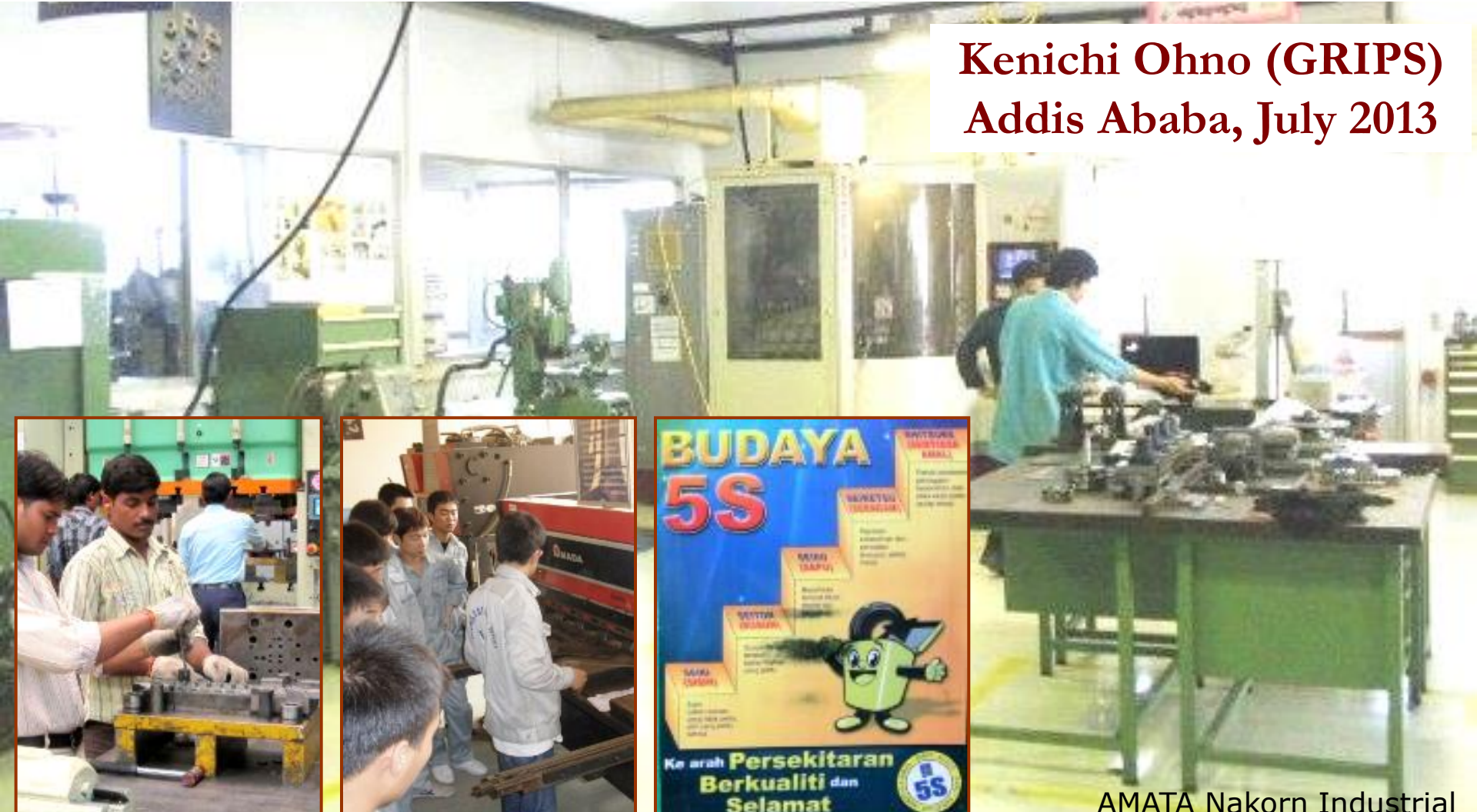


# FDI-linked Technology Transfer

A Search for a Model Most Suitable for Ethiopia

Kenichi Ohno (GRIPS)  
Addis Ababa, July 2013



India

Vietnam

Malaysia

AMATA Nakorn Industrial  
Park, Thailand

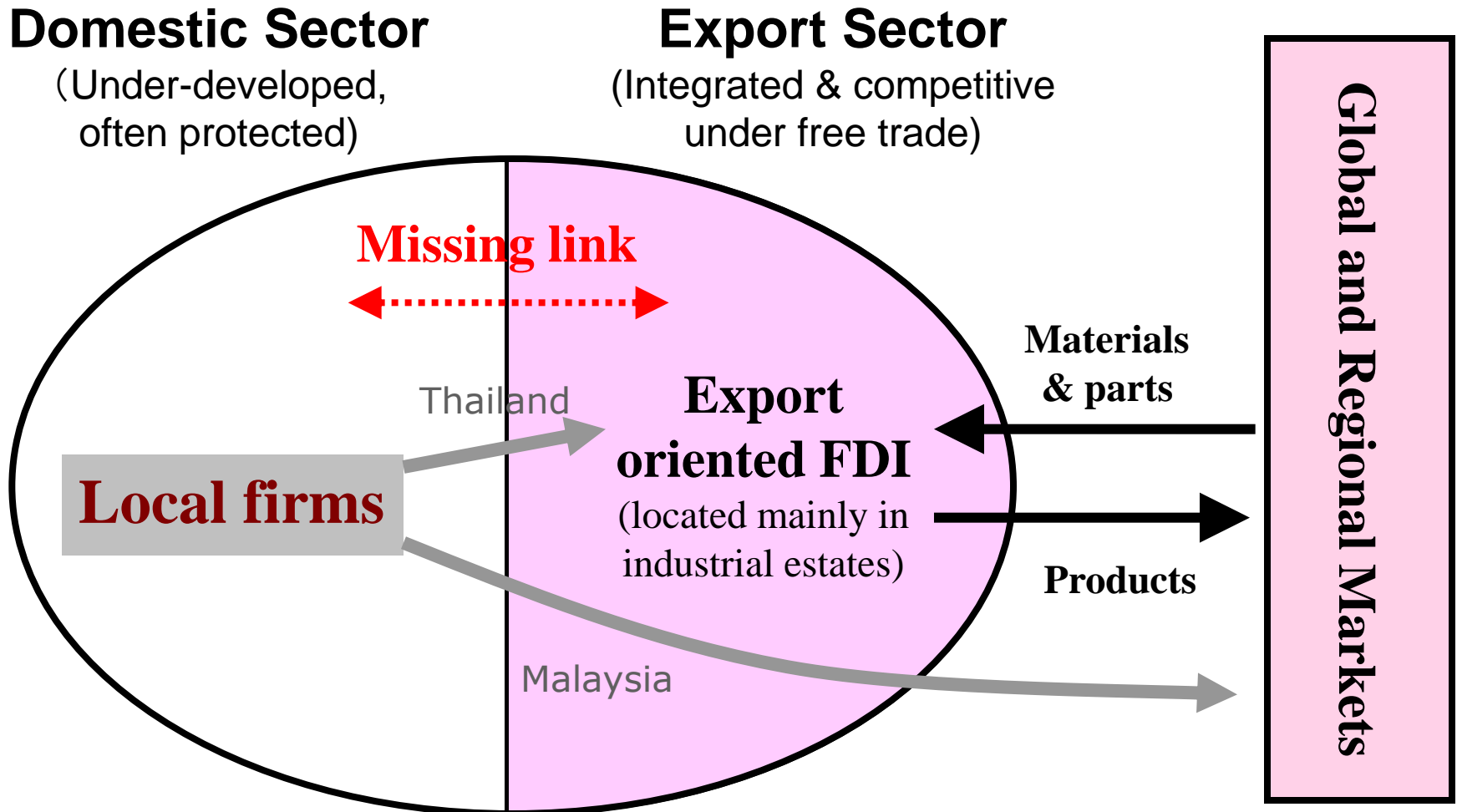
# Topics

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- ❑ Technology transfer: types and modes
- ❑ The Ethiopian way
  - < Asking projects to train engineers & procure locally >
- ❑ The Thailand model
  - < FDI attraction + SME support + linkage promotion >
- ❑ The Malaysia model
  - < Create innovative & competitive local SMEs >
- ❑ A suggested model for Ethiopia

