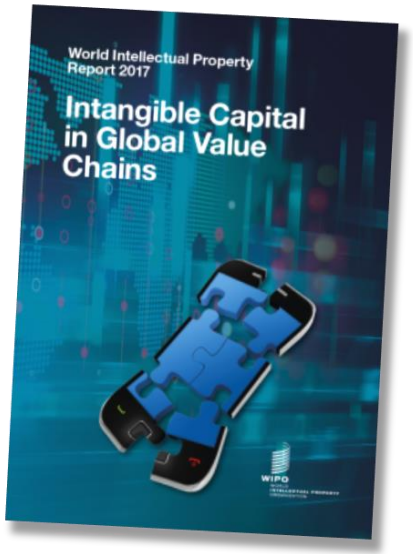


The Role of Intangible Capital in Global Value Chains

Sacha Wunsch-Vincent, WIPO

Wen Chen, University of Groningen

Safe and Ethical Cyberspace, digital assets and risks:
How to assess the intangible impacts of a growing phenomenon?

The World Conference on Intellectual Capital for Communities

UNESCO, June 14&15 2018

Smartphones - What drives retail price? What drives value-added *and* returns to intangible assets?

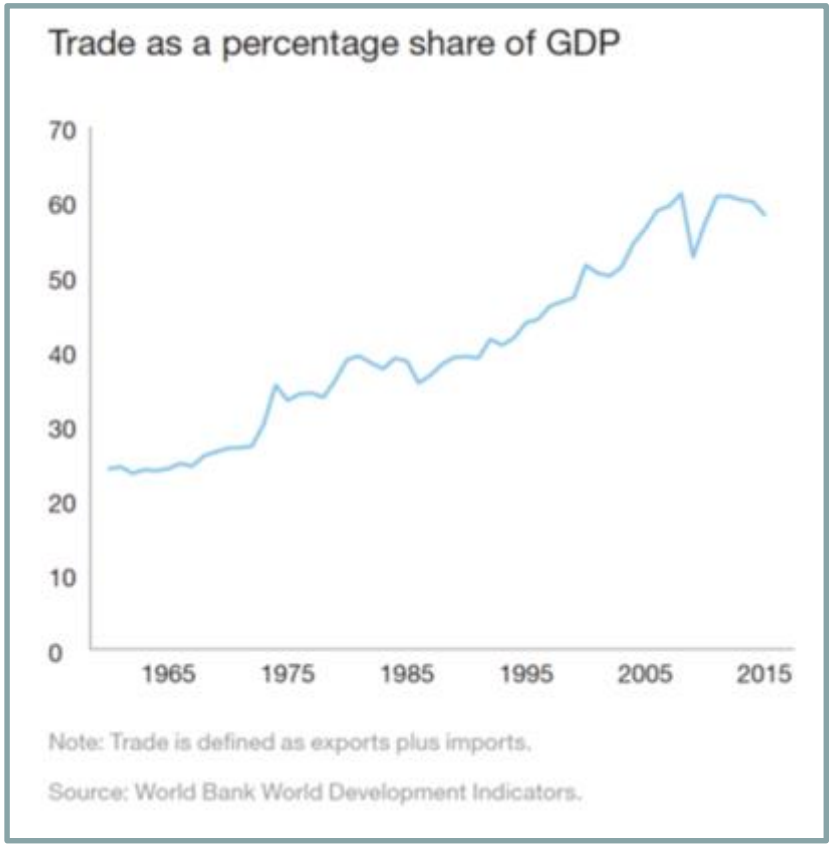
Photo credit: https://newatlas.com/best-smartphones-specs-features-comparison-2017/49418/

Coffee- What drives retail price? What drives value-added and returns to intangible assets?

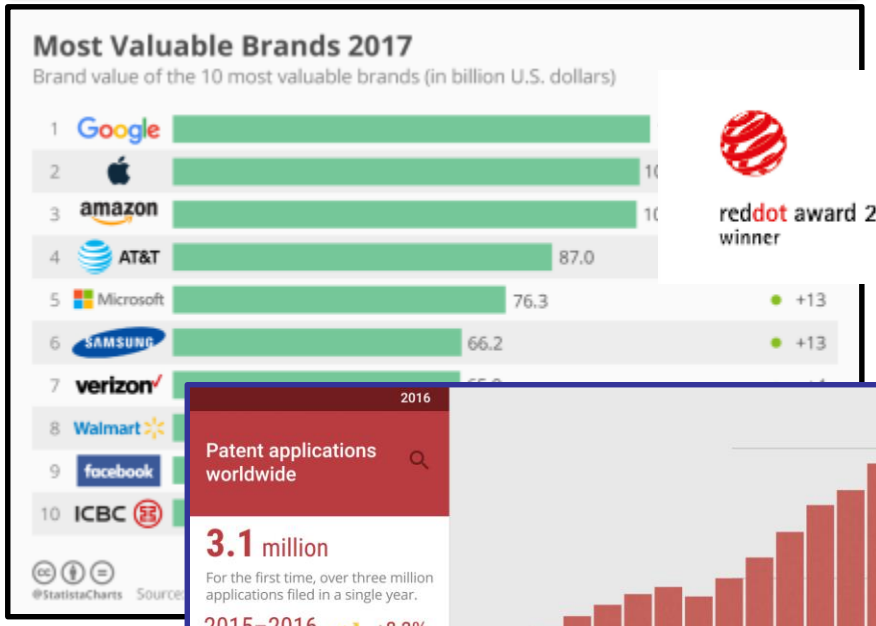
Photo credit: https://www.which.co.uk/reviews/coffee-machines/article/how-to-buy-the-best-coffee-machine

