Protecting Intellectual Property and Appropriating Value from Innovations

in Weak Appropriability Regimes

James Nebus
Chair of Strategy &
International Business Dept.
Suffolk University
Boston

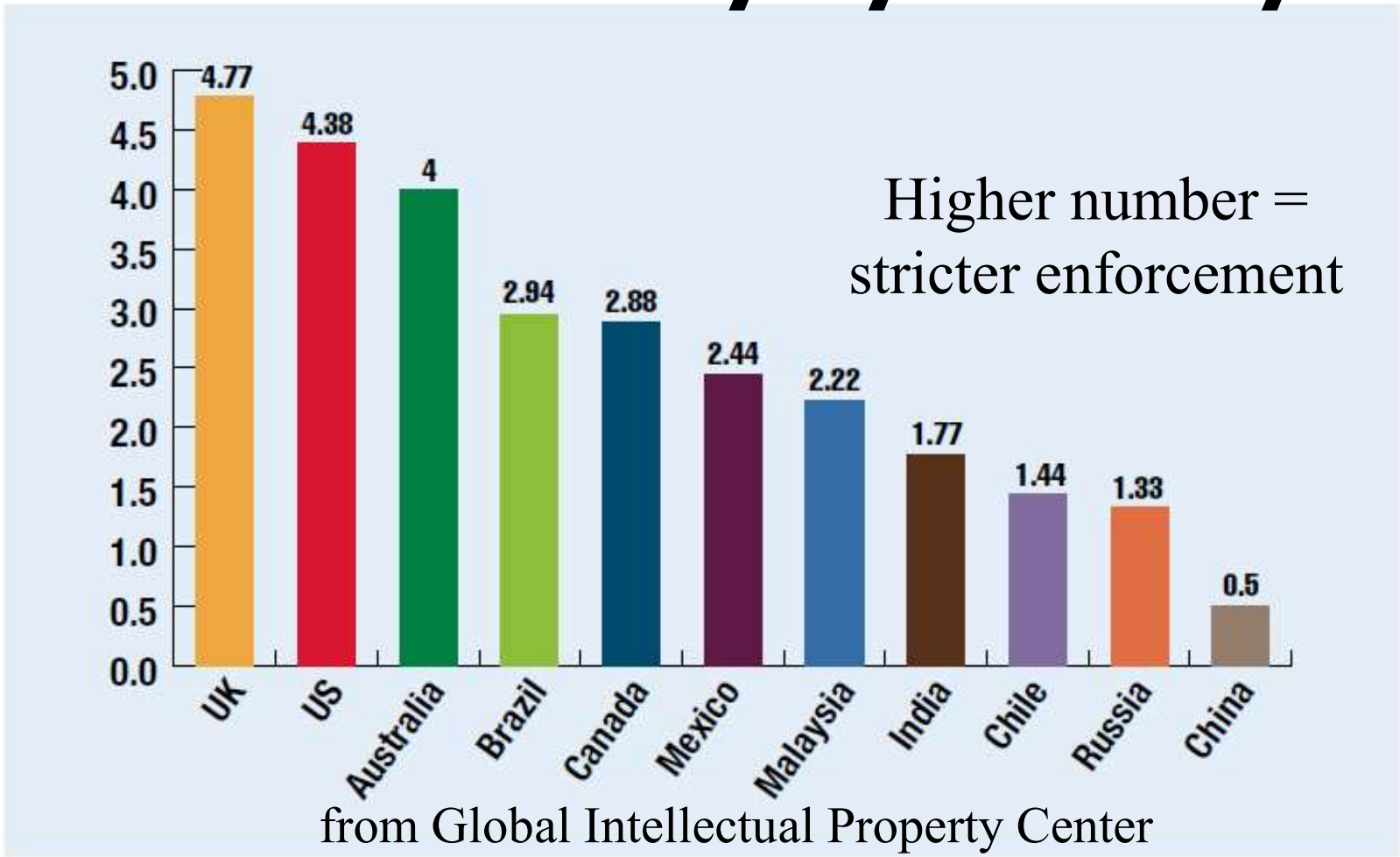
Chai Kah-Hin,
Annapoornima Subramanian
Dept. of Industrial Systems Engineering
National University of Singapore

What is the Question we are trying to answer?