# Dual Economic Structure of Typical Latecomer Country in East Asia

The Need to Link Domestic Sector with Globally Integrated Sector



# Types of Technology Transfer

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**Frontline technology**—providing technology in exchange for other business advantages

- Japan's Sharp & Korea's Samsung  
Sharp providing LCD technology & Samsung providing capital
- Steel makers & emerging economies  
Nippon Steel & JFE providing energy saving technology to India & Philippines for carbon offset

**For latecomers**—improving partner firms with non-proprietary knowledge for mutual benefits of foreign firms & locals


- Toyota, Denso, Honda & Nissan training Thai auto parts makers
- Colgate & Sanyo coaching Vietnamese plastic injection firms for QCD (quality, cost, delivery)
- Japanese fishery company teaching how to produce high quality frozen shrimp products

**Improved outputs of local firms are procured by foreign partners that taught technology**

# Modes of Technology Absorption

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**Local capability & ownership** (Meiji Japan proceeded from Low to High)

- LOW**
- 
- A. 100% foreign owned factory (headquartered abroad)
  - B. Factory operated by foreign immigrants
  - C. Joint venture
  - D. Management contract
  - E. Turnkey contract (factory construction + training for operation & maintenance)
  - F. Locally owned factory assisted by hired foreign engineers
  - G. Purchase of foreign machinery and know-how
  - H. Technology learning through operating, analyzing & adjusting imported machinery
  - I. Patent licensing
  - J. Copy production of latest machine through local effort
  - HIGH** K. Local development of new technology

Source: Hoshimi Uchida, "Technology Transfer," *Economic History of Japan* vol.4, Iwanami Shoten, 1990 (a study on Meiji Japan (1868-1912)'s absorption of Western technology).

# 1. Ethiopia's Way

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## **PM Meles** (May 19, 2011):

“Skills & technology are crucial; I use four ways to upgrade them: (i) kaizen & benchmarking; (ii) enhancing engineering universities & twinning them with foreign institutes; (iii) soft & hard infrastructure; (iv) using FDI-local linkage to enhance local producers.”

## **PM Meles** (Jan.19, 2011)

“New sugar, fertilizer & cement plants shall be built in two ways: (i) management contract through competitive bidding **[D]**; and (ii) Indian, Cuban & Filipino engineers teaching technology to Ethiopians through OJT **[F]**. We want to shift from (i) to (ii) over time. In both plant construction and operation & maintenance, Ethiopians should undertake as much as possible except the most difficult areas.”

# PM Meles (cont.)

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## **PM Meles** (Jan.19, 2011)

“I hear that in Meiji Japan, engineers learned Western technology very quickly under foreigners’ supervision. I want to know more about this process. In Ethiopia, Germans have been teaching us for long but good practical results were not obtained. Germans are taking too long to teach. Hundreds of Filipinos & Indians also help us. In addition, can Japan also teach our factories? We want to learn the Japanese and Asian way.”

Note: Mr. Meles’ suggestions were (i) courses on Meiji Japan’s industrialization for civil servants; and (ii) mobilizing retired Japanese engineers for OJT in local factories (broader than kaizen).

Source: the minutes of Ethiopia-Japan Policy Dialogue compiled by the GRIPS Development Forum.



# Requiring FDI & ODA Projects to Conduct Technology Transfer

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**PM Meles** (Jun.4 & Sep.3, 2009): “I ask individual foreign investors and donors to do the following”

- Train Ethiopian workers (but this is not enough).
- Teach Ethiopian engineers so they acquire skills to build, operate and maintain the factory & equipment.
- Use local inputs & works as much as reasonably possible in building plants & infrastructure (build railroad carriages & stations locally, if not locomotives).