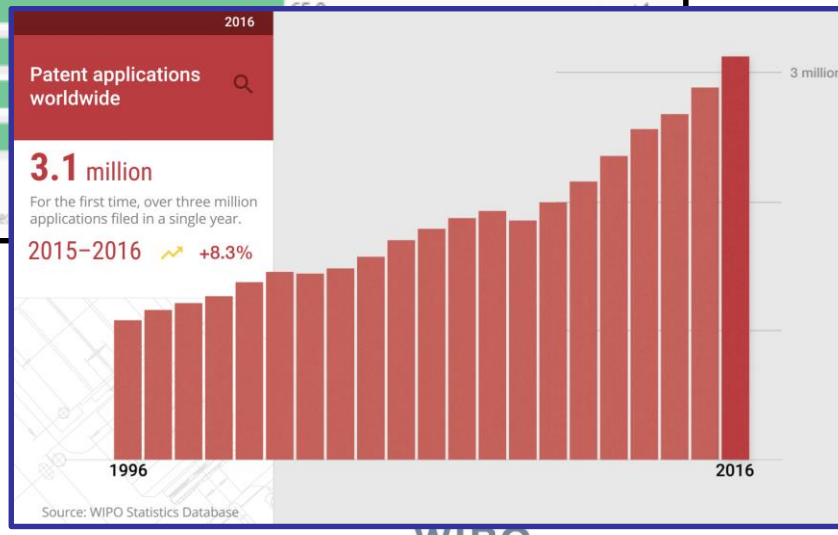
Reconciling the evidence:
What drives value in «value-added»?

The rise of global value chains



The rise of intangible assets





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Overview

1. The rise of global value chains (not treated)

2. Macro - What return accrues to intangible capital?

3. Micro - Case study – Smartphones

4. The role of Intellectual Property

<u>Way Forward: A measurement and policy agenda</u>

2. Macro: What return accrues to intangible capital?

Chapter 1 of World IP Report and "Measuring the income to intangibles in goods production: a global value chain approach" WIPO Economic Research Working Paper No. 36 Wen Chen, Reitze Gouma, Bart Los, Marcel P. Timmer | 2017

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Background / Motivation

- Two emerging strands of literature: Intangibles & GVC
- The intangibles literature focuses on the measurement issue and role of intangible capital in productivity and economic growth (e.g. CHS, 2005; 2009)
- The GVC literature emphasizes on the fragmentation of production processes and the fact that countries start to specialize in tasks and business functions rather than specific products (e.g. Gereffi, 1999; Baldwin & Venables, 2013; Timmer et al., 2014)

What return accrues to intangible capital?

Value added as starting point

Inputs
- Purchased domestically
- Imported from abroad

Outputs
- Sold domestically
- Exported abroad

Employs
- Labor
- Tangible capital
- Intangible capital
  - technology
  - know how
  - design
  - branding
  - etc.

Produced inhouse

Value added = value of outputs – value of inputs

Intangibles create value out of tangible factor inputs

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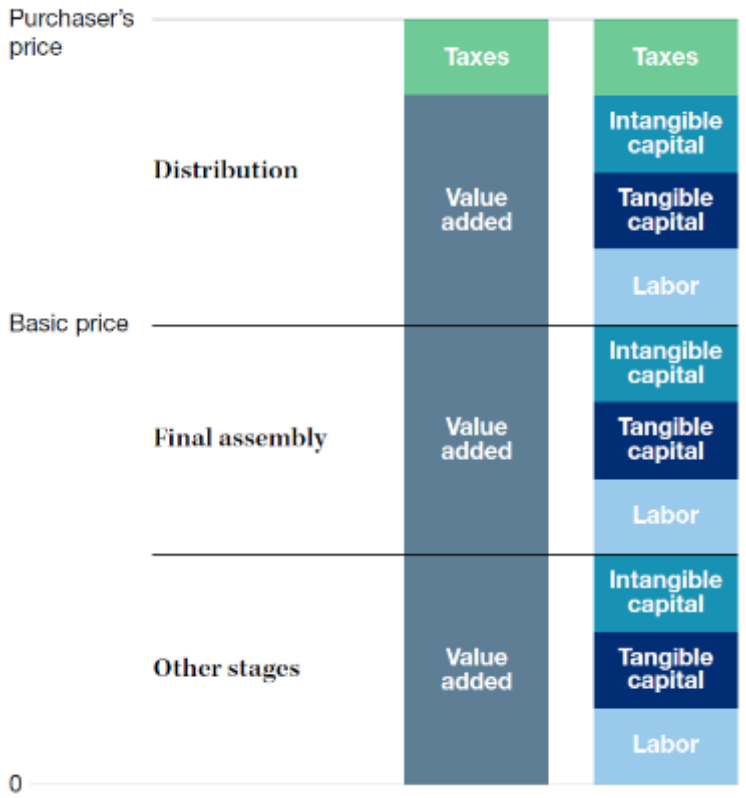
New framework to measure returns to intangibles at macro-level

- Database on value added by Groningen University (Marcel Timmer):
  - Based on national accounts, input-output tables and international trade statistics
  - 19 manufacturing value chains, around one-quarter of global output



intangible capital is "yeast" that creates value from labour and purchased assets

