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Fostering Clusters in the Malaysian Electronics  
Industry

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# **FOSTERING CLUSTERS IN THE ELECTRONICS INDUSTRY IN MALAYSIA**

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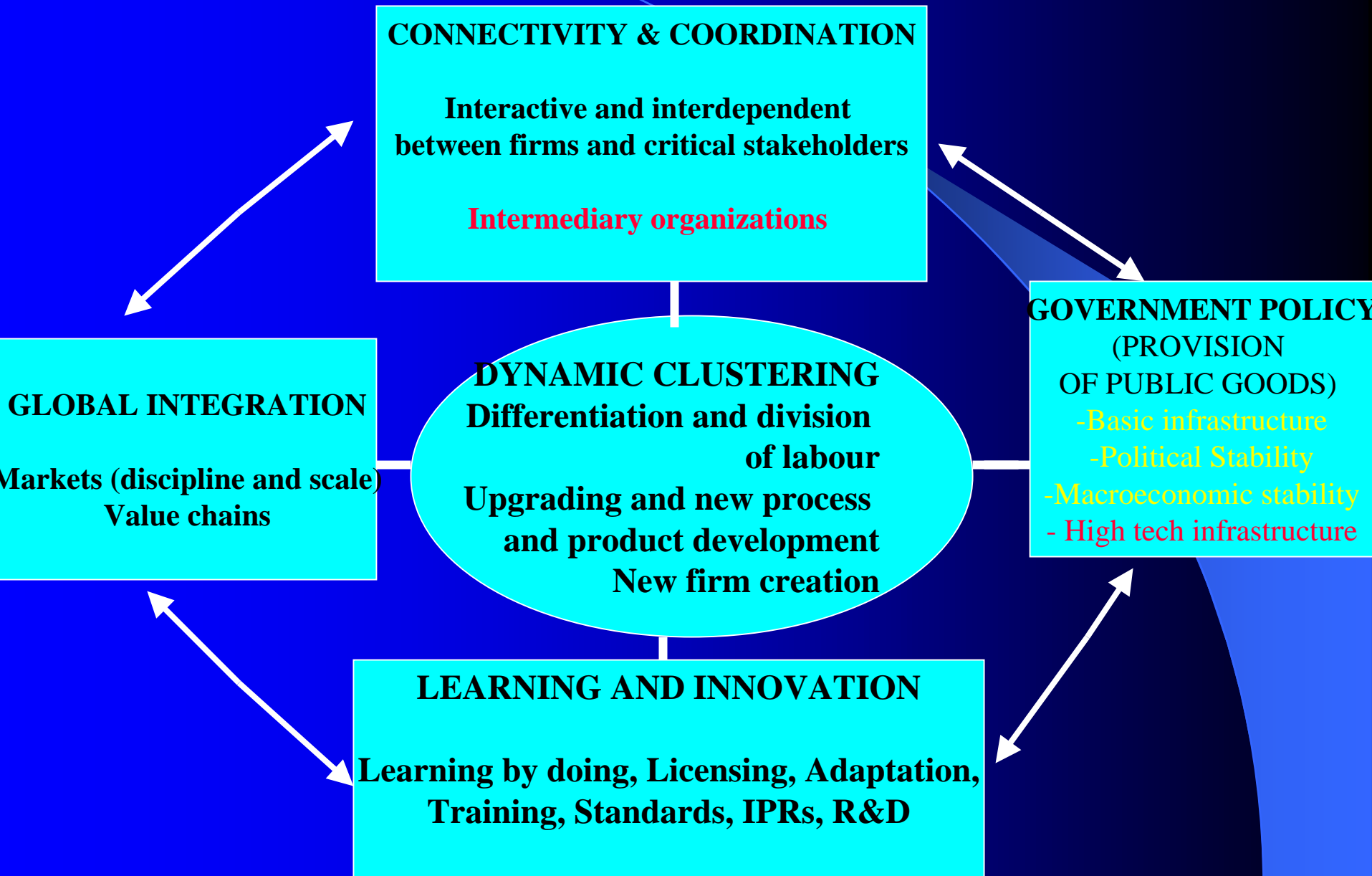
**Paper prepared for the Asian Development Bank Institute; Views expressed are  
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# 1 INTRODUCTION