**In sum, the Ethiopian way has been:**

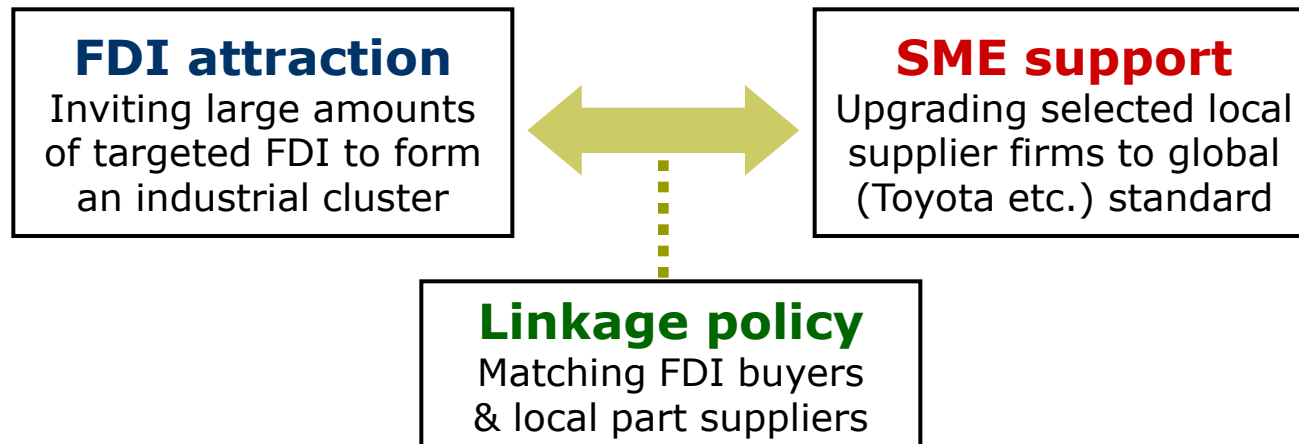
- Top sales + Business & Economic Diplomacy
- Using new & existing factories and infrastructure projects as learning vehicles
- Requiring foreigners to teach local engineers & use local works as much as possible--through technical assistance or as conditions for investment





## 2. The Thailand Model

- ❑ This model is common in Southeast Asia (but not Malaysia today). For this model to work, large absorption of manufacturing FDI is required (esp. cars & electronics).
- ❑ We call this “supporting industry” (local parts) development.
- ❑ The strategy consists of three policy components:



- ❑ For each policy component, international cooperation is often mobilized (expert dispatch, training, kaizen & shindan...)