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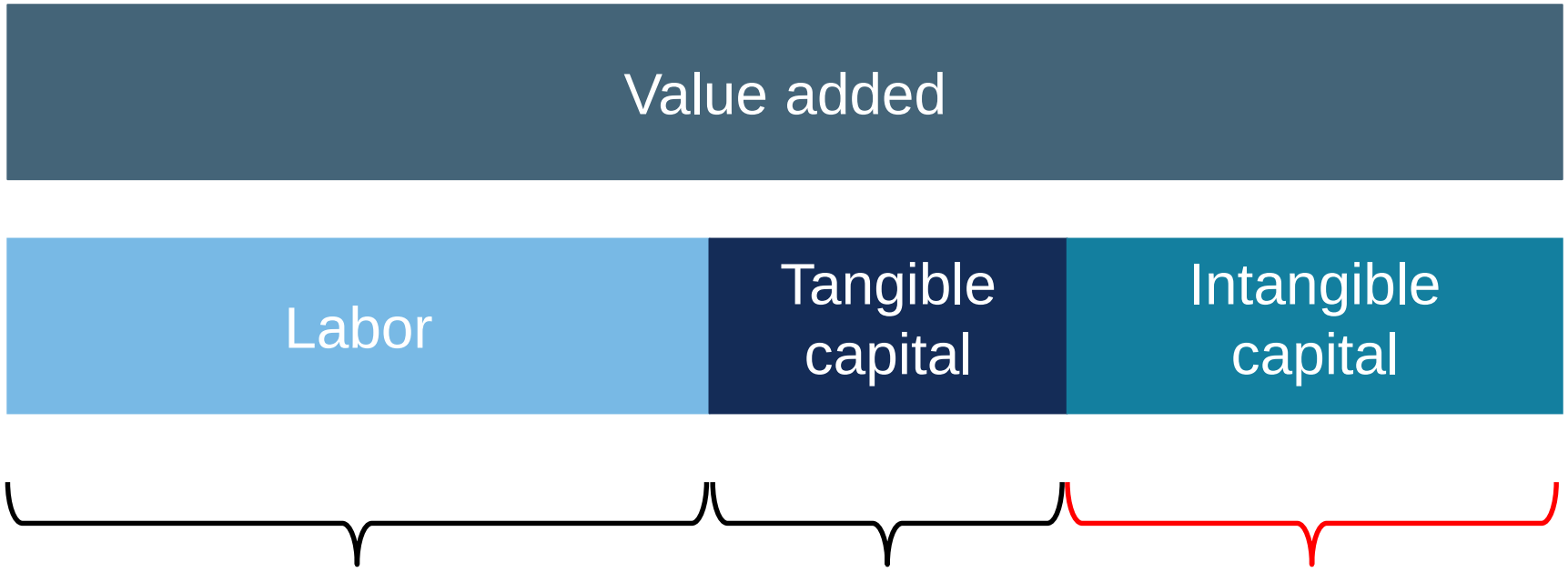
How to measure returns to intangibles?



The GVC Approach

- Follow the GVC approach introduced by Los, Timmer and de Vries (Journal of Regional Science, 2015)

- $\mathbf{g} = \hat{\mathbf{v}}(\mathbf{I} - \mathbf{A})^{-1} \cdot \mathbf{F}$

	Intermediate use (*S* columns per country)			Final use (*C* columns per country)			Total
	1	...	*N*	1	...	*N*	
S Industries, country 1	$\mathbf{Z}^{11}$	$\mathbf{Z}^{1\cdot}$	$\mathbf{Z}^{1N}$	$\mathbf{F}^{11}$	$\mathbf{F}^{1\cdot}$	$\mathbf{F}^{1N}$	$\mathbf{x}^{1}$
...	$\mathbf{Z}^{\cdot 1}$	$\mathbf{Z}^{\cdot\cdot}$	$\mathbf{Z}^{\cdot N}$	$\mathbf{F}^{\cdot 1}$	$\mathbf{F}^{\cdot\cdot}$	$\mathbf{F}^{\cdot N}$	$\mathbf{x}^{\cdot}$
S Industries, country *N*	$\mathbf{Z}^{N1}$	$\mathbf{Z}^{N\cdot}$	$\mathbf{Z}^{NN}$	$\mathbf{F}^{N1}$	$\mathbf{F}^{N\cdot}$	$\mathbf{F}^{NN}$	$\mathbf{x}^{N}$
Value added	$(\mathbf{w}^{1})'$	$(\mathbf{w}^{2})'$	$(\mathbf{w}^{N})'$				
Output	$(\mathbf{x}^{1})'$	$(\mathbf{x}^{2})'$	$(\mathbf{x}^{N})'$				

- $\mathbf{g}$ is the vector of value added created in each of the country-industry pairs involved in a value chain

The GVC Approach

An Accounting Framework for Global Value Chains

			Final products of a global value chain, identified by country and industry of completion							Value added
			Country 1			...	Country M			
			Industry 1	...	Industry N	...	Industry 1	...	Industry N	
Value added from country-industries participating in global value chains	Country 1	Industry 1								
		...								
		Industry N								
	...	...								
	Country M	Industry 1								
		...								
		Industry N								
Total final output value										World GDP

