



Catching Up through Divergent Paths: Technology Innovation and Institutions in Africa and Asia

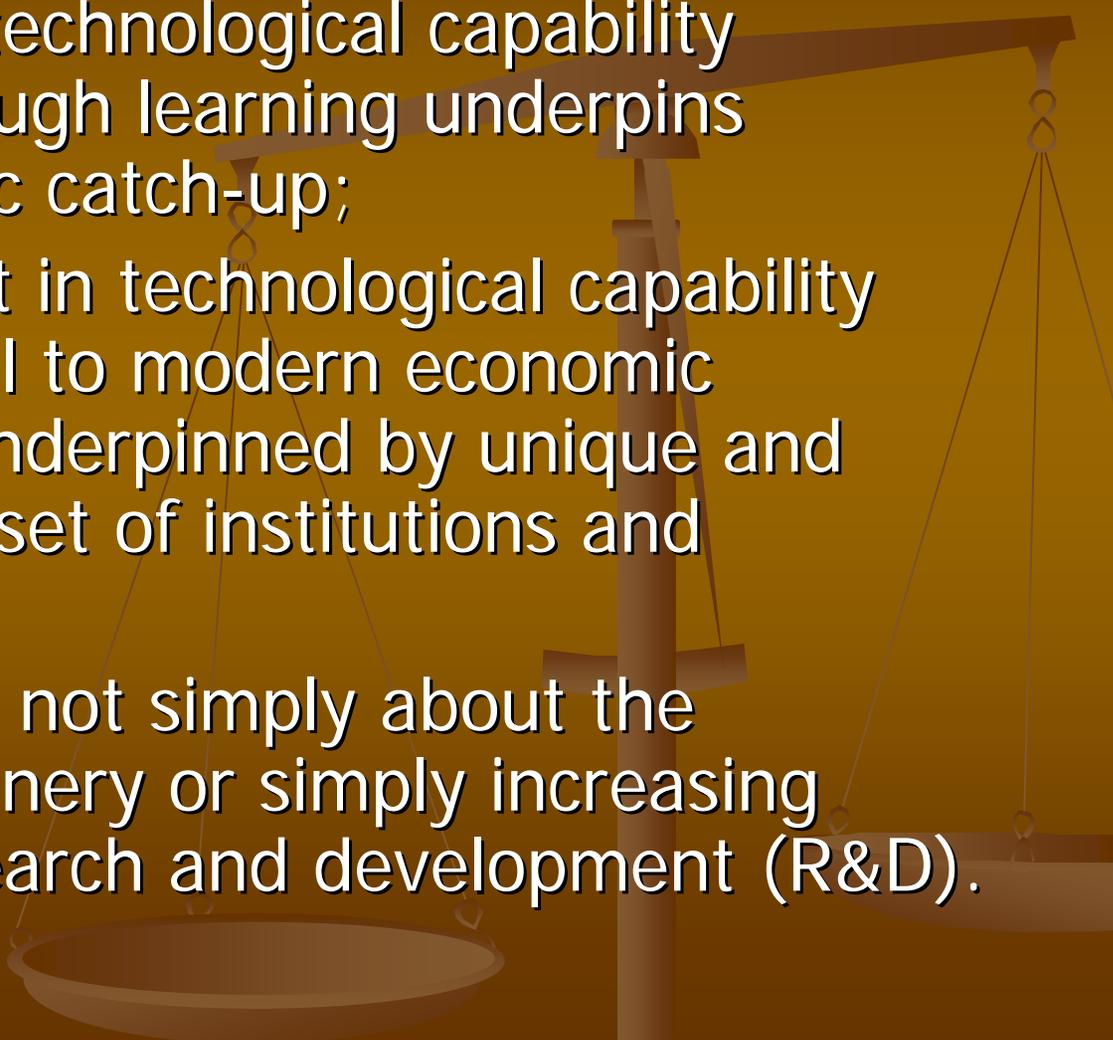
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Source



- Seven Countries Study:
 - Mauritius, Nigeria, South Africa
 - Taiwan, China, Indonesia and Malaysia
 - Sector: Information Hardware.
- United Nations University-MERIT,
Maastricht (2005-2006)

Uneven Paths Propositions

- The processes of technological capability accumulation through learning underpins historical economic catch-up;
 - Explicit investment in technological capability acquisition; central to modern economic development, is underpinned by unique and nationally distinct set of institutions and organizations.
 - Industrialization is not simply about the purchase of machinery or simply increasing investment in research and development (R&D).
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Uneven Paths Factors

Factors that shape the paths of development are complex but there are a few areas of agreement:

- knowledge, not just technological alone in its narrow sense, is critical;
- Leading sectors are able to propel economies in the direction of high growth dynamics;
- Learning through diversity generation (INNOVATION) fosters economic development;
- diversities of institutions and systems of production (and innovation) explain the persistent differences in the path of development and ultimately the economic outcomes of national endeavours

The stylized facts of Catch-Up

- Industrialization of forerunners provide an opportunity for *latecomers* to initiate their own processes of industrialization through learning;
- Catching-up demands an institutional arrangement that is peculiar to the endowment of the particular country;
- The catch-up strategy has almost always succeeded through the targeting of rapidly growing sectors

Stylized Facts of Catch Up

- Catch-Up involves an activist state; however the role of the state will differ in style and content across countries and time;
- The nature of demand has been critical in catch up strategies. Domestic demand was critical in driving scale-based industries in large economies such as the United States, Germany, Japan and Korea. However, export-oriented industries were central to all successful industries in Taiwan.

Sectoral Focus: Why Information Hardware?