# Creating Business Linkages: A Policy Perspective (UNCTAD Report 2010, p.14)

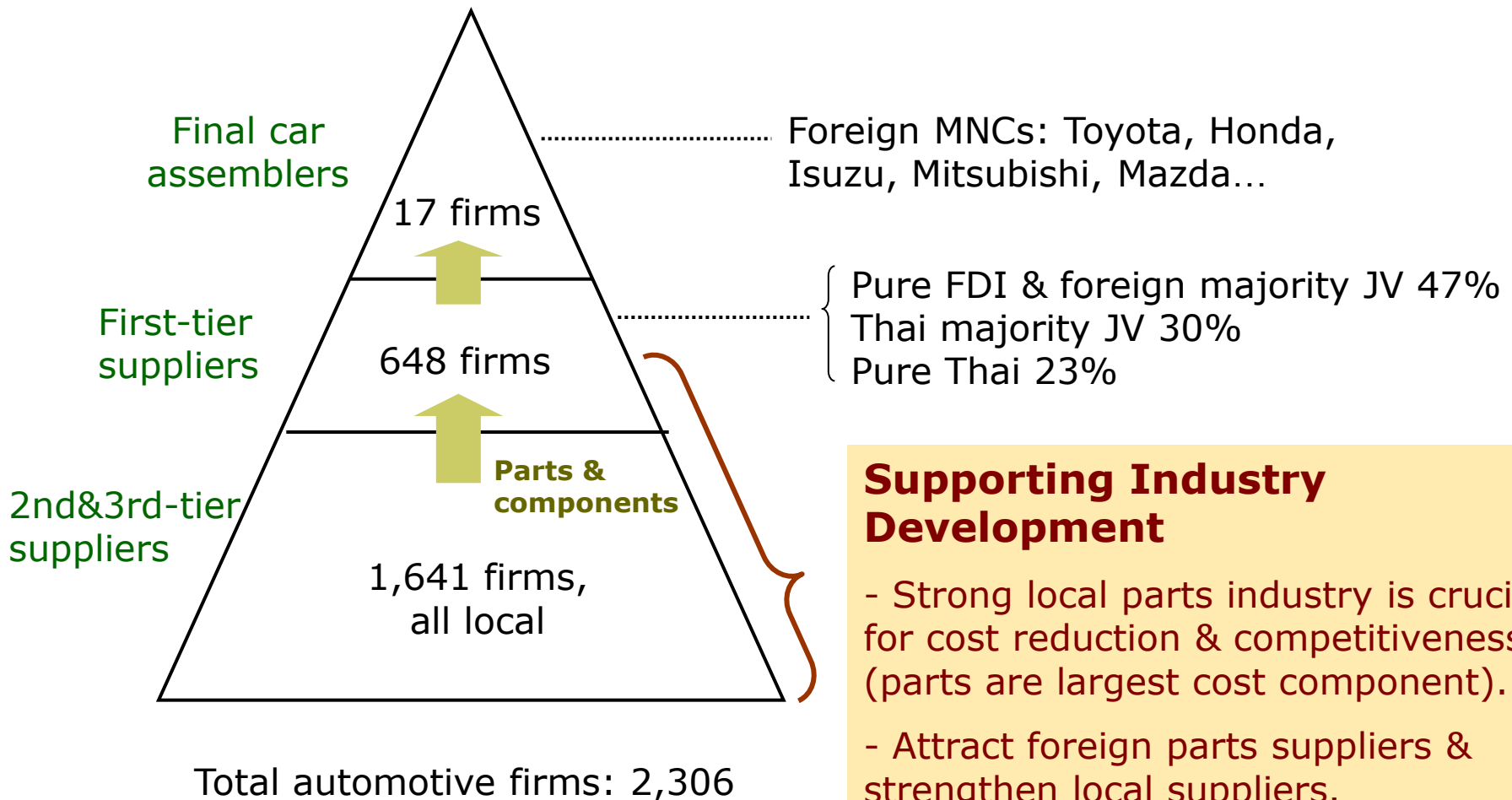
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Systematic policy approach to linkage building consists of:

- Improving investment climate
- Strategic FDI attraction
- Strengthening absorptive capacity of local firms
- Linkage policies

Note: middle-income economies in East Asia have largely achieved the first two and now work on the latter two (Thailand, Indonesia, Vietnam...)

# The Automotive Pyramid in Thailand



Source: Thai Ministry of Industry, Oct. 2009.

## Supporting Industry Development

- Strong local parts industry is crucial for cost reduction & competitiveness (parts are largest cost component).
- Attract foreign parts suppliers & strengthen local suppliers.
- Spillover & learning from FDI do not occur automatically; these must be created by serious enterprise effort and appropriate policy.

# Standard Policies for Local Capability Building

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- **Industrial human resource**
  - Universities, colleges and technical schools
  - Transfer of specialized skills to engineers
  - Subsidies for training
  - Skill certification, competition, awards and prizes
- **Enterprise capability**
  - *Kaizen* - quality & productivity mindset and tools
  - *Shindan* - state-supported SME diagnostic & advisory services
  - Subsidies for upgrading management, design, marketing, accounting, etc.
  - Quality standards and certification, best practice awards
- **SME finance**
  - Development finance institutions and subsidized bank loans
  - Credit guarantee
  - Equipment leasing
  - Enterprise credit information database
- **Start-up and innovation support**

# Standard Policies for Linkage

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- ❑ Strategic FDI marketing and investor support
- ❑ Domestic and export market development
- ❑ Trade fairs and “reverse trade fairs”
- ❑ Enterprise database & matching service
- ❑ Subsidies for FDI-local linkage and technology transfer
- ❑ Official promotion and intermediation of subcontracting
- ❑ Establishment and strengthening of business/sectoral associations
- ❑ Promoting local firm networks (for information sharing, support programs, joint order taking)

# Reverse Trade Fairs

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- ❑ Reverse trade fairs are trade fairs in which large firms exhibit components and materials they want to buy from local firms, instead of exhibiting what they want to sell.
- ❑ Japan External Trade Organization (JETRO) frequently hosts such fairs in China and Southeast Asia to help Japanese manufacturing FDI to procure inputs locally.





