Innovation Pattern and Determiners of Innovation in African and Asian Countries

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Research Purpose

- Background
  - Although Prahalad (2004) pointed out that multi-national companies could contributes development of base of pyramid (BoP) countries, firms in BoP countries could innovate by themselves that contributes development of their firm and country directly.
- Research Purpose
  - To understand situation of innovation in BoP countries: Africa and Asia.
  - To develop theoretical framework that relates firm and country level variables with firm level innovation performance.
  - To compare determiners of innovation performance between Africa and Asian firms.

Data

- Data
  - Innovation Survey conducted by World Bank between 2011-2014 to 10 African and 4 Asian countries was employed for the analysis.
  - 10,610 firms.
- Innovation
  - More than 40 subjective innovation items were measured with an Oslo manual based questionnaire. Most of items suffer “no response” bias, thus seven items that less than 5% was no response were included for the analysis.
  - “From fiscal year 2009/2010 thru 2011/2012, did this establishment introduce any innovative product or service?/ innovative methods of manufacturing products or offering services/ Packaging/ Branding, logo, name, or trademark/ products’ appearance, excluding packaging or branding/ innovative supporting activity for processes, such as maintenance systems/ innovative logistics, delivery, or distribution methods

Analysis 1: Classification of Firms based on Innovation

- Based on answer to seven innovation items, 10,610 firms were classified with k-means cluster analysis. Five cluster solution was adopted.
  - Although 4169 firms were classified as (a) less innovative, others are classified as (b) process and service innovative (n=1602), (c) product and marketing innovative (n=1579), (d) process innovative (n=1345), and (e) product, process, and marketing innovative firms (n=1915).

Table 1. Results of Cluster Analysis on Seven Innovation Items

Cluster name	Product, process, & marketing innovative	Product &marketing innovative	Process &service innovative	Process innovative	Less innovative
# of Firms	1915	1579	1602	1345	4169
Product	77.9%	57.1%	47.2%	50.6%	29.1%
Process	98.3%	18.1%	75.3%	100.0%	0.0%
Service	94.2%	10.6%	100.0%	0.0%	0.0%
Package	76.7%	85.3%	8.1%	17.9%	8.0%
Brand	57.1%	81.6%	9.6%	9.9%	4.5%
Product appearanc	83.6%	82.0%	8.8%	26.5%	9.6%

- Among analyzed countries, fraction of the most innovative firms: "(e) product, process, and marketing innovative" was highest for India (28.6%), followed by Malawi (23.2%), Namibia (23.0%), Zambia (22.0%), Nigeria (21.5%), and Bangladesh (18.7%). This result indicates that BoP countries are also innovative.

Table 2. Distribution of Five Clusters among 14 Countries

Region	Country	Product, process, & marketing innovative	Product &marketing innovative	Process &service innovative	Process innovative	Less innovative	%	N	GDP/person US$ 2013
Africa	Sudan	8.3	10.0	12.1	6.6	63.1	100.0	412	5488
Africa	Uganda	9.8	19.2	17.4	15.6	38.1	100.0	449	2997
Asia	Bangladesh	18.7	9.8	19.2	34.6	17.7	100.0	990	1956
Asia	Pakistan	3.9	22.7	1.3	2.2	70.0	100.0	696	1851
Africa	Kenya	9.1	7.8	13.3	7.7	62.1	100.0	549	1814
Africa	Malawi	23.2	22.8	7.2	8.0	38.8	100.0	250	1452
Africa	Zambia	22.0	8.1	29.3	14.3	26.3	100.0	540	1272
Africa	Namibia	23.0	33.0	8.2	6.6	29.3	100.0	379	1229
Africa	Dem. Rep. Congo	6.5	4.9	14.8	14.8	59.0	100.0	385	902
Asia	India	28.6	20.0	18.9	12.4	20.0	100.0	3,492	902
Africa	Tanzania	3.9	6.1	13.8	14.4	61.9	100.0	543	689
Asia	Nepal	2.8	14.0	8.5	6.4	68.4	100.0	471	662
Africa	Ghana	10.4	10.0	7.3	12.0	60.3	100.0	549	421
Africa	Nigeria	21.5	6.2	13.6	6.7	51.9	100.0	905	333
	Total	18.0	14.9	15.1	12.7	39.3	100.0	10,610	--

Note) Countries are sorted in the order of GDP/person.