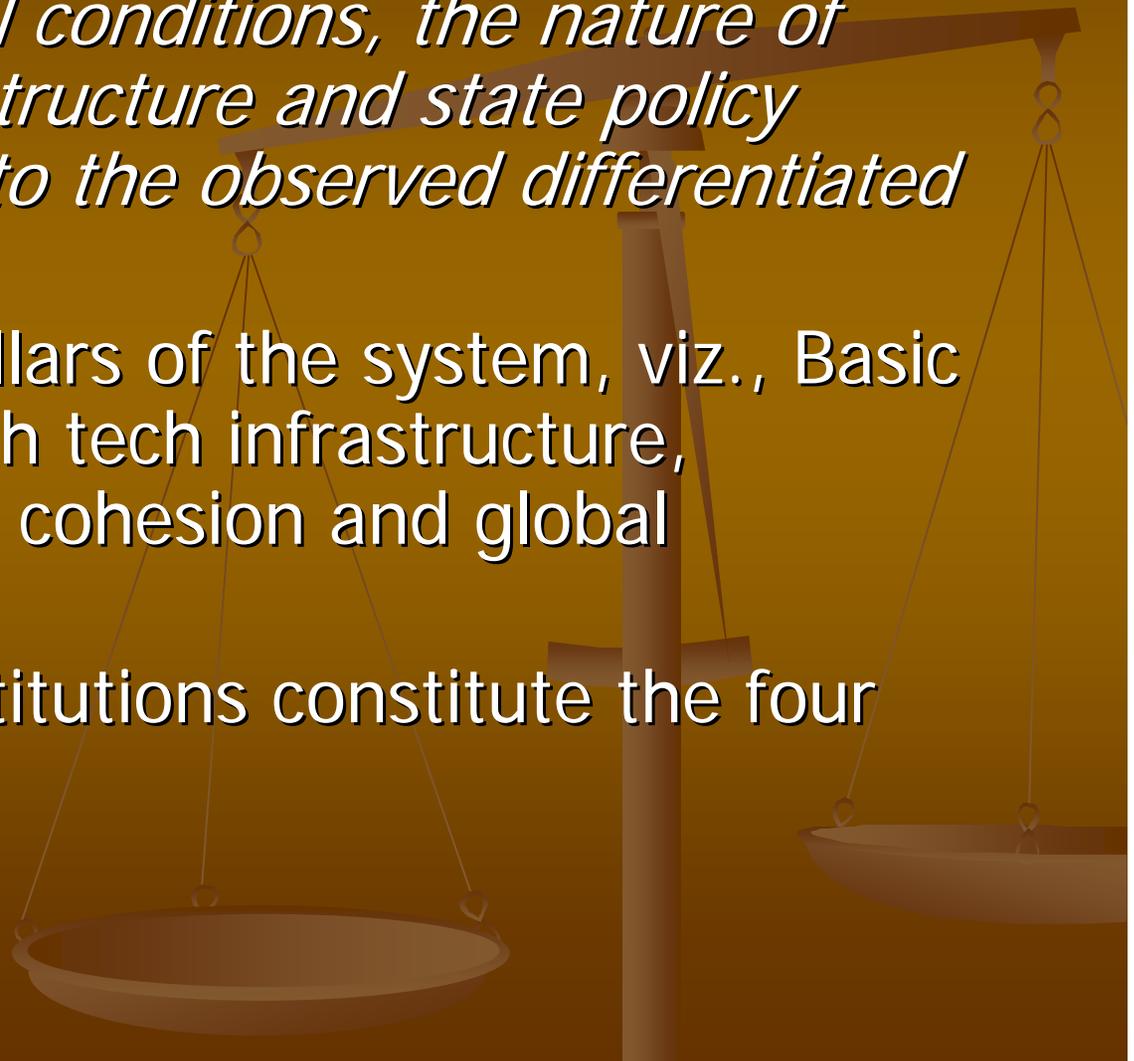
- Global growth is currently driven by knowledge-intensive industries; by rapid advances in information and computer systems;
- We examined IH in a systemic framework by which the complex interactions of actors involved not just in design and manufacturing but also in assembly and test, packaging, distribution, marketing and services of computers and components. In a global division of labour, all countries have an entry point in this complex products system

Why IH?

- It is important in an unpredictable world to understand the policy and institutional context of how this competition will be shaped;
- processes of learning are expected to drive firms in African countries to move beyond assembly and processing or simply selling computer hardware.