# Vietnam: Hanoi University of Industry

- ❑ Established in 1898 under French rule, HaUI was a technical college, upgraded to a university in 2005. It now has 1,400 teachers and 60,000 students.
- ❑ In 2000-05, JICA supported HaUI to create metal, machining and electronics programs with equipment and training.
- ❑ In 2010-13, JICA calibrated HaUI curriculums to meet the demands of Japanese FDI.
- ❑ Newly created courses: 5S, mechanical drawing, machinery maintenance, quality control, skills certification.
- ❑ Japanese firms cooperating with HaUI: Toyota, Panasonic, Ebara, Toho, Takagi, Nagatsu, Showa Denko.



# Vietnam: ESUHAI Company

## Producing workers with mindset & skills



- ❑ ESUHAI is a private firm founded by Mr. Le Long Son, a Vietnamese engineer who studied die & mold in Japan.
- ❑ ESUHAI dispatches Vietnamese workers to Japan as technical trainees for 3 years (about 400 workers per year).
- ❑ Before being sent to Japan, workers are trained for 1 year in Japanese language, basic manufacturing mindset such as greetings and 5S, and long-term life vision as engineer.
- ❑ After returning to Vietnam, they are supported with follow-up & level-up training, and matching with Japanese firms.
- ❑ ESUHAI also assists Japanese firms to establish factories in Vietnam (worker database, rental factory, factory construction, obtaining license, etc.)





# Kaizen in India



Indian auto part company practicing kaizen near Delhi; Indian engineers learned kaizen from Maruti-Suzuki, a Japanese JV.



# Shindan:

## Enterprise Diagnosis & Advisory Service

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- ❑ Shindan is a state-authorized system of enterprise diagnostics and advisory services targeted at SMEs.
- ❑ Japan's Shindan System started in 1948. Certified consultants are aided by legislation, official recognition and assistance, and supporting organizations such as SME Universities and J-SMECA (consultants association).
- ❑ Shindan experts advise SMEs in both management and technology. They also explain new policies. Shindan results are strongly linked with commercial bank loans to SMEs.
- ❑ Japan has over 20,000 Shindan experts, many of whom are JICA consultants working in developing countries.
- ❑ Shindan has been introduced to Thailand, Malaysia, Indonesia, Philippines... But institutionalization is not easy.

# Shindan Experts in Vietnam

## JICA Senior Volunteers

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- ❑ Since 2010, about 20 experienced JICA senior volunteers have been assisting Vietnam's "supporting industry" (part suppliers) in metals, plastic, electronics, nonferrous metals and machinery. 100 firms are targeted.
- ❑ Assistance focuses on 5S & quality control. Other areas of concern are productivity & technology management.
- ❑ Shindan experts visit factories regularly and give them homework for improving production lines. Seminars, training in Japan, manuals and materials are also used.
- ❑ Improved local firms are listed in JETRO's Excellent Local Company Database. This facilitates Japanese FDI firms to find local partners.



# Thailand

## Linking Local Part Suppliers with Japanese Auto FDI

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- ❑ **Technology Promotion Association** (TPA) is a local NPO established in 1973 by Thai students who studied engineering in Japan. TPA has offered courses in Japanese management, technology & language to Thai people for 40 years. In 2007 it created **Thai-Nichi Institute of Technology** (TNI), a university dedicated to Japanese-style manufacturing.
- ❑ **Thailand Automotive Institute** (TAI) is a state-created, but now financially independent, NPO that drafts auto master plans and implements policies.
- ❑ Under **Automotive Human Resource Development Program** (AHRDP, 2006-10), Denso, Honda, Nissan and Toyota taught lean production, mold & die, skill certification & Toyota Production System to Thai suppliers with additional support from JICA and JETRO.