- The meaning of clusters has evolved considerably over several decades. This paper seeks to use a synthesis of the concept from the time of Mill and Marshall (industrial districts), and Smith and Young on differentiation and division of labour to encompass the work of Brusco, Becatini, Sabel, Sengenberger, Zeitlin, Pyke, Richardson, North, Lorenz, Wilkinson and Piore to extract the influence of socio-economic relationships (a blend of markets and trust-loyalty), and subsequently the contributions of Porter (traditional and high tech clusters) and Best (organizational change, techno-diversity, open-system flows and speciation)
- Key institutions and horizontal interactive and interdependent relationships between key economic agents are considered critical to drive differentiation and division of labour in dynamic clusters.
- Paper examines clustering in the electronics industry in Malaysia with a policy focus on the embedding environment within which this process has evolved in the two main regions of Penang and Kelang Valley.

- Organization of paper:
- Section 2: Cluster framework
- Section 3: Industrial Strategies in Malaysia
- Section 4: Critical impasse in the industry
- Section 5: Clustering in the electronics  
Malaysia – Penang and Kelang Valley
- Section 6: Conclusions and Policy  
Implications

## 2. FRAMEWORK OF DYNAMIC CLUSTERS



### 3. INDUSTRIAL STRATEGIES IN MALAYSIA

	Industrial Development Strategy	Nature of Policy
1958-1971	Industrial Estates	Import-substitution (IS) but with only tariffs on final goods; basic infrastructure, stability and security
1972-1979	Export Processing Zones	Tariff free and tax holidays basic infrastructure, political and macroeconomic stability, security, investment coordination, customs coordination and control over unions
1980-85	Heavy industries	Direct state ownership; preferential loans; protection in domestic markets; spawning of Bumiputera entrepreneurs
1986-1995	Industrial Master Plan	Promotion of EPZs, Resource-based, Heavy Industries and Strategic industries – all with increased emphasis on exports; Critical high tech institutions were created in this period – e.g. MIMOS (1985), MTDC (1992), HRDF (1992); MIGHT (1993); Promotional aspects of investment such as incentives and low interest rates were maintained
1996-2005	2nd Industrial Master Plan	Cluster strategy adopted based on endowments, strategic and policy considerations. SMIDEC (1996), MDC (1996) and MSC (1997) were created; Promotional aspects of investment (for strategic and high tech industries such as incentives and low interest rates maintained. Slowdown from 1995 led to resumption of incentives to all exporting firms.

**Table 1: Basic and High Tech Infrastructure Index, 2000**

	BI	RDI
Korea	0.544	0.446
Taiwan	0.613	0.490
Malaysia	0.416	0.029
Thailand	0.296	0.019
Philippines	0.117	0.021
Indonesia	0.109	0.017

Note: BI calculated using the proxies of adult literacy rate (education), doctors per thousand people (health) and main telephone lines per thousand people (communication) using the normalisation formula in model (4) below and the 96 countries where data were available from World Bank (2003). The same approach was used to calculate HTI using the proxies of R&D scientists and engineers per million people, and R&D investment in Gross Domestic Investment and 55 countries where the data was available from World Bank (2003) and national ministries. Both the BI and HTI scores were eventually divided by the highest score in the respective categories so that the leading country achieved a score of one, while that of the remaining countries fell in the range  $0 \leq X \leq 1$ .

Source: Computed from World Bank (2003); Taiwan (2004); Malaysia (2004); Thailand (2004)

# 4 CRITICAL IMPASSE

Rapid growth in the electronics industry in the industry until mid-1990s but is now slowing down; Employment has fallen since 1997.