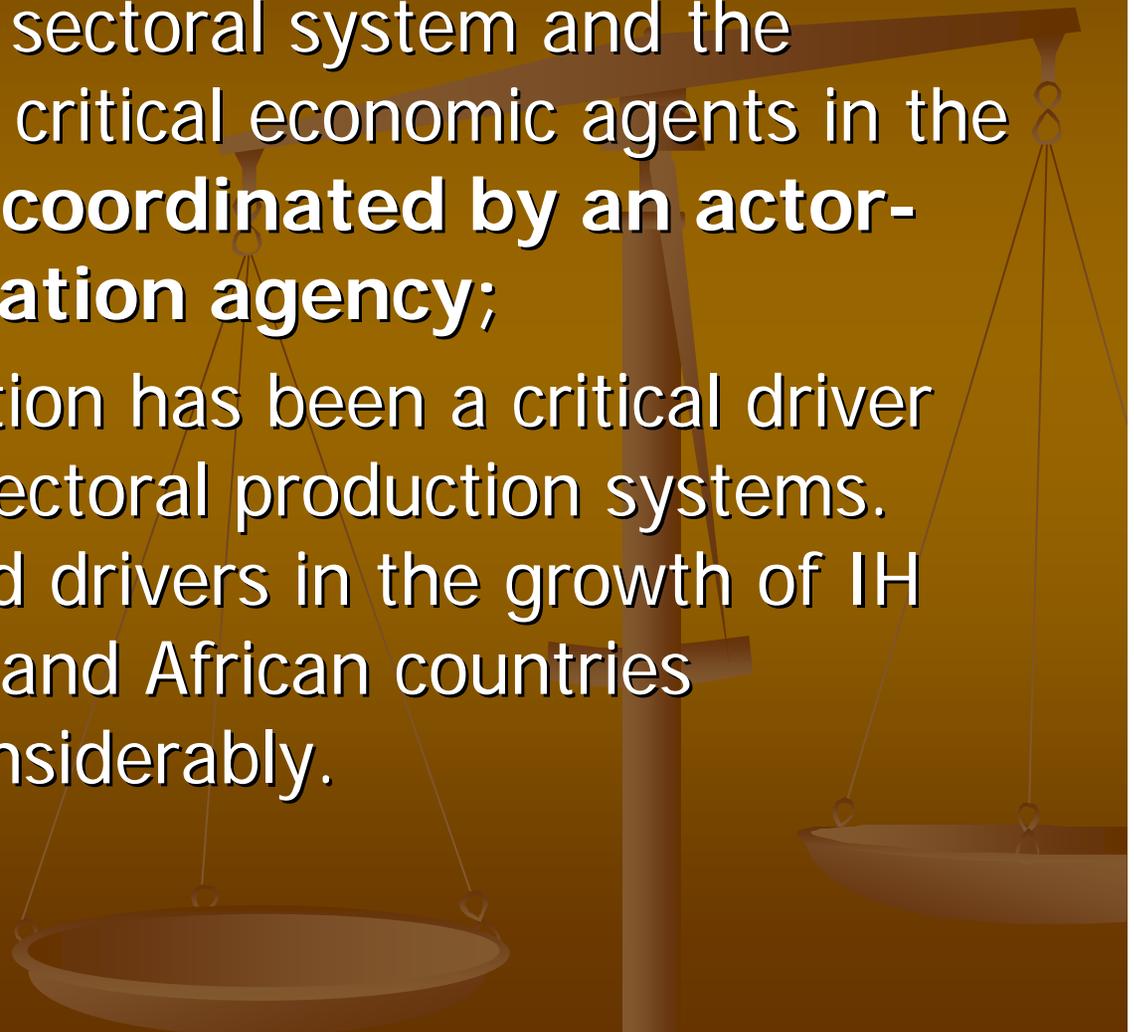
Explaining Divergent Paths

- *Variations in initial conditions, the nature of institutions, infrastructure and state policy support have led to the observed differentiated outcomes;*
- Emphasize four pillars of the system, viz., Basic infrastructure, High tech infrastructure, Systemic/Network cohesion and global integration.
- A multitude of institutions constitute the four pillars



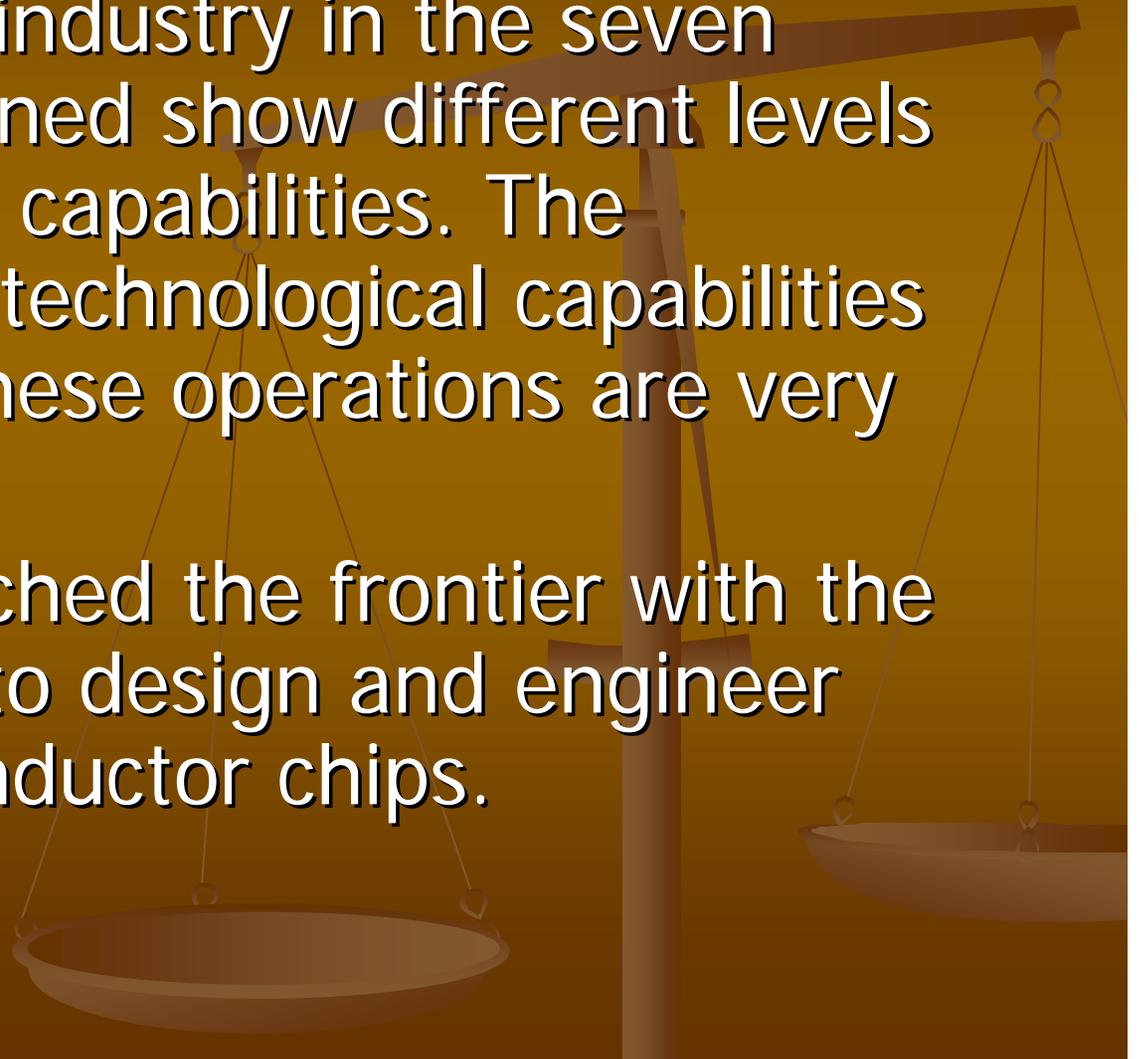
Explaining....