- There are many examples of actions, other than patents, that firms use to protect its IP, but they do NOT prescribe under what circumstances to take each of these different actions.

- Our Question: Which strategy (set of actions) should firms use when, and where (which countries) to protect their products and services against imitation in weak property rights enforcement countries?

Patent Enforcement Varies Widely by Country



Patents do NOT effectively protect IP in Weak Enforcement Regimes:

- Weak enforcement transitions patents from an asset to a liability
- Legal suits can take years; governments can be biased
- Even if you win, the compensation can be pocket change

Patents in Weak Enforcement Regimes

- Focus on a direct response against imitators, rather than indirectly through the country's legal system
  - Ryan Lee, the founder of Xmi, experienced every innovator's nightmare, his product was imitated and sold less expensively.
  - Lee decided that lawsuits weren't productive, and the money and time required for a legal fight was better off spent on designing new products to stay ahead of imitators.
  - Lee summarized "I'd rather throw my money to the engineers, not to my lawyers. You innovate faster than your fakes. That's how you play in the technology game"

Defn: Innovators vs. Imitators

- Definitions and Context:
  - Our focus is on **imitators** who illegally employ **innovator's** patented technologies and processes in their products and services, but sell them under their own brand name
    - In industries which develop complex products and services requiring more sophisticated technologies and corresponding production and deployment capabilities; biotechnology, electronics, pharmaceuticals, machinery, aeronautics, and telecommunications are examples.
  - We are **NOT** concerned here with "**knock-offs**", **counterfeits** of brand name products with logos that denote status. These "**look alike**" pirated brand products are based on relatively simple technologies.
  - We use a more narrow **definition of imitation** – deliberate attempts to steal the innovator's intellectual property in order for the imitator to substitute it's product for the innovator's product – rather than a more broad definition of an imitator as a legal fast follower in the industry.

Motivation, Opportunity, and Ability (MOA) Argument

- MOA argument is that the imitator will copy the innovator's product **only if** the imitator concurrently has the **Motivation**, **Opportunity**, and **Ability** to appropriate the value of innovator's products
  - **Motivation** (M) = Financial Motivation
  - **Opportunities** (O) are afforded by the country environment and taken advantage of by the imitator.
  - **Abilities** (A) can be technical, business, operational.
- Having one or two of the M,O,A conditions is not sufficient; **all three must be present.**
- If the **innovator** can **decrease any one of these conditions** to a level that demotivates or inhibits the imitator, **the innovator will have protected its IP**.

Abilities (A) and Barriers Defn.

Abilities (A) can be technical, business, and operational.

- The 2 sequential stages of product development:

Innovation → **Commercialization**

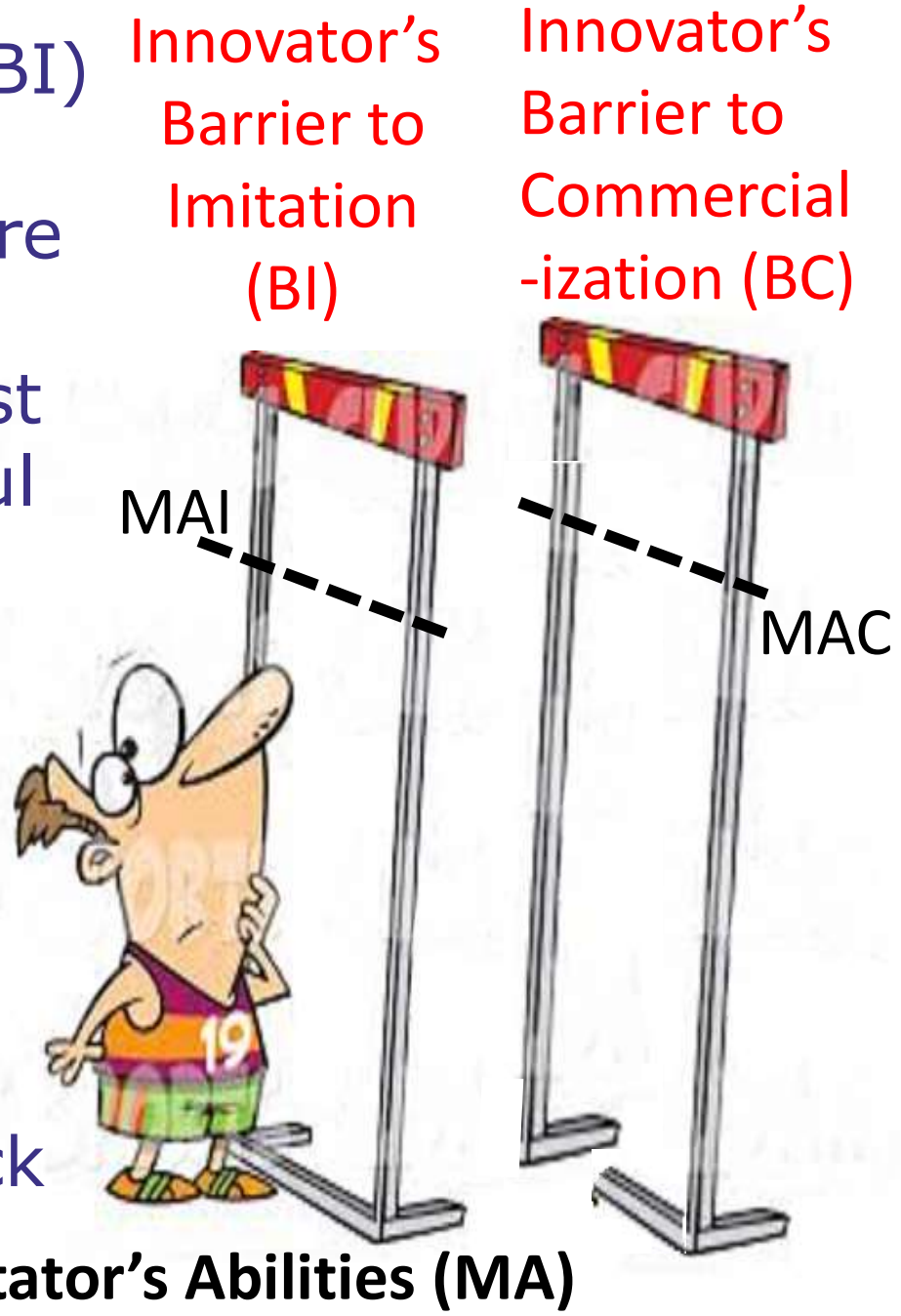
- We label the corresponding 2 necessary sequential stages for the imitator:

Imitation → **Commercialization**

- Therefore, the innovator has two opportunities to create barriers that block or deter the imitator
  - **Barrier to Imitation** (Barriers to Making One)
  - **Barrier to Commercialization** (Barriers to Making and Selling Many)

Two Barriers (BI, BC)

- The **barrier to imitation** (BI) and **barrier to commercialization** (BC) are two **sequential** obstacles over which the imitator must hurdle in order be successful at appropriating innovator profits by stealing IP.
- Innovator firm does **NOT** need to prevent **both** the imitator's ability to imitate and commercialize; the innovator needs to only obstruct one activity to block the imitator



Barriers Scenarios & IP Risk

Innovators 'Barriers to Imitation (BI)