Resumption of tax holidays in 1997 for all exporting firms has stimulated exports again, but foreign firms are gradually relocating operations outside (especially in China, Thailand and Philippines).

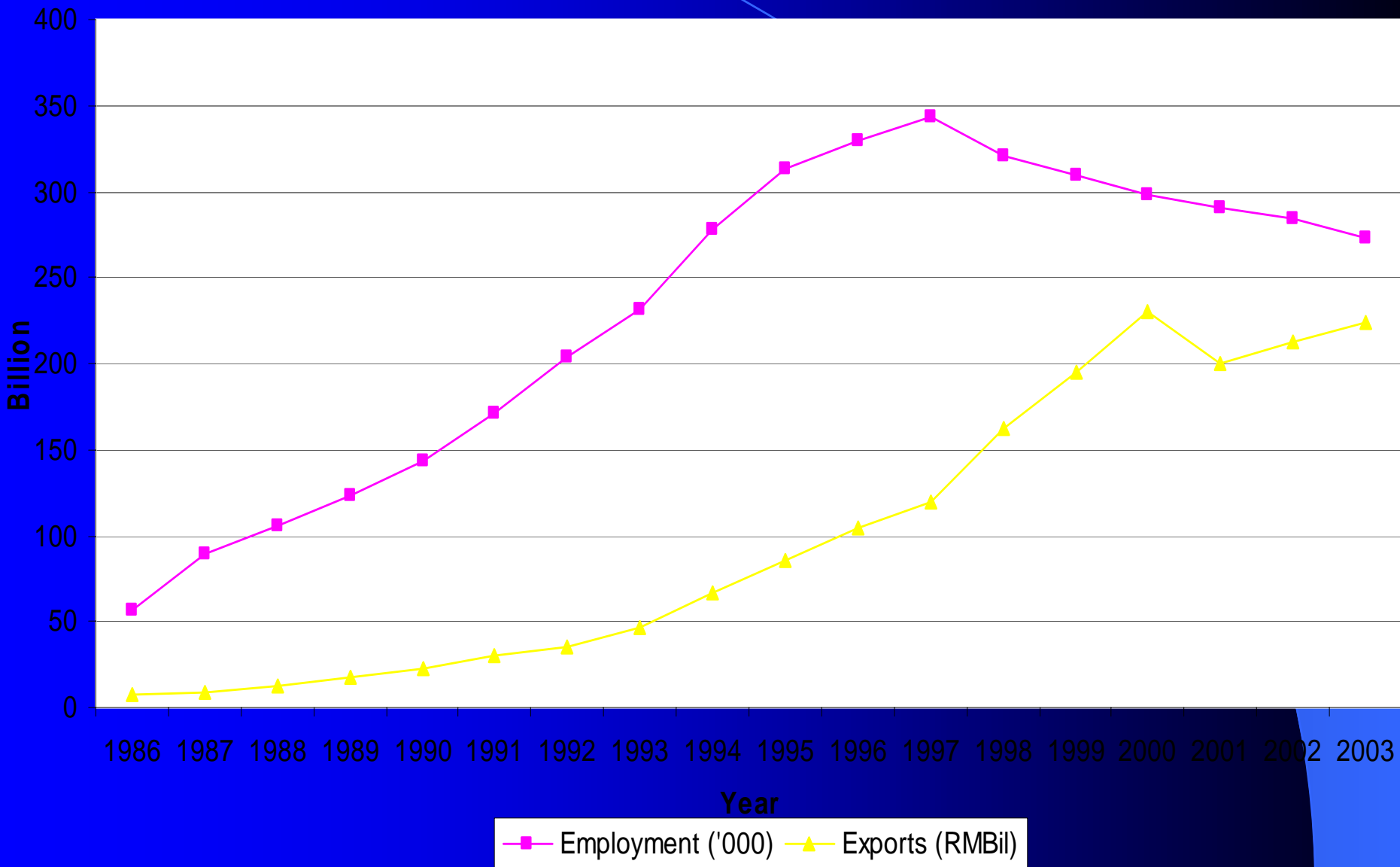
A failure to upgrade (learn and innovate) has left Malaysia to compete with low cost sites such as China, Philippines and Thailand.