- The selection of a sectoral system and the participation of all critical economic agents in the development was **coordinated by an actor-focused coordination agency;**
- Demand coordination has been a critical driver in the growth of sectoral production systems. The prime demand drivers in the growth of IH firms in the Asian and African countries examined vary considerably.



Explaining: Uneven Capabilities

- Firms in the IH industry in the seven countries examined show different levels of technological capabilities. The knowledge and technological capabilities demanded by these operations are very uneven.
- Taiwan has reached the frontier with the R&D capability to design and engineer frontier semiconductor chips.

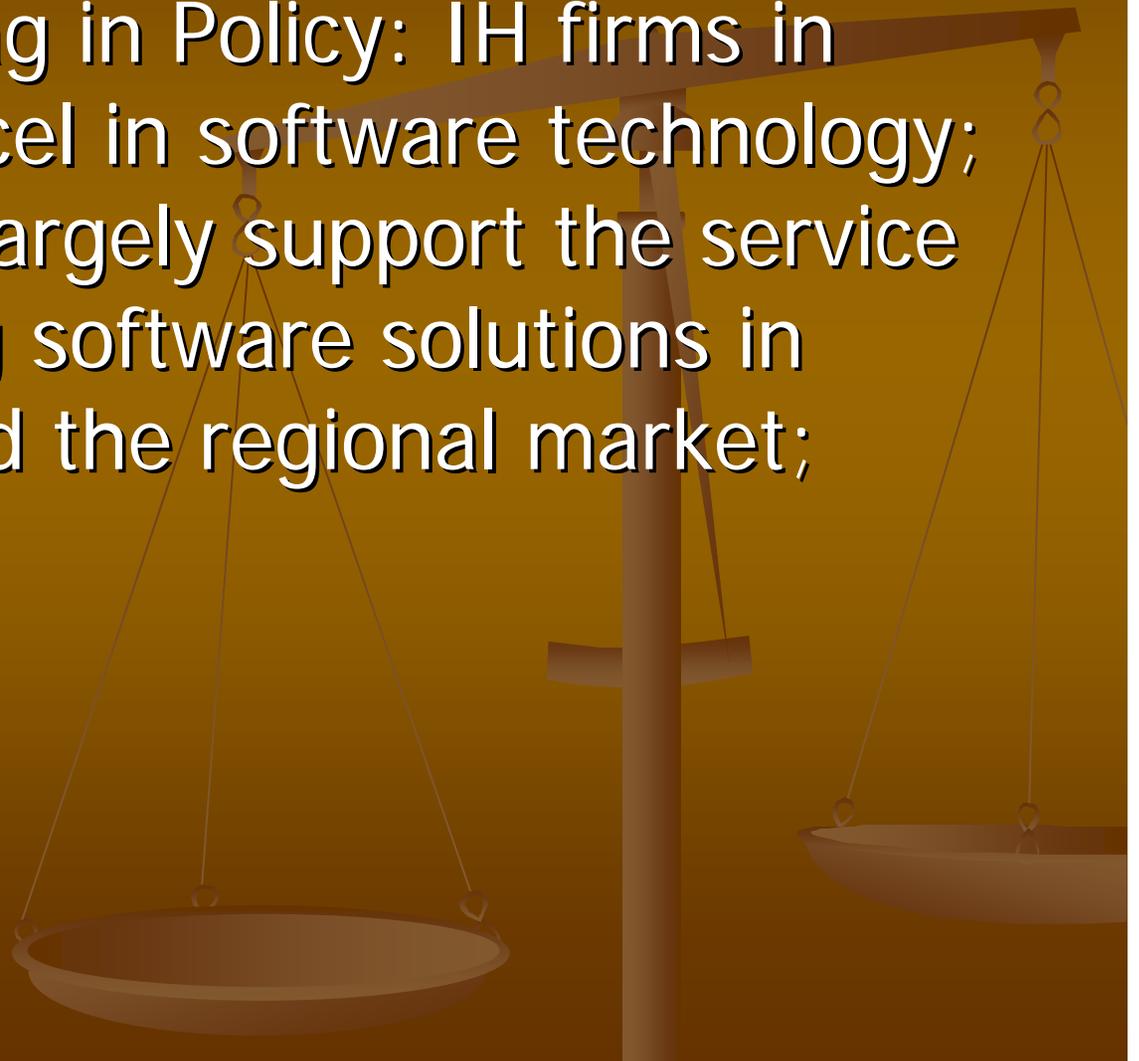


Examples

- The IH in Mauritius and Nigeria undertake minor design activities, the technological capabilities of these firms is in labour-intensive and imitational capabilities.
- Lacking in scale and lock-ins with lead firms as well as effective institutional support, local firms in these countries absorb and internalize prevailing technology to assemble computers and mobile phones for the domestic and African continental market.
- These products lack the quality and price to compete in major export markets