Analysis 2: Determiners of Innovation

Theoretical Framework

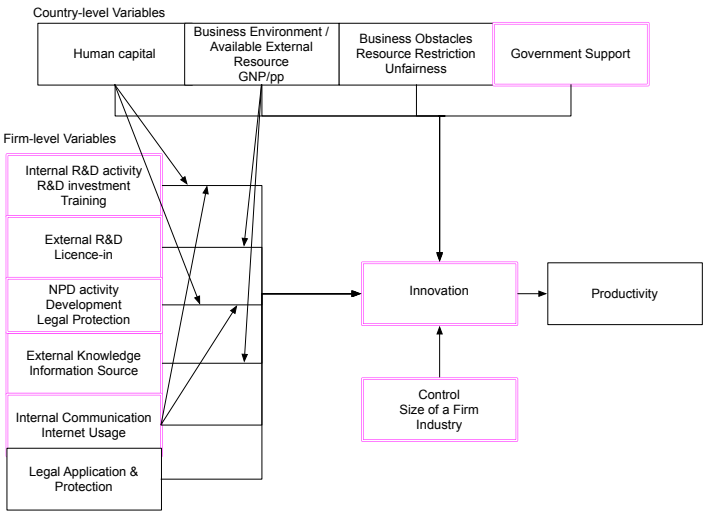

Figure. Theoretical Framework on Determiners of Innovation

Note) Factors highlighted with pink are included for the present analysis.

Analysis

- Dependent variables
  - 3 innovation factors were extracted from 7 innovation items.
    - “Product Innovation,” ”Process & Service Innovation,” and “Marketing Innovation”
- Explanatory variables
  - Based on developed framework, available variables were introduced for the analysis.
- 2 sample (African vs Asian countries) structural equation modeling was applied.

Results

- *R&D activity* (R&D investment and training) and *information source* has positive impact on 3 innovations for both countries.
- In most cases, coefficients are larger for African firms that implicates, investments and information is efficient in less developed countries.
- Government support is less effective in African countries.

Table 3. Results of 2 Population (Asian/ African Firms) Structural Equation Model

		Produc Innovation	Process & Service Innovatic	Marketing Innovaiton
R&D activity		0.337***/1.408***	0.589***/2.05***	0.361***/1.078***
Licence-in		-0.004/-0.142***	-0.004/-0.174***	-0.021
Fund for Innovation activity		0.139***/-0.899***	-0.078**/-1.481***	0.538***/-0.672***
Government Support		0.071***/-0.034	0.081***/-0.04	0.042***
Internet Usage		0.0235	0.114**	-0.14***/0.239***
log(# of Employee)		0.112***/0.072***	0.1005***	0.112***/0.075***
Information Source	Business Association	0.4875***	0.405***	0.259***/0.514***
	Consultants	0.298***/0.489***	0.154**/0.521***	0.177***/0.552***
	Custmer	0.3835***	0.4345***	0.142***/0.406***
	Government	0.23***	0.245**	0.1105
	Own R&D depertment	0.364***	0.238***/0.404***	0.131***/0.431***
	Internet	0.3725***	0.137*/0.421***	0.1625**
	Parent company	0.4925***	0.426***	0.159**
	Competitors' product	0.57***	0.4545***	0.161***/0.365***
	Industry Magazine	0.631***/0.457***	0.259***/0.69***	0.2355**
	Recent hiers from competitors	0.6425***	0.067/0.568***	0.025/0.458***
	Suppliers	0.3995***	0.557***	0.177***/0.466***
	University	0.272**/0.62***	0.4805***	-0.157/0.326**
Service industry dummy		-0.204***/0.027	-0.126***/-0.02	-0.43***/-0.072***

Note) Two standardized coefficients are displayed for Asian/ African firms, in case of equality test was rejected. Significance level ***: 1%, **: 5%, and *: 10%. Red and Blue indicates positive and negative significant coefficients respectively. N= 5649 for Asia and 4961 for Africa, RMSEA=0.080.

Conclusions

- Through analysis of World Bank Innovation Survey for African and Asian countries, we identified half of them are innovative.
- Developed theoretical framework was tested and similarities and differences between two areas were identified.

Acknowledgement

- We acknowledge World Bank Enterprise survey for providing Innovation Survey data.
- All the analysis, interpretations, and conclusions drawn from the data are entirely and solely those of mine.