		D	E	F
Innovator can't block Imitator, BI << MAI	Z	Medium Risk; Innovator Blocked by BC	High Risk: Imitator not blocked; but innovator can block with BC	Highest Risk: Innovator can't block either barrier; should enter with JV
Innovator can block Imitator with BI, but currently BI < MAI	Y		High Risk: Imitator not blocked on either barrier, but innovator can block both barriers	High Risk: Now Imitator not blocked on either barrier, but innovator can block imitator with BI
Innovator has blocked Imitator, BI > MAI	X	Lowest Risk; Imitator blocked by both BC & BI	Medium Risk; Innovator Blocked by BI	
		Innovator has blocked Imitator, BC > MAC	Innovator can potentially block Imitator with BC, but currently BC < MAC	Innovator can't block Imitator, BC << MAC

MAI – Imitator's Ability to Imitate

MAC – Imitator's Ability to Commercialize

Innovator's Barriers to Commercialization (BC)

Protection Mechanisms to Implement IP Strategies

Innovator can't block Imitator, BI << MAI	**Cell EZ Strategy** Raise Barriers to Commercialization (BC) 1. Increase innovation to decrease product life cycle. 2. Bundle imitable products with inimitable complementary products. 3. Adopt advanced manufacturing processes. 4. Pre-empt scarce assets. 5. Develop public-private partnerships.	**Cell FZ Strategy** Enter into a joint venture (JV) to enable MNE access complementary assets and blocking local imitators. Local firms may enter into a JV because they lack product, technology, or investment required, but they wish to acquire them and an incremental revenue source.
Innovator can block Imitator with BI, but currently BI < MAI	**Cell EY Strategy** Raise the one barrier, BI or BC, that Brings its *barrier protection deficit* to zero for the least amount of investment.	**Cell FY Strategy** Raise Barriers to Imitation (BI) *I.* ***Decrease Knowledge Spillover****:* 1. Install IT defensive shields. 2. Develop trade secrets. 3. Give employees IP training. 4. Geographically distribute IP. (not mutually exclusive) *II.* ***Decrease Product Imitability by Product Design***
	Innovator can block Imitator with BC, but currently BC < MAC	Innovator can't block Imitator, BC << MAC

5 ways of Raising Barriers to Imitation (BI)

- Dupont / Dow uses 3 protection mechanisms to limit product knowledge leakage:
  - Dupont accused a former scientist employee of stealing $400M of IP regarding its unique titanium dioxide process
  - To avoid repeats of this incident, Dupont put in place:
    1. installing IT defensive shields.
    2. Appointing Trade Secret managers ,
    3. employee IP training,
  - DuPont appointed Trade Secret Managers in each of its business and function units.
    - Trade Secret managers conduct annual employee product stewardship training to set expectations regarding IP security.
  - Besides the usual IT security methods, these Trade Secret managers monitor a software package installed to record and report who and when IP sensitive files are accessed as part of protecting IP.

Raising BI – Trade Secrets

- A **trade secret** is information:
  - 1) which is necessary to know for the final product/service to be imitated,
  - 2) which is made known or accessible only to a limited group of employees, and
  - 3) for which steps are taken to keep it from unauthorized appropriation.
- Google uses trade secrets to protect IP even when it is patentable, because patents expire after 20 years.
  - Google's first search algorithm, PageRank, was patented in 1999.
  - Since then, improvements in the algorithm were not patented by Google, but instead kept as trade secrets.
  - Most importantly, when Google's initial search algorithm patent expired recently in 2019, Google's IP was protected by trade secrets.

4th way of Raising BI

- Geographically distributing IP (4th protection mechanism) is an enhancement of the trade secret approach.
  - This method entails building of a complex product from subsystems that can be developed independently in different geographic locations yet function together as a whole.
  - This geographical dispersion precludes an employee at any one location from having an overall understanding sufficient to replicate the product.