Examples

- South Africa: Lag in Policy: IH firms in South Africa excel in software technology; software firms largely support the service sector providing software solutions in South Africa and the regional market;

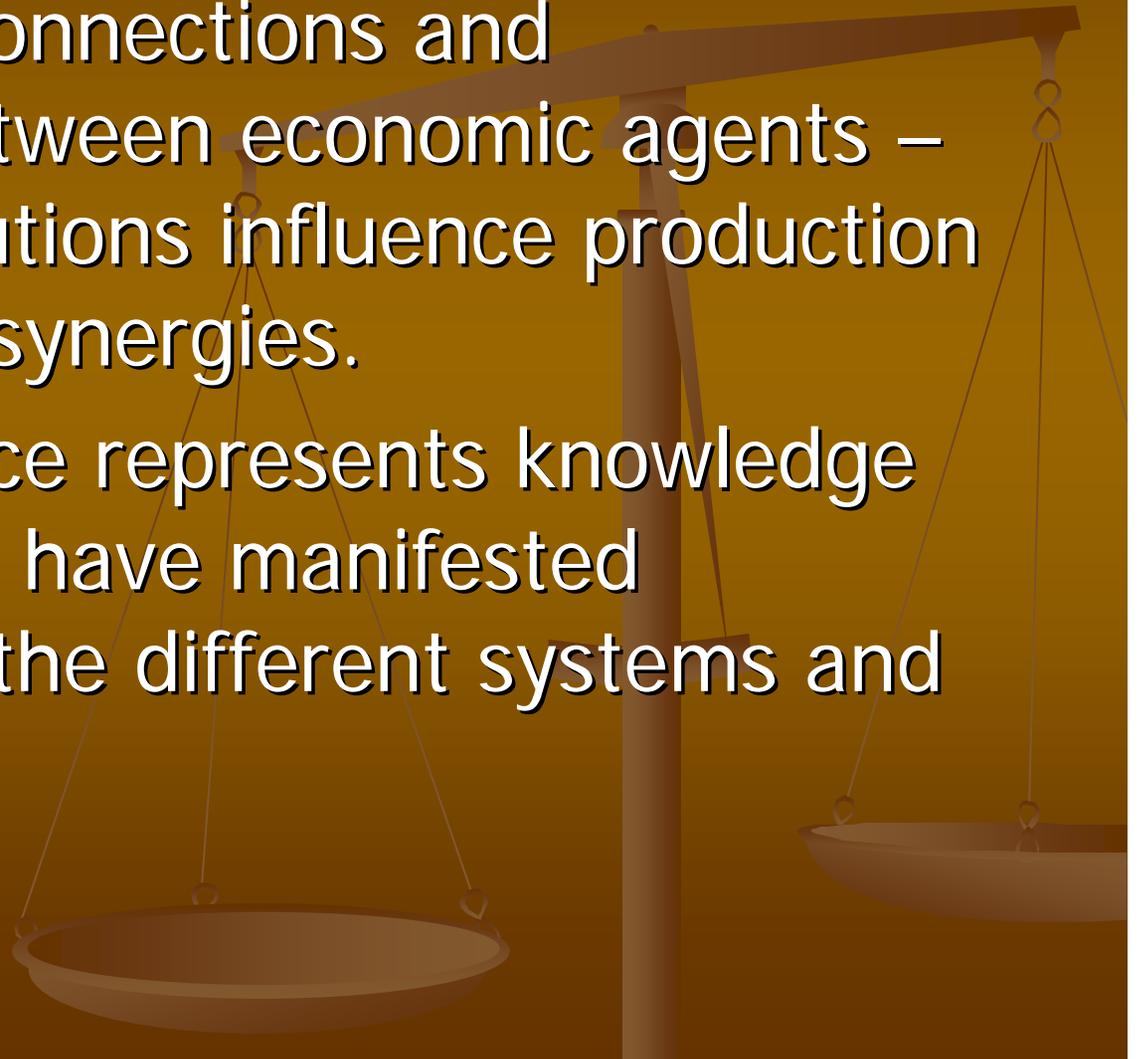


Explaining....

- Overall, IH firms in Taiwan and China clearly either already at the technology frontier or show clear movement towards it.
- IH firms in Malaysia are at an impasse for over a decade now as institutional weaknesses has restricted firms' movement to the catch up phase.
- ***The lack of effective industrial and Innovation policy*** has prevented IH firms in Indonesia, Mauritius, Nigeria and South Africa from locating themselves in the IH manufacturing trajectory, though the last has both human capital and market networks to make the transition.

Explaining Uneven Coordination

- The nature of connections and coordination between economic agents – firms and institutions influence production and innovation synergies.
- Geographic space represents knowledge bases but these have manifested differentially in the different systems and countries.



Uneven networks

- When an agglomeration of enterprises exhibits strong attributes of an innovative cluster it becomes more than a geographic space where firms co-locate;
- Strong clustering is associated with high rates of learning and knowledge accumulation that continually alter the knowledge base of the cluster. We found demonstrable evidence of a dense network of formal and informal institutions in Taiwan, China, and Malaysia