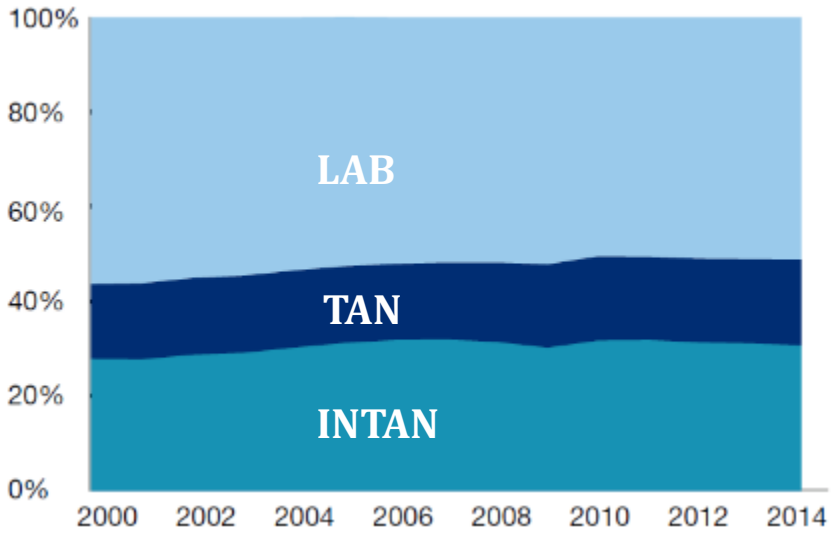
Note: Cell values represent the value added generated in the country-industry given in the row, within the global value chain corresponding to the country-industry of completion given by the column.

Strong role of intangible income in GVCs

- Share of intangible income increased rapidly since 2000, levelling off post 2008, standing at 31% in 2014

- Returns to intangibles are twice returns to tangible assets, and increasing

Intangible capital accounts for one-third



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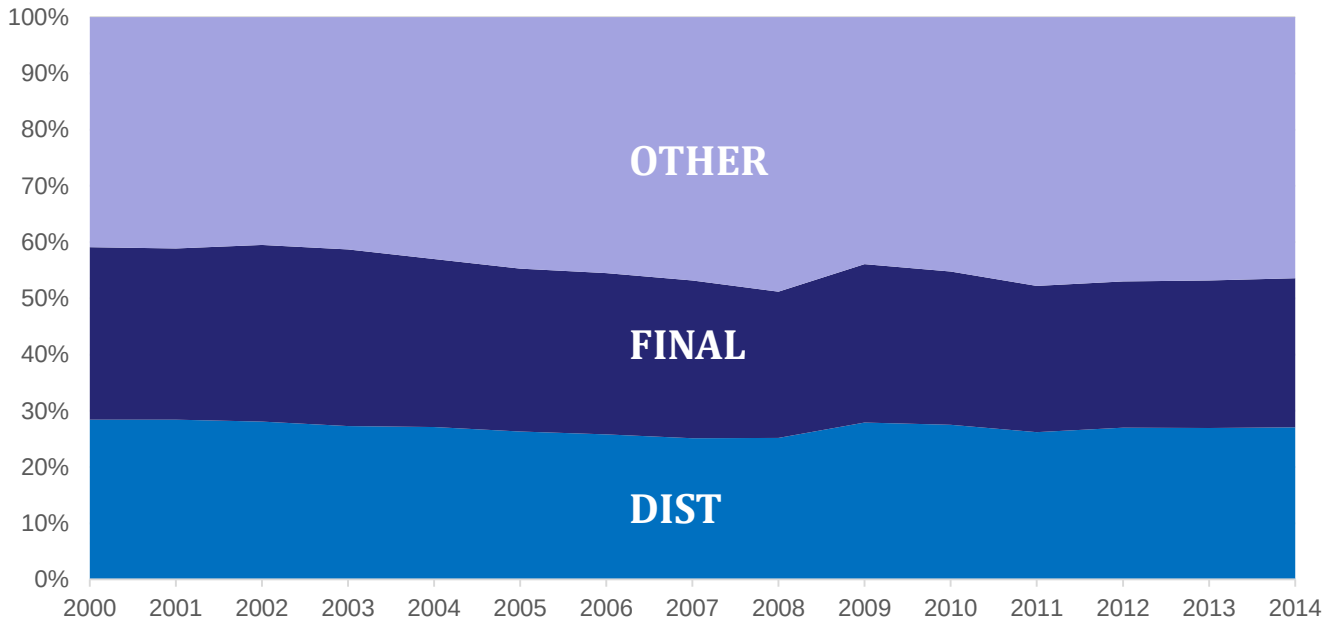
Intangible incomes by stages of production

- 1/4 of intangibles income realised in distribution stage, 1/4 in final production stage and 1/2 in other production stages



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Returns by product group

Income shares by manufacturing product group, 2014

Product group name	Intangible income share (%)	Tangible income share (%)	Labor share (%)	Global output (USD bn)
Food, beverages, and tobacco products	31.0	16.4	52.6	4,926
Motor vehicles and trailers	29.7	19.0	51.3	2,559
Textiles, apparel and leather products	29.9	17.7	52.4	1,974
Other machinery and equipment	27.2	18.8	53.9	1,834
Computer, electronic and optical products	31.3	18.6	50.0	1,452

Product group name	Intangible income share (%)	Global output (USD bn)
Food, beverages, and tobacco products	31.0	4,926
Motor vehicles and trailers	29.7	2,559
Textiles, apparel and leather products	29.9	1,974

Paper products	28.0	20.9	51.1	140
Other non-metallic mineral products	29.7	21.5	48.9	136
Wood products	27.5	20.0	52.5	90
Printing products	27.1	21.2	51.7	64

Source: Chen et al. (2017).

