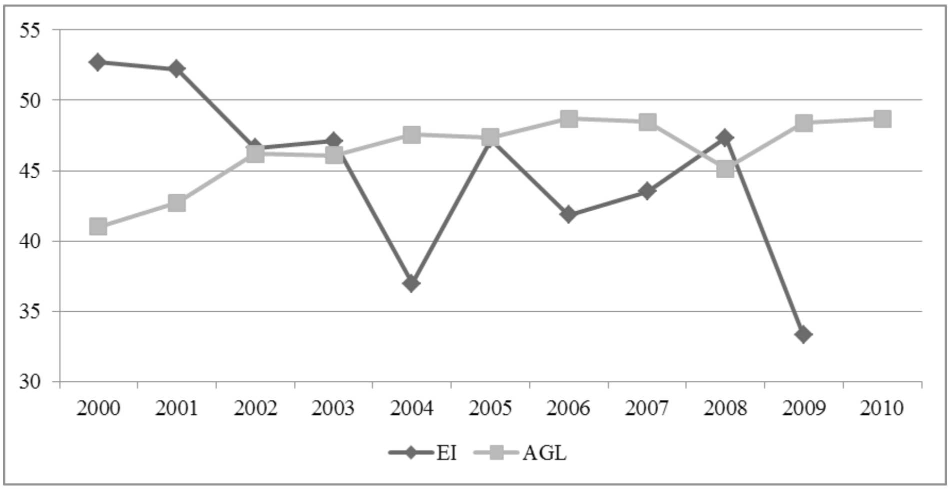

FIGURE 2. Trade Patterns in Manufacturing, 2000-2010 (in percent)

Notes: EI – export intensity; *AGL* – aggregate Grubel-Lloyd index
Source: Calculated from UNCOMTRADE.

The trade patterns however differ considerably between industries (see Table 2). Industries such as beverages, footwear and transport are highly inward-oriented, showing low export intensity. Export-oriented industries include leather, petroleum and electrical and electronics. Interestingly, two-way trade flows are not confined to export-oriented industries. For example, industries engaged in IIT comprise beverages, footwear, plastic, petroleum, electrical and electronics, scientific and measuring equipment, miscellaneous items, fabricated metal and machinery.

In general, the rise in the AGL index between 2000 and 2010 seem to be an industry-wide phenomenon, thereby underscoring the importance of analyzing trade-concentration linkage in terms of trade structure. The increase in IIT is attributed to the increasing reliance on production networks, where parts, components and other intermediate products instead of consumer/final goods (Khalifah 1996) are brought together in one location for final assembly. In this context, Malaysia produces some among various product specifications and buys abroad the others, but is dependent on imported intermediate and capital goods. This type of trade, which is basically outsourcing, results in high trade activity within the same industry.

METHODOLOGY

ECONOMIC MODEL

The estimating equations across manufacturing industries are as follows:

$$CR4_{it} = \alpha_i + \delta_{it} + \gamma_{1i}EI_{it} + \varepsilon_{it} \quad (1)$$

$$CR4_{it} = \alpha_i + \delta_{it} + \gamma_{1i}AGL_{it} + \varepsilon_{it} \quad (2)$$

where $i = 1, \ldots,$ N for each industry in the panel and $t = 1, \ldots,$ T, refers to the time period. The parameters α_i and δ_i allow for the possibility of industry-specific fixed effects and deterministic trends, respectively.

EI is expected to be inversely related to industry concentration as export opportunities are expected to enlarge existing market size (Ratnayake 1999; Bhattacharya 2002). Following from the firm (or industry) efficient structure hypothesis, firm-specific advantages (beyond technology, organization, managerial

TABLE 2. Concentration and Trade Measures, by Major Industrial Groups (in percent)