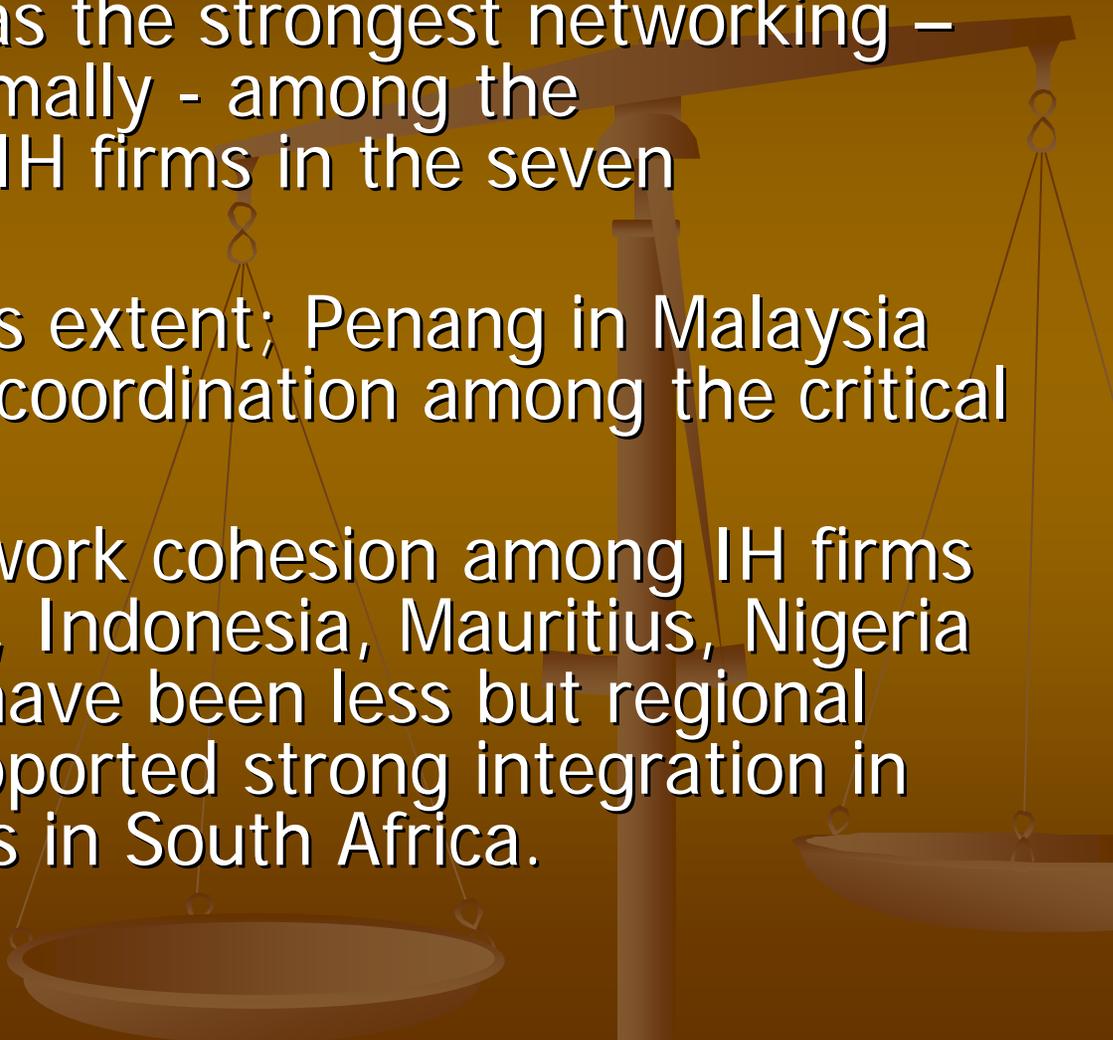
Explaining Clustering..

- Clusters in Taiwan, China and Penang in Malaysia are strongly integrated in global factor and final product markets.
- Among the seven countries examined only Taiwan exhibits integrated networks throughout the country.
- There are wide regional differences in the character of these clusters in China and Malaysia dictated in the main by their differential knowledge characteristics.

Clustering....

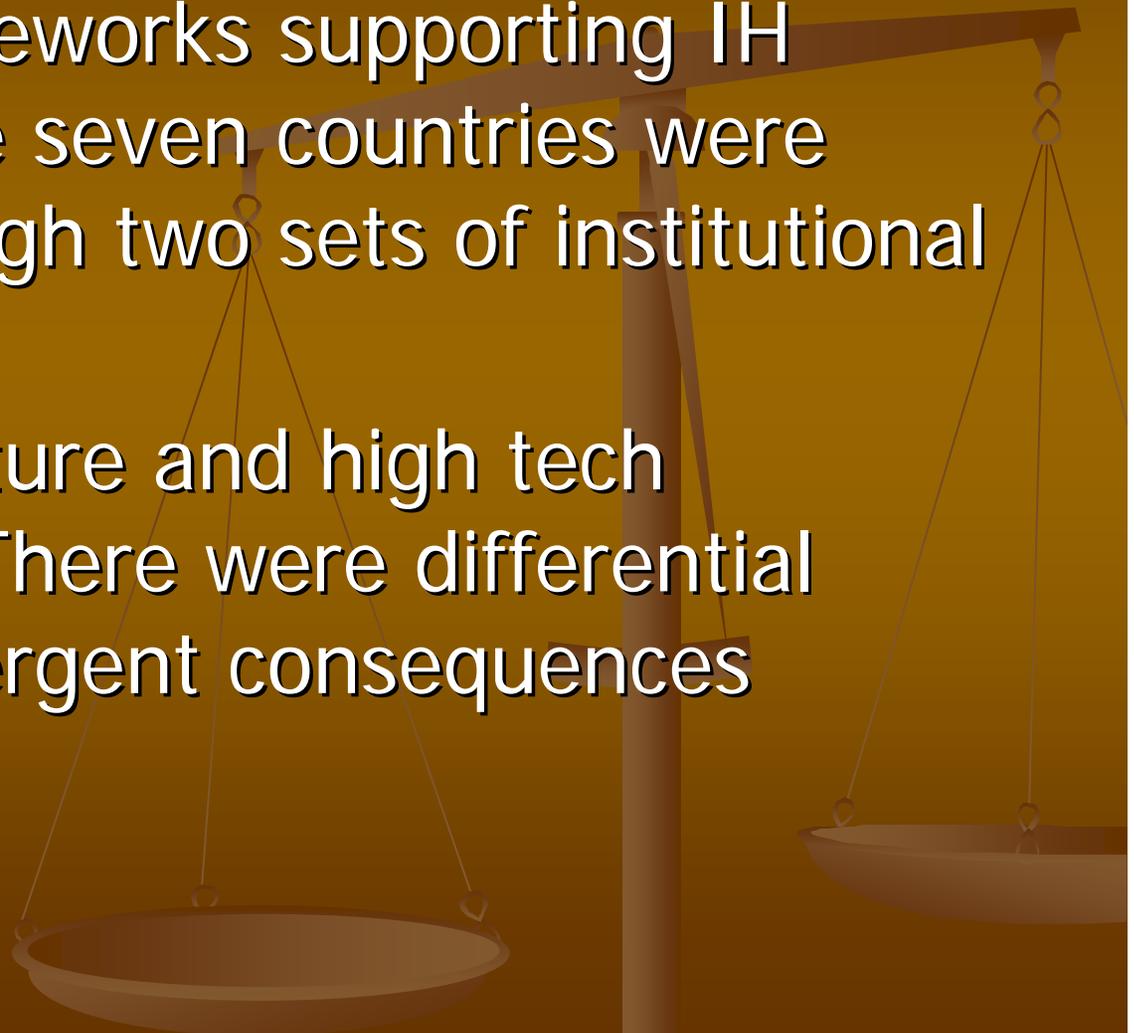
- In Mauritius and Nigeria organizations to, *inter alia*, promote interactions emerged and though the chambers but very underdeveloped. There are also weaknesses in connections between IH firms and basic institutions such as power and finance suppliers;
- South Africa: different experience. Lack industrial policy support to stimulate IH manufacturing; the South African government especially at the regional level has encouraged strong networking to encourage IT use across the country.