# 3. The Malaysia Model

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## 1980s-90s:

- ❑ **Automotive**—PROTON, a state-owned national car company, was created and promoted under heavy policy support & protection. Local (Malay) part suppliers were also assisted.
- ❑ **Electronics (E&E)**—FDI clusters formed in semi-conductor & consumer electronics under open & free environment.

## Today:

- ❑ Although E&E remains the largest exporter (33% in 2012), Malaysia no longer promotes SME-FDI linkage. Instead, it hopes to create **innovative SMEs** independent of FDI.
- ❑ Strong emergence of innovative SMEs is key to overcoming the middle income trap & achievement of “2020 Vision” (become a fully developed nation).

# Supporting Agencies for SMEs

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**Implementation agencies collectively assist SMEs. Many have long history and good performance records:**

- ❑ **SME Corp**—one stop service for all SME policy issues; overall policy coordination
- ❑ **MIDA**—investment promotion (both domestic & FDI)
- ❑ **MATRADE**—promotion of trade & outward FDI
- ❑ **Malaysia Productivity Corporation**—quality & productivity training, consultation, research, certification, etc.
- ❑ **SIRIM**—state-owned corporation for technology & innovation
- ❑ **Dev. Finance Institutions**—SME Bank, Agro Bank, Exim Bank, National Saving Bank, Dev. Bank, Rakyat Bank, MIDF
- ❑ **Malaysia Automotive Institute**
- ❑ **Halal Industry Development Corporation**



# Malaysia:

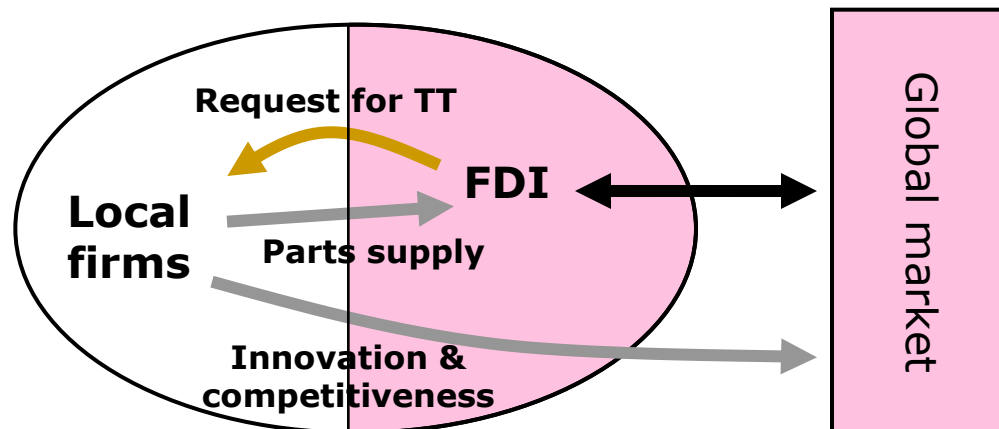
## Noteworthy Policy Measures

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- ❑ SME policy coordination, master plan, One Referral Centre, SCORE (SME rating), database, campaigns (**SME Corp**).
- ❑ Effective screening, support & post-license follow-up of investors (**MIDA**).
- ❑ Hand-holding program—assisting selected SMEs individually and comprehensively for 3 years until they succeed in penetrating foreign markets (**MATRADE**).
- ❑ A wide variety of short-term management, productivity, quality, etc. courses taught by local experts (**MPC**).
- ❑ State-owned corporation developing technology & offering testing & certification services (**SIRIM**).
- ❑ 12 National Key Economic Areas (11 sectors & 1 region)—support agencies work in concert toward NKEAs.

# Summary Up to This Point

- ❑ **Ethiopian way** is acceptable—but it will be better if FDI is given stronger commercial motives for transferring technology (not as required conditions for aid or investment).
- ❑ **Thailand model** is good—but impractical for Ethiopia as it lacks a large cluster of mechanical type FDI. Ethiopia must attract FDI and strengthen local SMEs in different ways.
- ❑ **Malaysia model** is difficult—creating globally competitive SMEs without foreign linkage is unrealistic, at least initially.