3. Micro - Case study – Smartphones

Chapter 4 of World IP Report and “Intangible assets and value capture in global value chains: the smartphone industry”, WIPO Economic Research Working Paper No. 41 Jason Dedrick, Kenneth L. Kraemer | 2017

Smartphones: what's inside the box?

How to arrive at the value capture estimate

Smartphone retail price

- Cost of materials
  in decreasing order of cost: touchscreen display, application processor, enclosure, camera and baseband processor...

- Assembly and other labor costs

- Distribution costs

= Value capture or gross profits

One critical measurement challenge is that IP payments are not explicitly captured – some are embedded.

Key intangible assets: cutting edge technology, hardware and software design, brand reputation and image

Teardown reports, IP experts, research team (Prof. Jason Dedrick and Prof. Ken Kraemer).

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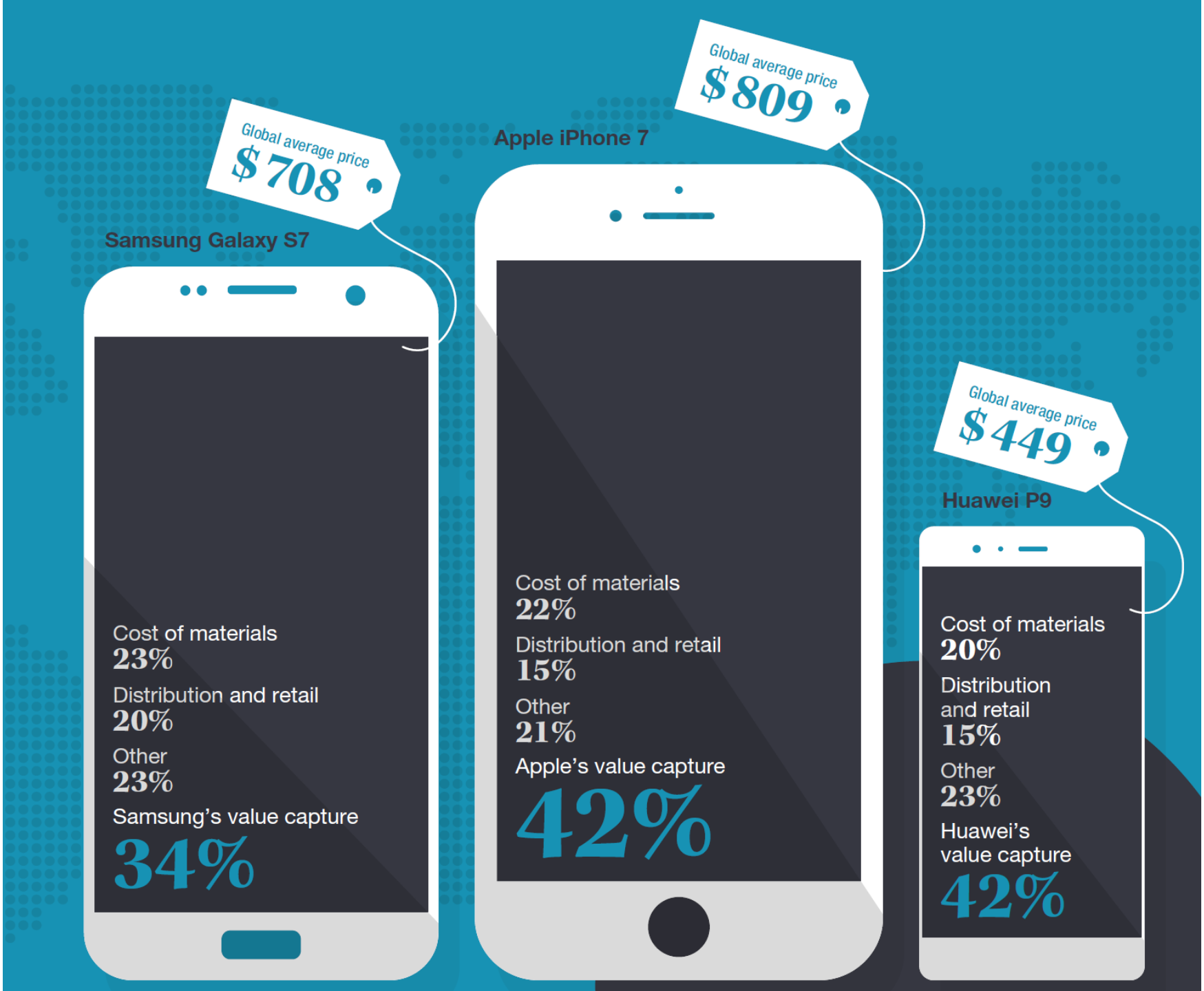

Global average price
$ 708
Samsung Galaxy S7
Cost of materials
23%
Distribution and retail
20%
Other
23%
Samsung's value capture
34%
Global average price
$ 809
Apple iPhone 7
Cost of materials
22%
Distribution and retail
15%
Other
21%
Apple's value capture
42%
Global average price
$ 449
Huawei P9
Cost of materials
20%
Distribution and retail
15%
Other
23%
Huawei's value capture
42%

Comparison of value capture for premium phone models in 2016

Smartphone model	Global average sales price (USD)	Value capture/ margin (%)	Value capture/ gross profit (USD per phone)	Worldwide shipments (units shipped in 2016)	Total 2016 value capture/gross profits (USD bn)
Apple iPhone 6	748	42	314	199,614,814	62.4
Apple iPhone 7	809	42	339	15,871,584	5.4
Apple total					67.8
Samsung Galaxy 6	732	34	248	52,892,898	13.1
Samsung Galaxy S7	708	34	240	35,701,806	8.6
Samsung total					21.7
Huawei P8	298	42	125	15,418,859	1.9
Huawei P9	449	42	188	9,986,811	1.9
Huawei total					3.8