Example - Geographically Distributing IP

- AMSC geographically distributed its IP for wind turbines.
  - AMSC opened a factory in China to assemble power convertors for its turbines.
  - AMSC decided that its most strategic IP hardware components would be built in the US and shipped to China as sub-modules.
  - AMSC took the further precaution of developing the source code for its control system software on a secure server in Austria.
  - Confirmation of this strategy's effectiveness is that one of AMSC's Chinese competitors allegedly offered to pay to an AMSC engineer working at the Austria center US$1.7 million for access to the AMSC software

5th way of Raising BI

- Another protection mechanism (5th) is designing into the product ways to decrease product imitability
  - An example was told to me in an interview with a Boston entrepreneur whose firm does 20% of its business in China
  - His firm's unique IP is its signal processing code in firmware on a controller card of an industrial measurement product.
  - The product is installed in a customer's factory, and sends measured data over the network.
  - The product's firmware also contains hacking sensing code which monitors whether there is an attempted unauthorized access from the network.
  - If it detects this situation, the firmware executes code to output a signal to a semiconductor fuse, which abruptly removes power to the instrument, rather than risk someone successfully hacking into it to steal the firmware IP.
  - To turn the instrument on again requires manual reset

5 ways of Raising Barriers to Commercialization (BC)

1. Increasing innovation to decrease product life cycle

- Schneider Electric insists that constant innovation is the only way to keep ahead of imitators
  - If the time required for an imitator to copy an innovator's product is sufficiently long, and the innovator's time to launch a new, replacement product is relatively shorter
    - the imitator will be disadvantaged by introducing a previous generation product while the innovator is selling the next generation product.
  - Develop a more advanced replacement product, and then temporarily delay this new product entry until an imitator appears with a copycat product.
  - When the imitator enters the market, the innovator could
    - 1) launch its new replacement product and at the same time
    - 2) decrease the price of its product the imitator copied.
  - This immediacy and intensity of response is likely to deflate the aspirations of even the most aggressive imitator.

2nd way of Raising BC (cont'd)

2. Bundle imitable products with complementary inimitable products

- IBM adopted this model when it transitioned from a computer manufacturer to an IT services provider
  - With hardware becoming a commodity, IBM's hardware prices became less competitive.
  - IBM's new path was to offer customized services and software built on top of their hardware.
  - For example, if a bank may wish to implement a CRM system, IBM would combine appropriate hardware, software, and professional services tailored to the bank's specific needs to target potential customers.
  - By demonstrating to a bank the additional revenue it could acquire by identifying customers who were likely to purchase the bank's products, IBM changed the focus of the IT purchase decision from the price of hardware to the value of the solution as the incremental profit it provided the bank.

3rd way of Raising BC

3. Complexity of advanced manufacturing processes

- In 2008, Apple faced many Asian imitators of its high performance PCs as Acer, Asus, and Lenovo.
- These PCs, like Apple's, were bulky and heavy.
- In order to differentiate itself, Apple introduced its MacBook Air which was less than 0.8" thick and weighted 3 pounds.
- Lightweight but without sacrificing performance and function.
- The packaging technology that enabled this design was a unibody enclosure milled from metal alloy, allowing the it to get even thinner while retaining rigid durability and strength
- Apple accomplished this through an advanced manufacturing process, a prohibitive investment for most imitators.
- Prior to the MacBook Air, CNC milling, was primary used for low volume prototypes
- Over the years, Apple invested in R&D and manufacturing to scale CNC milling into a production volume manufacturing process.

4th way of Raising BC

4. Preemption of scarce assets

- Innovators can block imitators by monopolizing, or limiting the availability of, assets required to imitate its products.
  - Apple extended its BC, beyond the advanced manufacturing process mentioned above, by entering into an exclusivity agreement with its supplier of the metal alloy used to make its MacBook Air.
  - The metal alloys owned by Liquidmetal Technologies are harder than alloys of titanium or aluminum.
  - In a deal with Liquidmetal Technologies, Apple was awarded a perpetual, worldwide, fully-paid, exclusive license to commercialize these alloys in the field of electronic products in exchange for a license fee

5th way of Raising BC

- *Public-private partnerships –*
  - *By emphasizing technological, organizational, and management knowledge, innovators can even convince country governments to bypass local national competitors*
- Infrastructure projects - In its bid for the Taiwan High Speed Rail project, Japan Railways (JR) emphasized its strengths that local Taiwanese firms did not have.
  - These included its experience in the design of earthquake resistant railway systems, as well as its safety record and accuracy in train management.
- Health care - In March 2020, Roche partnered with the China to conduct a clinical trial of its drug Actemra with covid patients
  - Actemra was approved in US since 2010, but never in China.
  - China's National Medical Product Administration gave its approval for Actemra to be sold for use in coronavirus infection cases despite the fact that Chinese drug makers were developing alternatives to Roche's treatment.