**Table 2: Foreign Ownership in Malaysian Manufacturing, 1968-2001 (%)**

	1968	1975	1980	1985	1990	1993	1998	2001
<b>Food</b>	74	55	32	25	30	33	27	28
<b>Beverages and tobacco</b>	93	79	76	67	62	58	69	61
<b>Textiles</b>	52	63	54	48	61	64	76	61
<b>Leather</b>	17	48	48	54	59	57	61	62
<b>Wood</b>	15	8	13	9	19	36	27	22
<b>Furniture and fixture</b>	50	61	31	19	45	45	25	40
<b>Paper, printing, publishing</b>	Na	16	10	20	14	13	10	11
<b>Chemicals</b>	53	63	53	16	24	25	46	50
<b>Petroleum and coal</b>	78	79	78	37	44	50	34	36
<b>Rubber</b>	14	42	46	42	55	51	50	38
<b>Plastic</b>	na	na	12	13	27	46	38	44
<b>Non-metal mineral</b>	57	52	19	32	33	39	34	37
<b>Basic metal</b>	49	42	35	32	17	33	30	40
<b>Fabricated metal</b>	66	59	26	23	30	56	36	46
<b>Machinery</b>	74	51	42	35	53	65	66	70
<b>Electric/electronics</b>	70	84	80	73	89	91	83	70
<b>Transport equipment</b>	Na	51	32	15	25	35	29	24
<b>Other manufacturing</b>	60	69	57	53	69	81	56	50
<b>Manufacturing</b>	61	52	39	33	42	50	47	44

# Figure 1: Employment and Trade, Electric/Electronics, Malaysia, 1986-2003



## Two-tailed t test of SI and R&D intensities (Malaysia against Taiwan and Korea)

- Skills-intensity (SI) – share of professional and technical workers in workforce
- R&D intensity – normalized using R&D investment in sales and personnel with R&D duties
- Two-tail t-test of means
- \*, and \*\* - significant at 1%, 5% and respectively.

<b>SI</b>	<b>Malaysia</b>	<b>Taiwan</b>	<b>t</b>	<b>Malaysia</b>	<b>Korea</b>	<b>t</b>
<b>All</b>	<b>0.310</b>	<b>0.687</b>	<b>-8.67*</b>	<b>0.310</b>	<b>0.635</b>	<b>-6.361*</b>
<b>Foreign</b>	<b>0.309</b>	<b>0.629</b>	<b>-5.444*</b>	<b>0.309</b>	<b>0.665</b>	<b>-5.302*</b>
<b>Local</b>	<b>0.317</b>	<b>0.718</b>	<b>-4.856*</b>	<b>0.317</b>	<b>0.619</b>	<b>-3.008*</b>

Source: Computed from ADB Survey (2002); UNU-INTECH Survey (2002)

<b>R&amp;D</b>	<b>Malaysia</b>	<b>Taiwan</b>	<b>t</b>	<b>Malaysia</b>	<b>Korea</b>	<b>t</b>
<b>All</b>	<b>0.088</b>	<b>0.546</b>	<b>-10.737*</b>	<b>0.088</b>	<b>0.212</b>	<b>-4.265*</b>
<b>Foreign</b>	<b>0.103</b>	<b>0.423</b>	<b>-6.928*</b>	<b>0.103</b>	<b>0.225</b>	<b>-2.807*</b>
<b>Local</b>	<b>0.033</b>	<b>0.610</b>	<b>-6.584*</b>	<b>0.033</b>	<b>0.205</b>	<b>-3.583*</b>