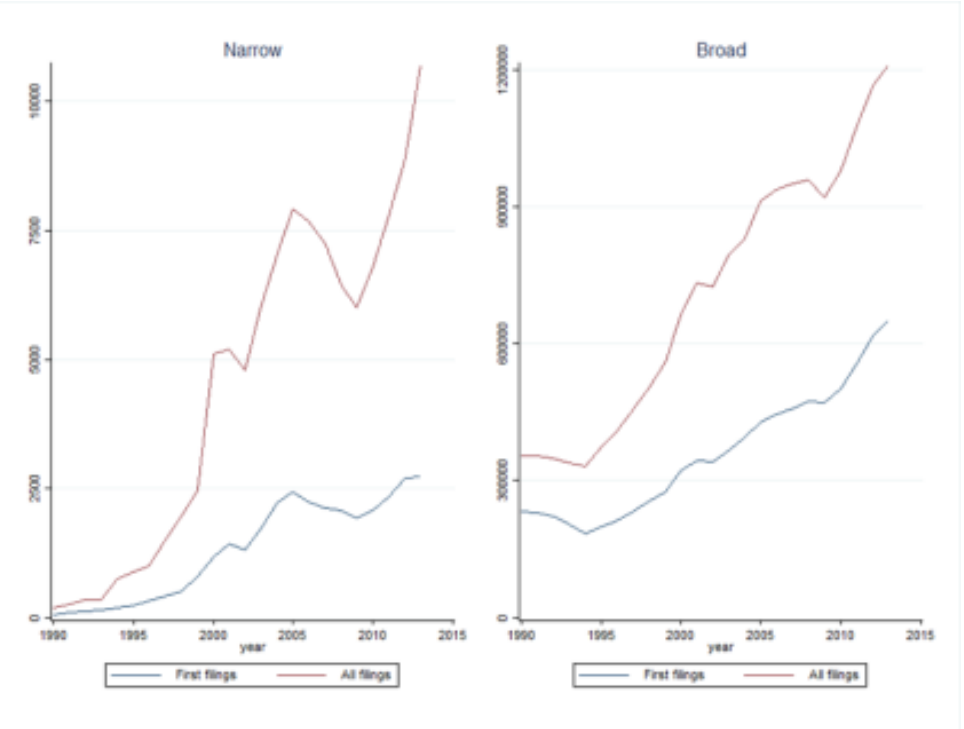
Sources: Dedrick and Kraemer (2017) based on IHS Markit teardown report.

4. The role of Intellectual Property

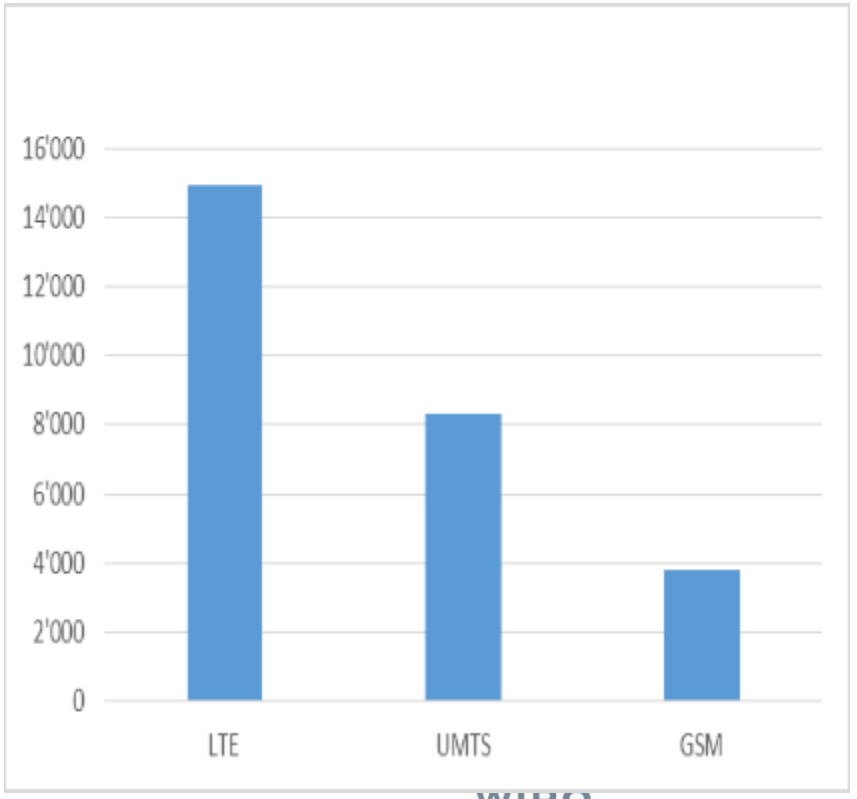
Key intangible assets: cutting edge technology, hardware and software design, brand reputation and image (reputational assets versus technology)

The number of smartphone patent filings is large and growing

First filings and all filings worldwide for smartphone-related patents, 1990-2013



Smartphone standard-essential patents are on the rise in fourth-generation mobile tech