# 4. A Suggested Model for Ethiopia

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## (A revised Thailand model)

- ❑ Ethiopia should build linkage with **light manufacturing & agro-processing FDI** (leather, garment, coffee, sesame, jewelry, horticulture...) rather than automotive or E&E.
- ❑ Build linkage even with **a small number of FDI**; a massive inflow of FDI (hundreds & thousands) is not required.
- ❑ Also, the **size** of FDI firm does not matter; investment by foreign SMEs should be welcomed.
- ❑ Devise “**win-win**” incentive mechanisms for both FDI and local firms.
- ❑ **Add & institutionalize technology transfer** to existing industrial projects (kaizen, export champions, TVET, EIA reform, TIDI, LIDI...) as an overarching aim rather than treating technology transfer separately.

# Integrated & FDI-linked Technology Transfer (TT)

Technology transfer as an overarching policy objective

- TT to enhance quality, productivity & ownership
- Firm effort + policy support + international cooperation
- Targeted: light manufacturing & agro processing

**Three policy pillars** (to be built up and strengthened over time)

## Targeted attraction of FDI & buyers

- General improvement of business climate
- Strategic marketing (bring light manuf. FDI from Asia)
- One-stop service
- Efficient logistics
- Hard & soft infrastructure
- Fast & reliable customs
- Industrial parks
- Reform laws, EIA, ERCA...

## Linkage policy

- Incentives, subsidies & policy support for TT
- Matching of business & JV partners
- Handholding
- Effective follow-up & monitoring

## Local enterprise capacity building for linkage

- Kaizen
- Benchmarking
- Management training
- Sector-specific TT & QCD
- Export marketing (incl. champion products)
- TVET
- Strengthening support agencies: EKI, TIDI, LIDI...

# Examples of Policy Actions in the Proposed TT Mechanism

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- ❑ **Product development**—assist foreigners wanting to create new products from unique Ethiopian materials (“champions”).
- ❑ **Partner enhancement** for foreign buyers of existing products (coffee, leather goods, flower, gems, jewelry, etc) but with higher quality—improve local partner companies & workers to the level required by targeted markets.
- ❑ **Linkage with kaizen**—upon request, EKI/JICA can send a kaizen team to FDI or its partner factory for improvement, or adjust kaizen programs to firms’ requirements.
- ❑ **Handholding & continued follow-up**—assist selected local firms comprehensively & continuously for 2-3 years until they attain technology or penetrate foreign markets. Continue to monitor them for any additional problems.
- ❑ **Incentives for TT & training**—firms acquiring designated technology or training workers in designated fields can receive matching grants from government.

# The Japanese Business Model Fits Well with Proposed Technology Transfer

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Japanese FDI & ODA should be mobilized in an integral way.

- Unique features of **Japanese FDI** should be noted & utilized
  - Manufacturing-oriented
  - Endless pursuit of quality & customer satisfaction
  - Long-term orientation—last in coming but staying long
  - Teaching skills & technology to local partner companies
  - Compliance of local labor, tax, environment laws
- **Japanese cooperation** (JICA, JETRO...) should:
  - Assist Japanese firms in realizing desired investment or trade with technology transfer
  - Negotiate/cooperate with the Ethiopian government to improve policies, institutions and incentives
- Japan should declare **FDI codes of conduct** that all Japanese firms must observe, which include promotion of FDI-linked TT (in Ethiopia & Africa—even globally).

# Additional Remarks

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- ❑ **Long-term endeavor:** existing & new measures should be combined in a linked way, and progress must be monitored regularly at high level. The entire mechanism should be built step-by-step as it cannot be completed in short term.
- ❑ **Forced vs. voluntary:** unrealistically high demand for TT, without cultivating local capability, keeps manufacturing FDI away. Understand business needs well, and offer encouraging measures so FDI will transfer technology happily & willingly (soft push).