Uneven Networking...

- Overall, Taiwan has the strongest networking – formally and informally - among the concentrations of IH firms in the seven countries.
 - China and to a less extent; Penang in Malaysia have fairly strong coordination among the critical agents.
 - The extent of network cohesion among IH firms in Johor, Malaysia, Indonesia, Mauritius, Nigeria and South Africa have been less but regional locations have supported strong integration in software segments in South Africa.
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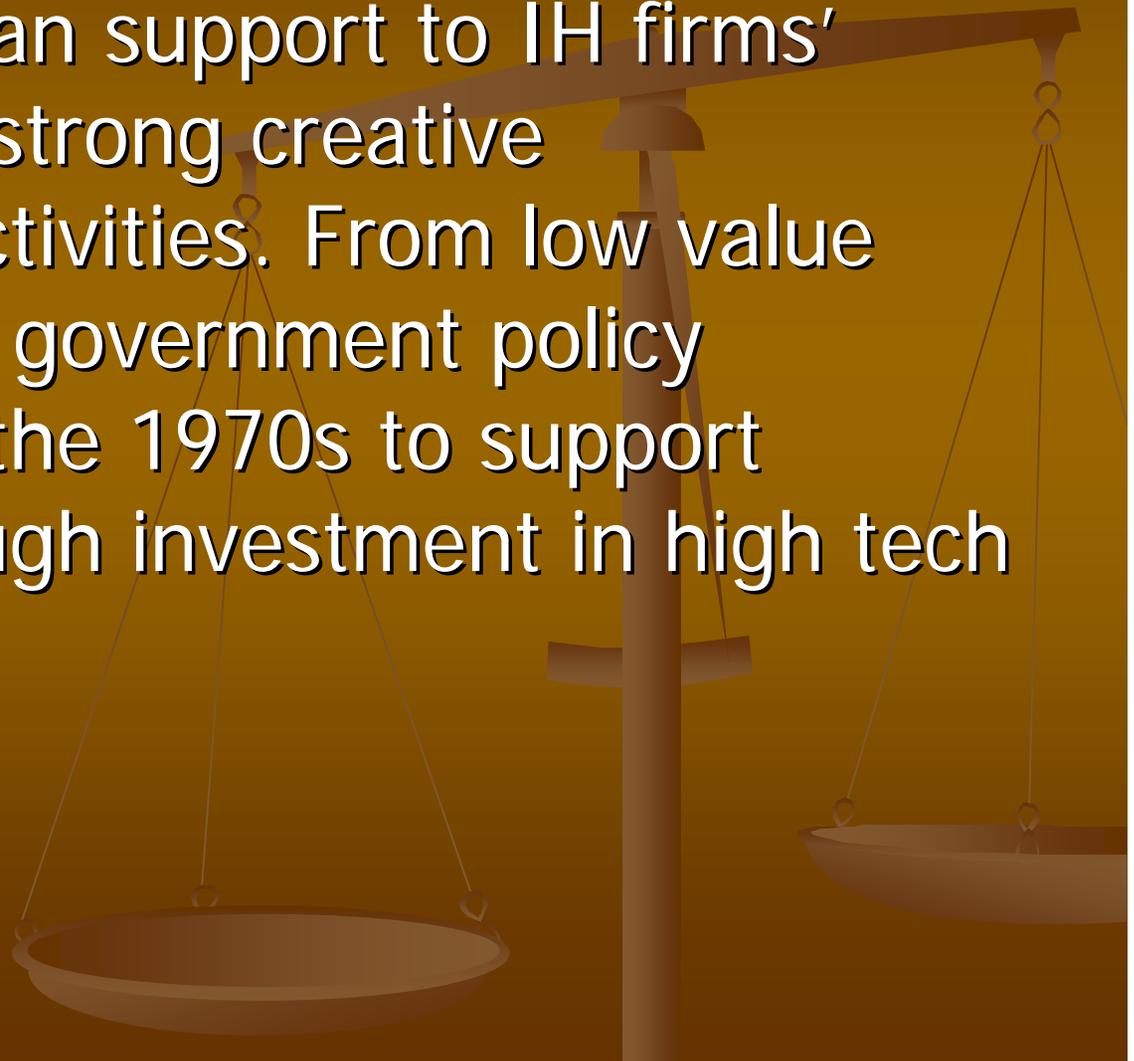
INSTITUTIONAL SUPPORT POLICIES