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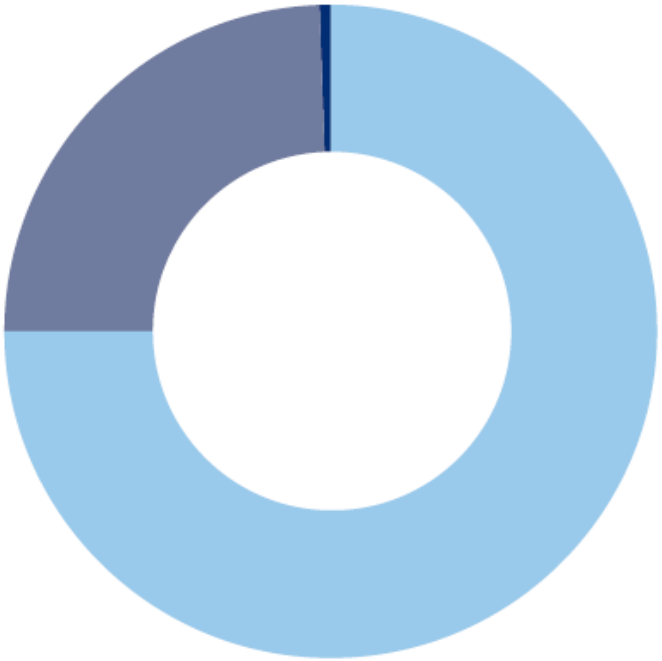
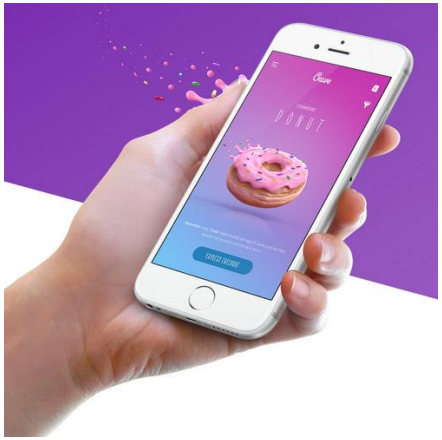
GUIs and icons represent the largest share of smartphone industrial designs

Share of industrial designs ("design patents") registered at the USPTO by selected companies for different smartphone elements, 2007-2015

- **75.2%** GUIs
- **24.4%** Icons
- **0.4%** Display screens and others



Apple



Interaction of value capture and IP

AND: Too early to discount secrecy

Actors make extensive use of full spectrum of IP rights.

Despite high correlation between value capture and use of IP, a specific value contribution by selected IP assets is hard to provide.

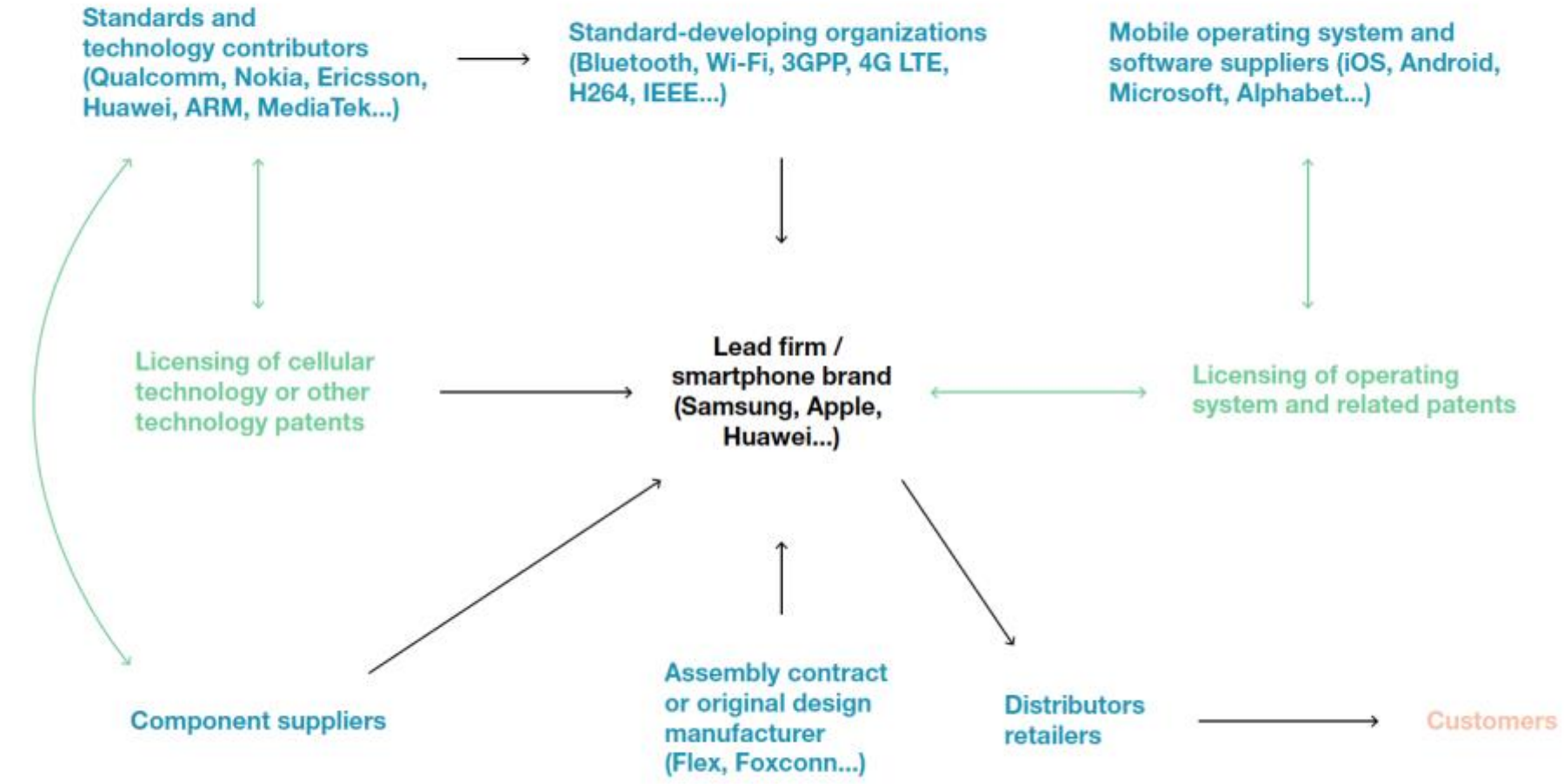
IP is only a source of advantage when combined with complementary assets