Industry	*CR4* (%)			*EI* (%)			*AGL* (%)		
	2000	2005	2010	2000	2005	2009	2000	2005	2010
Food	16.55	18.92	20.24	23.78	29.95	15.15	15.14	21.01	20.85
Beverages	67.69	60.63	57.03	4.40	5.71	3.54	47.01	59.32	72.89
Tobacco	93.13	90.80	95.60	19.94	18.85	36.67	17.75	56.26	25.01
Textiles	57.88	66.63	69.31	62.81	64.57	24.70	28.65	30.48	32.57
Garments	16.95	17.76	24.70	48.60	32.67	41.17	20.14	30.61	44.85
Leather	48.77	47.04	74.49	62.63	36.43	63.67	25.06	20.33	21.17
Footwear	42.22	37.15	48.57	15.02	14.85	5.86	51.00	57.39	71.77
Wood	9.10	10.70	15.20	55.22	52.71	39.65	11.79	13.65	16.44
Furniture	14.47	10.01	8.67	48.52	40.19	29.89	13.55	24.67	23.69
Paper, Printing & Publishing	26.46	27.43	21.73	15.38	9.08	9.88	34.76	40.30	42.50
Chemical	24.59	25.89	26.96	34.23	36.58	23.54	32.29	36.72	36.58
Petroleum Refineries/Products	71.50	57.50	65.31	27.60	46.07	56.90	38.72	54.52	59.64
Rubber	15.21	12.09	15.60	55.47	45.93	35.01	22.58	21.32	23.71
Plastic	7.21	16.96	8.92	26.26	28.54	21.86	58.87	61.64	64.12
Glass	78.71	78.76	55.74	38.00	46.47	45.02	66.32	68.36	42.41
Non-Metallic Mineral	16.46	18.46	16.87	16.40	16.30	9.95	19.83	19.75	31.92
Basic Metal	31.72	37.20	38.82	26.20	16.63	13.00	32.29	46.23	43.79
Fabricated Metal	29.70	28.92	13.54	29.77	26.75	14.25	44.84	48.89	51.16
Machinery	39.56	65.16	32.26	45.52	43.58	22.07	34.87	54.19	51.24
Electrical & Electronics	36.14	44.21	45.54	78.23	62.95	49.78	52.35	52.14	59.68
Transport Equipment	76.89	72.43	68.62	19.19	11.94	8.72	31.99	32.75	28.74
Scientific & Measuring Equipment	67.34	76.79	88.35	57.54	50.13	47.30	38.05	52.42	57.94
Miscellaneous	19.50	21.84	72.07	90.10	33.87	24.46	35.44	50.51	56.88
MANUFACTURING	35.98	43.08	38.17	52.71	47.23	33.29	41.03	47.35	48.69

Notes: *CR4* – four-plant market concentration; *EI* – export intensity; *AGL* – aggregate Grubel-Lloyd index.

Sources: *CR4* calculated from the firm-level data obtained from DOS for the years for 2000, 2005, 2008, 2009 and 2010. For the remaining years, the *CR4* is calculated from Ramstetter (2009).

or marketing) in terms of extensive trade overlap or two-way trade flows may pose competition to firms that are less networked, thereby leading to higher concentration. Therefore *AGL* is hypothesized to have a positive association with industry concentration.

EMPIRICAL STRATEGY

Before proceeding to cointegration techniques, the required condition is to verify that all variables are integrated to the same order. In doing so, the Levin et al. (2002, hereafter LLC) and the Im et al.[6] (2003, hereafter IPS) first generation panel unit root tests are used to determine the stationarity properties of the respective variables. Both tests assume the null hypothesis of nonstationarity. Since the first generation panel unit root tests assume that cross sections are independent, the cross sectional augmented Dickey-Fuller (CADF) test of Pesaran (2007) is also considered.

Appropriate methods of inference depend in important ways on whether data are integrated or not. In general, the residual from a regression of integrated variables is also integrated. This violates the assumptions of the classical regression model and the distribution of the regression parameters is highly non-standard. This is a so-called spurious regression (Granger and Newbold 1974). However, if the integrated variables share stochastic trends, and no relevant variables are omitted, the residual will be stationary. In this case, the variables are said to be cointegrated. Hence, cointegration testing is a powerful test of misspecification; it can test whether appropriate variables are included in the model.

Therefore, once the order of stationarity has been defined, the panel cointegration tests developed by Pedroni (1999, 2001, 2004) are applied to establish the long-run equilibrium relationship between the variables. A panel cointegration test overcomes the problems of low power associated with small samples, and the Pedroni (2001) test is chosen as it allows for cross-section interdependence with different individual effects to overcome the heterogeneity problem. Two types of cointegration tests are proposed by Pedroni, panel tests based on the within dimension approach (panel cointegration statistics, of which includes four statistics, the panel *v*-, rho-, PP-, and ADF-statistics) and group tests based on the between dimension approach (group mean panel cointegration statistics, of which includes three statistics, the group rho-, PP-, and ADF-statistics). The null hypothesis of no cointegration, $\rho_i = 1$, is tested by conducting a unit root test on the residuals as shown below upon estimating the long-run relationship based on equations (1) and (2):

$$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + w_{it} \qquad (3)$$

Next, the cointegrating coefficients are estimated using the between-dimension fully modified ordinary least squares (FMOLS) and dynamic ordinary least squares (DOLS) techniques as proposed by Pedroni (2000, 2004; see also Kao 1999; Kao and Chiang 2000). The FMOLS is considered appropriate as it exhibits small sample bias and is believed to eliminate endogeneity in the regressors and serial correlation in the errors.