**Source: Computed from ADB Survey (2002); UNU-INTECH Survey (2002)**

## **5 CLUSTERING IN MALAYSIA**

- 1. Rooted from industrial estates and EPZs**
- 2. Significant improvements to basic infrastructure – including modern highways and the provision of broad band cyber cables**
- 3. Significant improvements to investment coordination, customs coordination, political stability and security**
- 4. Physical infrastructure for high tech operations created**
- 5. However, being knowledge-intensive and given the exhaustion of surplus labor (reserve army) from the 1990s, wages have been rising strongly despite the lack of unions in the industry.**
- 6. Despite creation of high tech institutions since the 1990s severe institutional failure has stifled the supply of knowledge-based public goods for firms to upgrade and participate in R&D activities. MIMOS has failed to achieve the success of ERSO at ITRI**

**Table 3: Institutional and Systemic Coordination Instruments, Malaysia, 2005**

<b>Systemic Features</b>	<b>Penang</b>	<b>Kelang Valley</b>
<b>Chambers of Commerce</b>	<b>Strong</b>	<b>Weak</b>
<b>Number of TNCs and institutions</b>	<b>High</b>	<b>High</b>
<b>Network cohesion</b>	<b>Strong</b>	<b>Weak</b>
<b>Skills development and training</b>	<b>Strong</b>	<b>Weak</b>
<b>Matching of supplier firms with TNCs</b>	<b>Strong</b>	<b>Weak</b>
<b>Basic infrastructure support</b>	<b>Strong</b>	<b>Strong</b>
<b>Security</b>	<b>Strong</b>	<b>Strong</b>
<b>Industry-government coordination councils</b>	<b>Active</b>	<b>Passive</b>
<b>Production of high tech human capital</b>	<b>Low</b>	<b>Low</b>
<b>Links with standards organization</b>	<b>High</b>	<b>High</b>
<b>Industry-Public R&amp;D ties (e.g. MIGHT)</b>	<b>Weak</b>	<b>Weak</b>
<b>Industry-University ties</b>	<b>Weak</b>	<b>Weak</b>
<b>R&amp;D labs (e.g with MIMOS)</b>	<b>Weak</b>	<b>Weak</b>
<b>Publication of documents on product and process technology of suppliers</b>	<b>Strong</b>	<b>None</b>
<b>Access to foreign High tech human capital</b>	<b>Restricted</b>	<b>Restricted</b>

## 5.1 Penang (Strong synergies)

- **Strong speciation synergies**
- **Strong role of firms as invisible colleges and training synergies**
- **Strong differentiation and division of labour**
- **Weak upgrading and innovation**
  - **- MSC status provided in 2005 but this may be too late to re-attract high tech firms**



## **5.2 Kelang Valley (Weak synergies)**

- **Weak speciation synergies**
- **Weak role of firms as invisible colleges**
- **Weak differentiation and division of labour**
- **Weak upgrading and innovation**
  - **- MSC status provided in 1997 but being embedded in a poorly connected cluster lacking in high tech support, this has discouraged firms' participation in high value added activities**

## 6. CONCLUSIONS

- Like in many developing economies cluster-based industrialization in Malaysia evolved from industrial estates and EPZs.
- Consistent with the promotion of EPZs, Malaysia offered excellent basic infrastructure to attract a critical mass of electronics firms.
- Strong systemic and institutional coordination in the state of Penang stimulated strong differentiation and division of labour.
- Weak systemic and institutional coordination in the Kelang Valley region left MNC operations largely truncated and hence little differentiation and division of labour.
- Network cohesion helped the movement of human capital from firms in Penang to start new firms.
- Lack of cluster cohesion restricted the movement of human capital from firms in the Kelang Valley to start new firms.

- Lack of coordination between high tech institutions and industry has restricted learning and innovation in firms (technological capability) to globalize creatively (gales of creative destruction).
- Lack of institutional and systemic support – both to finance and to create the human capital necessary to drive R&D has restricted upgrading and innovation.
- Two critical features are critical in driving high tech clusters: 1. creating the institutional and systemic coordination environment and 2. the high tech support (public goods) necessary to support firms' participation in upgrading and innovation – which is essential for long term competitiveness.