Unable to Raise BI or BC > Imitator Use Joint Venture (JV) Strategy

- JV entry mode can provide IP protection
  - by both enabling an Innovator's access to local complementary assets and blocking local imitators.
  - Local firms may be motivated to enter into a JV because they don't have the product, technology, or investment required, but have the desire to acquire these and incremental revenue
- China's auto industry - world's largest auto market
  - GM and Volkswagen have JVs with local China car companies
  - The Chinese government has been trying for more than two decades to build the country's auto industry by providing local firms access to generous credit from state owned banks

China's Auto Industry JV Example

- Shanghai's SAIC, China's largest car company, supplies GM / VW with the complementary assets of distribution, sales, and service at their dealerships.
  - SAIC also produces its own car brands
  - However, 59% of the passenger cars SAIC sold in 2017, were GM and VW brands produced from joint ventures
  - The reason is that Chinese consumers perceive global models as having higher quality and status than local models.
  - While the Chinese government would prefer these local producers to develop a world class Chinese automobile, the Chinese car companies are very content selling more profitable GM and VW models.
- Counterintuitively, JVs have resulted in GM and VW being successful in China a country in which they have little leverage and the government subsidizes local firms.

Opportunities (O) from Country Environment

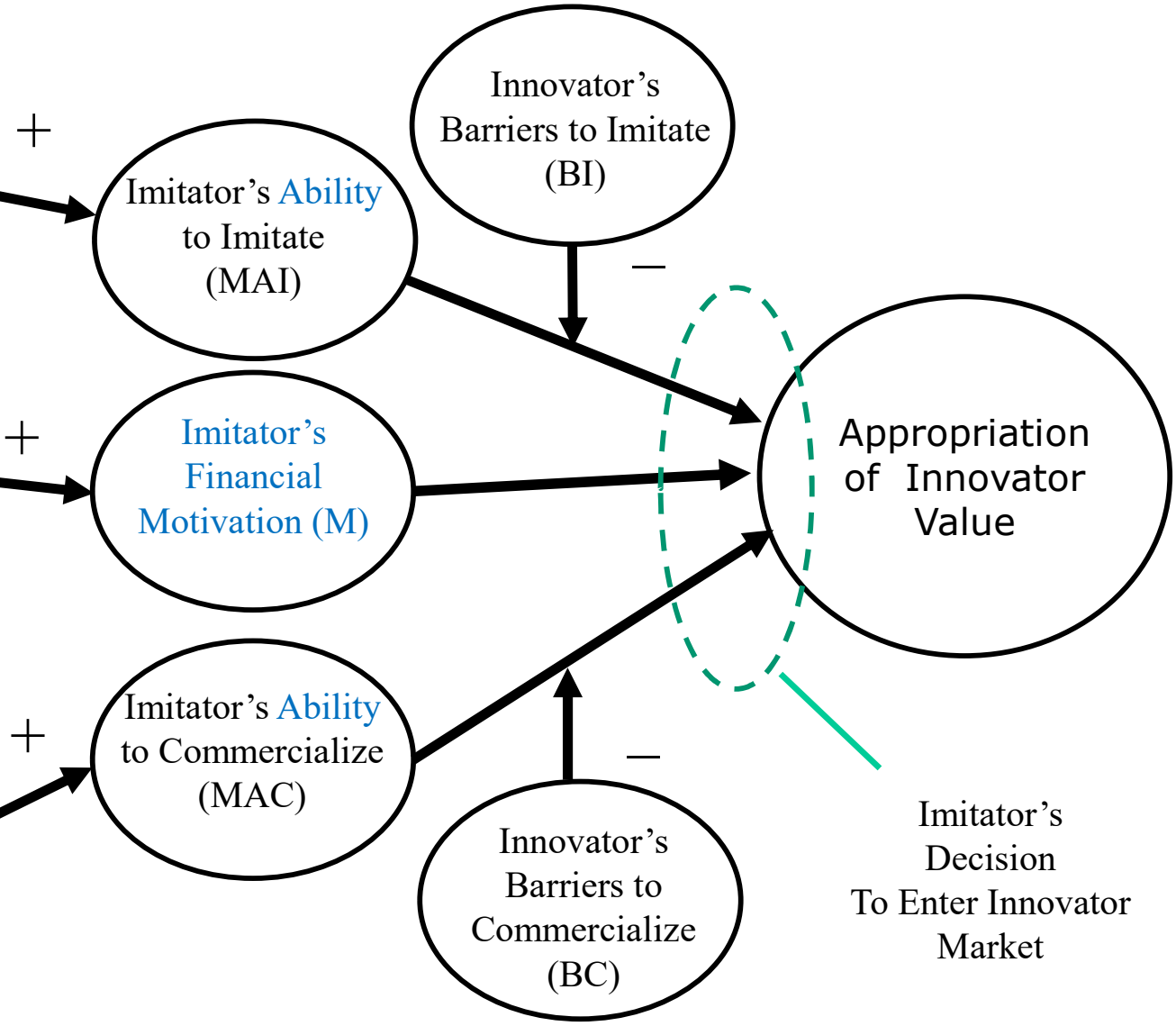
Opportunities

Country Environment Opportunities (O)

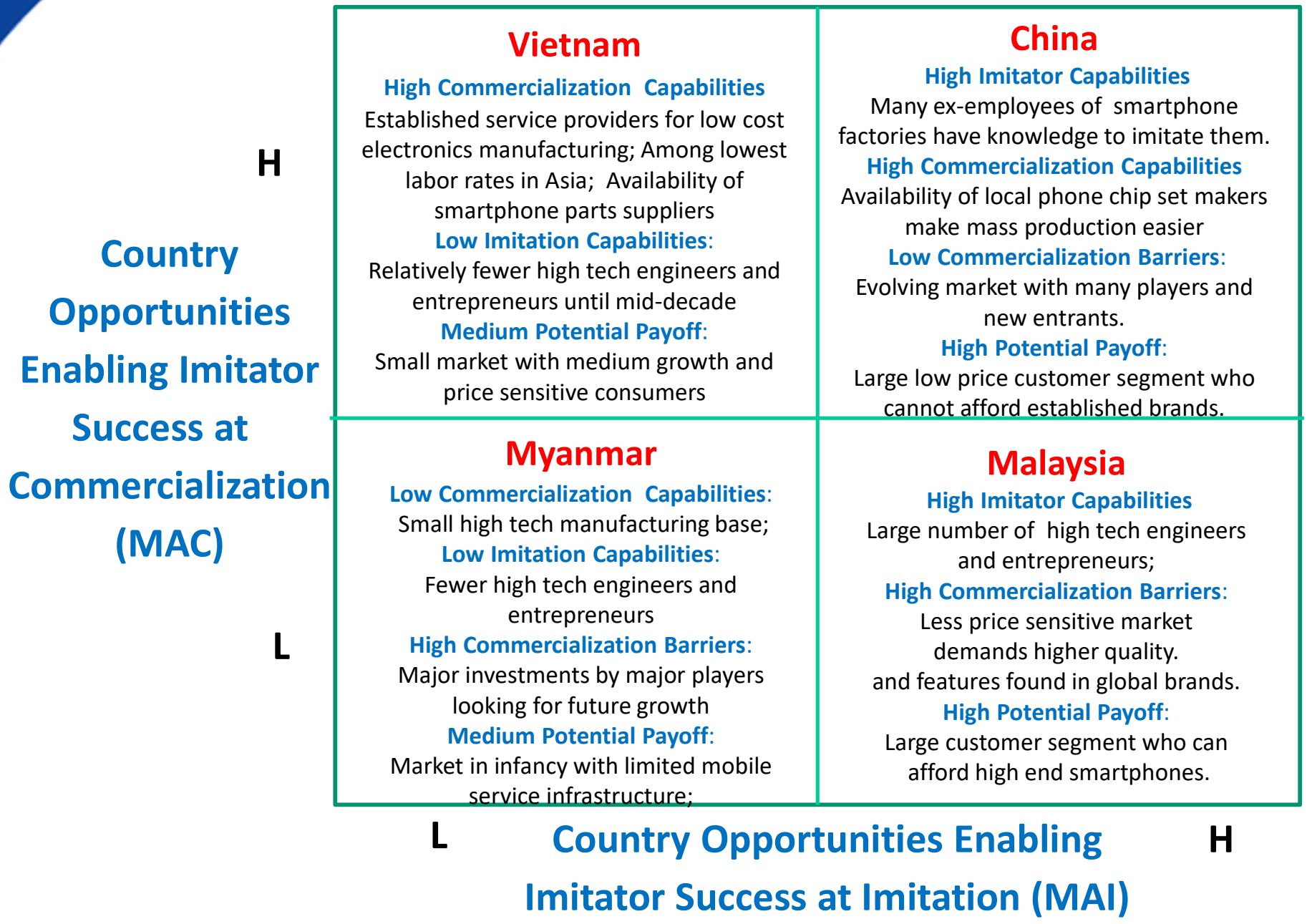
Technical Enablers
Supply of engineers with technical knowledge relevant to the product / service.