RESULTS AND DISCUSSION

PANEL UNIT ROOT TESTS

Table 3 reports the results of the panel unit root tests in level and first difference. The results based on the LLC IPS and CADF tests show no uniform conclusion that the null of unit root can be rejected for *CR4*, *EI* and *AGL* However, the LLC, IPS and CADF test statistics for the first-differences strongly reject the null hypotheses for all three variables, which indicate that each variable is integrated of the order one. Thereby, what follows is testing for the Pedroni heterogeneous panel cointegration test in the next step of empirical analysis.

PANEL COINTEGRATION

Table 4 reports both the within and between dimension Pedroni panel cointegration test statistics. Most of the test statistics, for both the cases of intercept and intercept and trend, reject the null hypothesis of no cointegration at the 1 per cent significance level. Since the null hypothesis is rejected for panel ADF and group ADF statistics, which have the best small sample properties of the seven test statistics (see Pedroni, 1999), this provides the strongest single evidence of cointegration. As such, it can be

TABLE 3. Panel Unit Root Test Results

	Level			First Difference		
	LLC	IPS	CADF	LLC	IPS	CADF
CR4	–6.191**	–1.239	–1.381	–15.603***	–6.824***	–3.252***
EI	–8.263***	–1.659	–2.496***	–17.241***	–7.560***	–3.287***
AGL	–12.441***	–1.654	–1.564	–14.787***	–8.610***	–2.536***

Notes: The *t*-values and are reported for LLC and CADF while the *t*-bar is reported for IPS. Unit root tests include a constant but no trend. One lag is assumed for all cases. ***, ** and * indicate rejection of the null hypothesis of unit root at the 1%, 5% and 10% significance levels, based respectively on critical values of -2.010, -1.850 and -1.770 respectively for the IPS test. ***, ** and * indicate rejection of the null hypothesis of unit root at the 1%, 5% and 10% significance levels, based respectively on critical values of -2.010, -1.850 and -1.770 respectively for the CADF test.

TABLE 4. Pedroni Panel Cointegration Test Results

CR4 and *EI*			
Intercept			
Within dimension test statistics		Between dimension test statistics	
Panel *υ*-statistic	0.763	Group *ρ*-statistic	1.225
Panel *ρ*-statistic	–1.301*	Group PP-statistic	–2.030**
Panel PP-statistic	–3.085***	Group ADF statistic	–2.056**
Panel ADF statistic	–3.299***		
Intercept and trend			
Within dimension test statistics		Between dimension test statistics	
Panel *υ*-statistic	–0.797	Group *ρ*-statistic	3.354
Panel *ρ*-statistic	1.437	Group PP-statistic	–2.664***
Panel PP-statistic	–3.141***	Group ADF statistic	–4.164***
Panel ADF statistic	–3.691***		
CR4 and *AGL*			
Intercept			
Within dimension test statistics		Between dimension test statistics	
Panel *υ*-statistic	0.080	Group *ρ*-statistic	1.240
Panel *ρ*-statistic	–0.711	Group PP-statistic	–2.190**
Panel PP-statistic	–2.712***	Group ADF statistic	–3.168***
Panel ADF statistic	–3.527***		
Intercept and trend			
Within dimension test statistics		Between dimension test statistics	
Panel *υ*-statistic	–0.812	Group *ρ*-statistic	2.932
Panel *ρ*-statistic	0.571	Group PP-statistic	–4.417***
Panel PP-statistic	–4.504***	Group ADF statistic	–4.005***
Panel ADF statistic	–5.235***		

Note: ***, **, and * indicate rejection of the null hypothesis of no cointegration at the 1%, 5% and 10% significance levels, based respectively on critical values of 2.326, 1.644 and 1.281.

concluded that a long-run equilibrium relationship exists between *CR4* with *EI* and *AGL*.

FMOLS AND DOLS ESTIMATIONS

In light of the panel cointegration tests, the FMOLS and DOLS estimators for heterogeneous cointegrated panels are employed to determine the long-run equilibrium relationship between industrial concentration and trade integration. Table 5 displays the FMOLS and DOLS results. With either method, the coefficient for *EI* is not significant though its shows the expected negative sign. Conversely, the FMOLS and DOLS coefficients for *AGL* are highly positive and significant at the 1 per cent level. The results suggest that intra-industry trade contributes to domestic market concentration. Given the trade collapse in 2008[7], the FMOLS and DOLS estimators are applied for a shorter sample period, 2000-2007. The results, as reported in the second panel of Table 5, are found to be robust to that of the full sample.

Studies described in the literature suggest domestic factors to have utmost influence on domestic market concentration in Malaysia (see Lall 1979; Rugayah 1992; Nor Ghani et al. 2000, 2004; Bhattacharya 2002; Muhammad and Suhaila 2006). Those that examine the influence of export intensity and import penetration seem to conclude that international influences (apart from FDI) are generally non-significant in influencing domestic market concentration in Malaysia. Examining market concentration based on the dual structure of industries serving the domestic or international markets may no longer be relevant. Instead, ignoring the dominant structure of trade in manufactures, which involves substantial two-way trade flows within industries, downplays the importance of trade linkages for domestic market concentration.