The role of IP – intricate and more of bargaining asset than tool of pure exclusivity

In most circumstances, IP protection is a crucial element of a firm's knowledge management strategy.

- Firms take IP for time-bound exclusivity.
- Collaboration and Specialization
  - IP helps firms in transferring technologies within the supply chain; facilitates outsourcing
  - Firms openly share or license knowledge assets, partly to encourage adoption of new technologies and partly to obtain access to technology.
  - Through cross-licensing arrangements, companies negotiate access to technologies

The smartphone global value chain is shaped like a spider



Note: Black lines represent the flow of parts or components through the value chain, green lines the licensing of technology and IP.

important enabler of collaboration

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SAMSUNG

Google™

CORNING
Gorilla Glass

Always Tough.
Always Innovating.

Perspectives on technological learning and intangibles

- Firms in catch-up economies acquire knowledge
  - ✓ through reverse-engineering
  - ✓ access to knowledge assets by importing capital goods
  - ✓ movement of skilled personnel

Intellectual Property

- Partnerships between GVC lead firms and catch-up firms entail the transfer of knowledge
  - ➢ Firms associated with assembly operations such as Foxconn have created their own technological edge.
  - ➢ transfer of relevant non-codified knowledge.
- Public patent records offer rich knowledge source
- Brand acquisitions and licensing - reputational assets.

Way Forward:
A measurement and policy agenda

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Future measurement agenda (see also Timmer paper)

- **Macro**: international stats initiatives are steps in the right direction. (OECD TiVa, UNECE and SEIGA initiative)
  - Increase the focus on intangible asset & value-added interaction in these GVC projects (open black box).
  - Knowledge of global intangible asset value chains is confidential and complex – needs special expertise
- In other fora, attention is to the measurement of intangible investment; there should also be focus on returns.

Open issues:

- Based on large product groups (with much heterogeneity)
- attribution of returns in a GVC to particular industries
- Quality of the databases (with strong modelling assumptions)

Future measurement agenda (see also Timmer paper)

- Broad concept of intangible capital – **residual**
  - ❖value of final product MINUS costs of all tangible factors

- **Micro**: teardown reports are useful starting point

Open issues:

- ➢ Equating profit/value capture to return of intangibles
- ➢ Only crude estimates of publicly available intangible asset payments (leads to overestimating returns in case third-party IP in use)
- ➢ More data required on IP transactions – BY PRODUCT
- ➢ Profit-shifting as part of tax minimization strategies

Reconciling the notions of IP and intangible assets

Intangible assets

Table 1. Intangible Capital Asset Types

Asset type	Included in National Accounts?
Computerized information	
1. Software	Yes
2. Databases	?[1]
Innovative property	
3. Mineral exploration	Yes
4. R&D (scientific)	Satellite for some[2]
5. Entertainment and artistic originals	EU-yes, US-no[3]
6. New product/systems in financial services	No
7. Design and other new product/systems	No
Economic competencies	
8. Brand equity	
a. Advertising	No
b. Market research	No
9. Firm-specific resources	
a. Employer-provided training	No
b. Organizational structure	No

Intellectual property

Table 1: Knowledge investment and different forms of intellectual property rights

Investment type	Patent	Copyright	Industrial design	Trademark
R&D	X		X	
Software development	X	X	X	
Design	X	X	X	X
Creative outputs		X	X	
Market research & advertising		X		X

Special Theme Section of the World IP Indicators Report 2012 on “The rise of Design in Innovation”, http://www.wipo.int/edocs/pubdocs/en/wipo_pub_941_2012-section1.pdf

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Way forward: Policy agenda

- Stagnant trade-to-GDP ratio: are there diminished opportunities for value chains to spread further?
- Strong concentration of IP still in selected few locations
  - What benefits moving up the value ladder?
- Balance of IP benefits (pecuniary and strategic) towards complexity of enforcement and litigation costs
- What will future role of IP be and what shall IP institutions do to facilitate?

Thank you!

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References

- WIPO World IP Report 2017, http://www.wipo.int/publications/en/details.jsp?id=4225&plang=EN
- Measuring the income to intangibles in goods production: a global value chain approach, WIPO Economic Research Working Paper No. 36, Wen Chen, Reitze Gouma, Bart Los, Marcel P. Timmer |2017
- Intangible assets and value capture in global value chains: the smartphone industry, WIPO Economic Research Working Paper No. 41 Jason Dedrick, Kenneth L. Kraemer | 2017
- SEE FOR PAPERS: http://www.wipo.int/publications/en/details.jsp?id=4225&plang=EN