Market Characteristics
1. Market growth with high rate of entry level adopters,
2. Consumers indifferent to global brands,
3. Consumers accepting of IP theft.

Commercialization Enablers
1. Suppliers, service providers, and inexpensive factors of production,
2. Entrepreneurs with the business knowledge relevant to the product.



Country Opportunities Enabling Imitators in Asian Smartphone Industry in 2010s



Trading-off between Locating Firm Activities & IP Protection: A Suggested Process

Locating Firm Activities and IP

- Firm decisions where to locate its value chain activities cannot be independent of its IP Strategy.
- Firms enter developing countries for two reasons.
  - To leverage country specific advantages, as low labor rates, which motivates firms to establish **manufacturing** centers
  - To grow **sales** by riding the wave of increasing consumption in countries whose disposable income is increasing.
- Different firm activities have different IP risks.
  - UK firm Dyson started contract manufacturing in China.
  - Knowledge spillovers from manufacturing spawned imitators
  - Afterwards, Dyson moved their manufacturing and product development to Malaysia and moved their R&D to Singapore
  - Sales and some other activities remained in China, but none which were privy to knowledge which could lead to imitation.
  - Although labor costs are marginally higher in Malaysia, IP protection enforcement is higher.

Location & IP Decision Process

- Step 1: The framework forces managers to first answer the "**where**" questions.
  - "where" asks in which countries does a firm desire to locate parts of its value chain,
  - to what degree does this country provide **opportunities** for imitators, and to what degree do potential or emerging **imitators** there have **abilities** to **imitate** and **commercialize**
- Step 2: Once the "where" questions are answered, the innovator answers the "**what**" questions
  - what value chain functions should be located in this country in light of IP risk, and **what barriers** should be raised to **block** imitators from appropriating profits.
- Step 3: Then finally, the "how" question
  - "how" to **raise BI or BC** with the appropriate protection mechanisms is relevant.

Conclusions

- An effective IP strategy consists of implementing relevant protection mechanisms to raise at least one barrier beyond the imitator's ability.
- Firms must not only have IP strategies that differ between developed and emerging countries, but may also need IP strategies that differ among emerging countries.
- Firm decisions as to what country to locate value chain activities must be based not only on economic factors, but must also take in account the IP risks of locating there.