CONCLUSION

The paper investigates the univariate relationship between inter-industry concentration with global integration of the manufacturing sector in the form of export intensity and intra-industry trade respectively. Two classes of panel cointegration test are applied and the between-group FMOLS and DOLS estimators to control for heterogeneous

TABLE 5. FMOLS and DOLS Long-Run Estimates

FMOLS:		
CR4 =	44.382*** (6.690) (0.170)	-0.065*EI*
CR4 =	16.122** (8.223)	0.652****AGL* (0.190)
DOLS:		
CR4 =	45.973*** (7.623) (0.199)	-0.111*EI*
CR4 =	16.390* (9.226)	0.643****AGL* (0.217)
Robustness Checks (2000 - 2007)		
FMOLS:		
CR4 =	45.307*** (7.259) (0.178)	-0.097*EI*
CR4 =	14.492 (9.082)	0.698****AGL* (0.214)
DOLS:		
CR4 =	46.434*** (8.371) (0.213)	-0.123*EI*
CR4 =	14.371 (10.551)	0.704****AGL* (0.254)

Notes: Standard errors are reported in parentheses. Significance at the 1%, 5 % and 10% levels are denoted by ***, ** and * respectively.

short-run dynamics and heterogeneous error terms are employed. It is found that the concentration ratio, export intensity and the AGL index in panel data are non stationary but the former is cointegrated with the latter two.

The empirical analysis has verified the existence of a positive and significant relationship between intra-industry trade and industrial concentration for Malaysia. This suggests that domestic market structure is directly related to industries that engage in two-way trade flows or trade overlap. The structure of trade therefore deserves further attention when analyzing market dominance in the Malaysian manufacturing sector, which is globally integrated at the production level. It would thus be viable to examine why and to what extent vertically integrated industries (more specifically intra-firm trade) that simultaneously facilitate not just external markets for components/final products but also the import markets for components (inputs) pose barriers to industries that are less networked globally. Concentration in these industries would thus have to take into account the barriers could arise from the combination of easy access to essential and cheap inputs from abroad, good network beyond buyers to suppliers in external markets.

NOTES

1 High concentration may be a natural result of the market mechanism if there is no freedom to enter the market, if there is a threat to newcomers and if the level of minimal optimal scale of the firm is high.

2 This study takes on a different perspective of vertical integration from that of previous studies that refer to the ratio of value-added to sales to capture internal and external exchanges within the domestic marketplace (Nor Ghani *et al.,* 2006).

3 MNCs in Malaysia basically import intermediate products sourced from their parent company or overseas subsidiaries and assemble products locally before exporting them as finished goods (Adam and Khalifah, 2012).

4 The concentration ratio is effective in showing the dominance of top firms, but it does not address the rest of the market nor does it account for the influence of a single firm. However, one consolation for using the *CR4* is that the plant-level data is generated from surveys and censuses. Following which, problems are not encountered in the calculation of *CR4*s as the survey includes the larger firms and omits smaller firms. Further, the literature shows that various concentrations measures are highly correlated and provide similar findings.

5 The Shepherd's (1997) classification is adopted, whereby industries are considered as displaying oligopolistic, dominant and monopoly behavior if *CR4* is above 60 per cent.

6 The results of the IPS are considered conclusive given that it allows for heterogeneous autoregressive coefficients, and hence more powerful than the LLC.

7 We thank the anonymous referee for highlighting this important point

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APPENDIX 1. Concordance of Industry- and Trade Classifications

	Industrial Classification		Trade Classification
Industry	MSIC 2000	MSIC 2008	HS96
Food	151-154	101-108	01-21
Beverages	155	110	22
Tobacco	160	120	24
Textiles	171-173	131, 139	50-60
Garments	181	141-143	60-63
Leather	191	151	41&42
Footwear	192	152	64
Wood	201-202	161-162	44-47
Furniture	361	310	94
Paper, Printing & Publishing	210, 221-223	170, 181-182	48-49
Chemical	233 & 241-242	201-203, 210	28-38
Petroleum Refineries/Products	232	191-192	27
Rubber	251	221	40
Plastic	252	222	39
Glass	261	231	70
Non-Metallic Mineral	269	239	68 & 71
Basic Metal	271-273	241-243	72-73, 75, 78-81
Fabricated Metal	281, 289, 291	251-252, 259	74, 76, 82-83
Machinery	292, 300	281-282	84
Electrical & Electronics	293, 311-315, 319, 321-323	261-264, 271-275, 279	85
Transport Equipment	341-343, 351-353, 359	291-293, 301-304, 309	86-89
Scientific & Measuring Equipment	331-333	265-268	90-91
Miscellaneous	369	321-325, 329	92, 95-96

Note: Matching of classifications by author.