- The policy frameworks supporting IH industries in the seven countries were examined through two sets of institutional categories:
- Basic infrastructure and high tech infrastructure. There were differential drivers and divergent consequences



Policies

- Exemplar: Taiwan support to IH firms' participation in strong creative accumulation activities. From low value added activities government policy transformed in the 1970s to support upgrading through investment in high tech institutions;



Policies

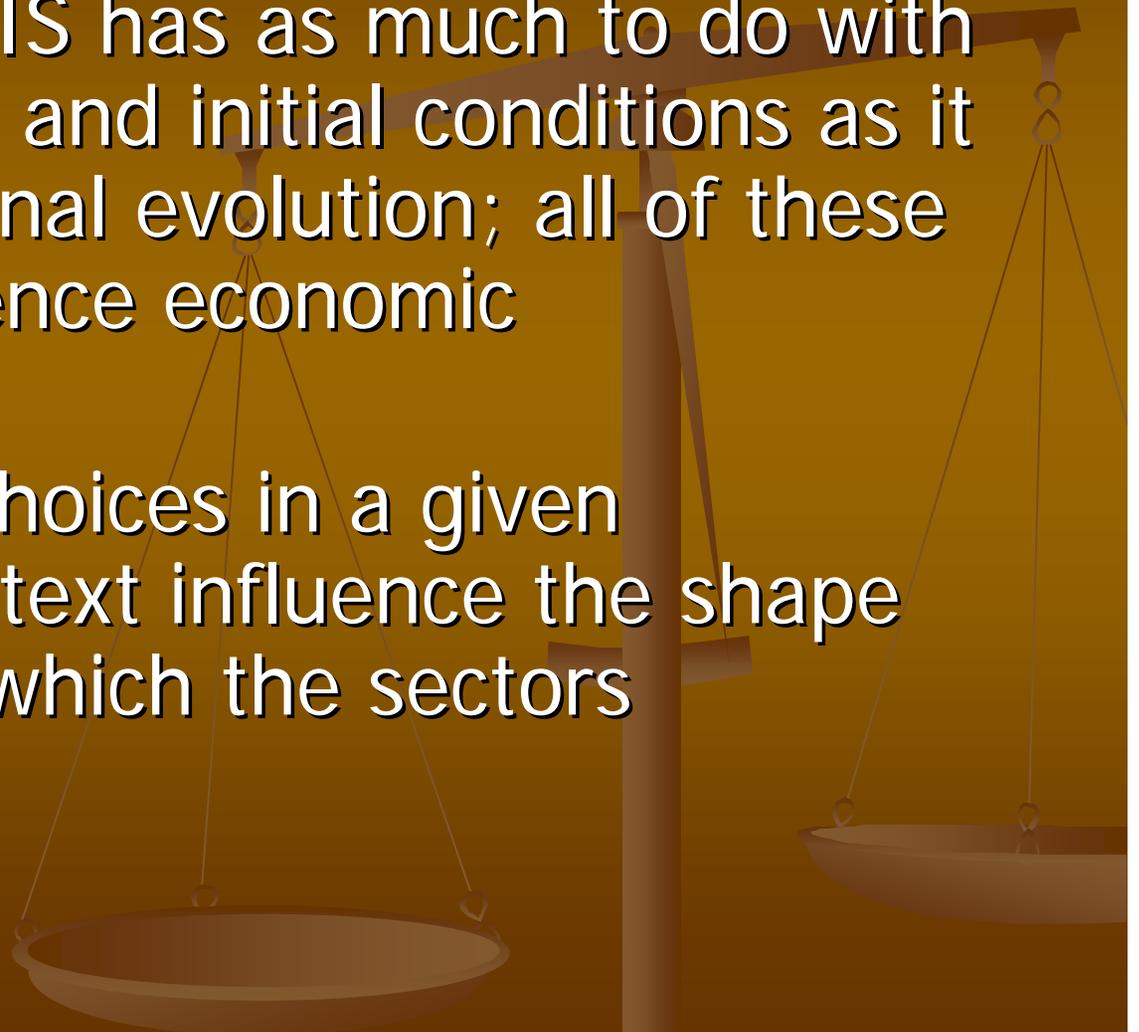
- Unlike China and Taiwan, incentives for building capabilities and for stimulating higher level manufacturing and R&D activities have not been well developed in Malaysia.
- The lack of proactive policies to support upgrading activities in IH manufacturing in Indonesia, Mauritius, Nigeria and South Africa means that these countries have remained without a significant concentration of IH firms.

Summing Up

- Links with global networks, local links with key actors have been important particularly for Taiwan and China.
- China has turned what could have been an institutional burden to a dynamic advantage illustrating in very direct ways, the impact of initial conditions.
- The role of scientific and technological manpower built up in the communist era in China and the quality of pre-existent national human and industrial capabilities meant for other purposes such as the military was successfully transformed to commercial IH

Summing Up

- Differences in SIS has as much to do with **policy choices** and initial conditions as it is with institutional evolution; all of these **together** influence economic performance;
- Policy political choices in a given institutional context influence the shape and direction in which the sectors developed.



End Note

- **Nothing Just Happens!!!**

