

---

# Constraints and Opportunities in Rwanda's Industrial Sector: Evidence from Firm level Data

---

Sophia Kamarudeen & Måns Söderbom  
International Growth Centre

IPAR's Annual Research Conference 2011

Contact: [mans.soderbom@economics.gu.se](mailto:mans.soderbom@economics.gu.se)

---

# Background

- McMillan & Rodrik (2011), Page (2011):
  - Productivity differences across sectors in Africa are **large**
  - High-productivity sectors are **small**
- Suggests **structural change** can be a source of growth.
- Manufacturing (including agro proc) is a relatively small, high-productivity sector. (Rwanda: 6% of GDP)
- Hence, reallocation of resources from (say) traditional agriculture to manufacturing results in growth?

---

# Manufacturing is heterogeneous

- For structural change to deliver growth, labor & capital must be reallocated to productive firms.
- The mfg sector includes firms with very different capabilities: small firms that cater for the local market and more modern large firms some of which export.
- What types of firms perform well?
- **Why** do such firms perform well?
- Very limited information on the features & characteristics of successful firms in Rwanda.

---

# Questions

- How well do Rwandan mfg firms perform?
- How big are productivity diffs across Rwandan firms?
- What factors distinguish the top performing firms from other firms?
- How well do Rwandan firms perform compared to similar firms in the region?
  - Questions such as these are at the center of several research programs at the IGC.
  - This presentation contains **preliminary results** based on a recent industrial survey in Rwanda, which shed some light on these issues.

---

# Finding answers

- Unique data for Rwandan firms with 10+ employees, collected & processed in August – October 2011 (NISR, RDB, BNR, MINICOM).
- Contains rich information on ownership, investment, managerial skills, sales, costs, exports etc.
- Enables us to construct simple measures of firm performance, such as value-added per worker.
- Comparison across different firms within Rwanda.

---

# Cross-country firm-level benchmarking

## ■ Ethiopia

- Like Rwanda, a high growth economy with a small manufacturing sector (5% of GDP) and very little manufactured exports.
- Census data on manufacturing firms with 10 or more employees. Year: 2008.

## ■ Kenya

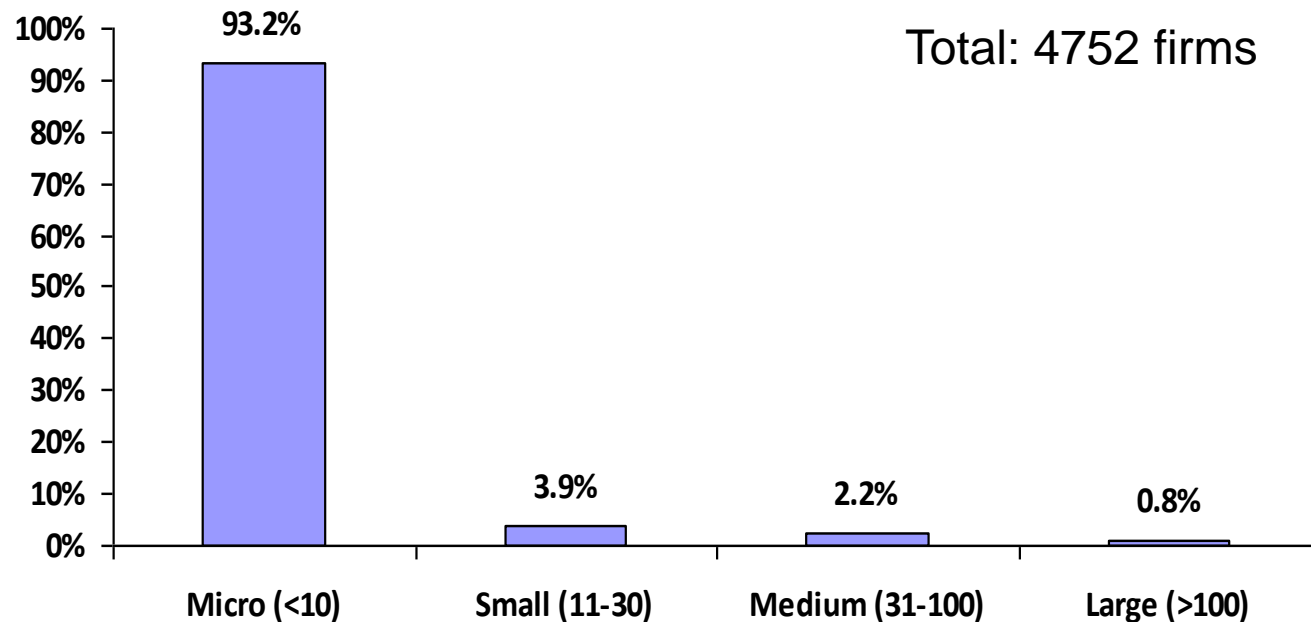
- Larger & more diversified mfg sector than Rwanda; more exporting.
- Survey data on Kenyan manufacturing firms for 2006.

---

Basic Facts:

Market structure and employment in  
Rwanda

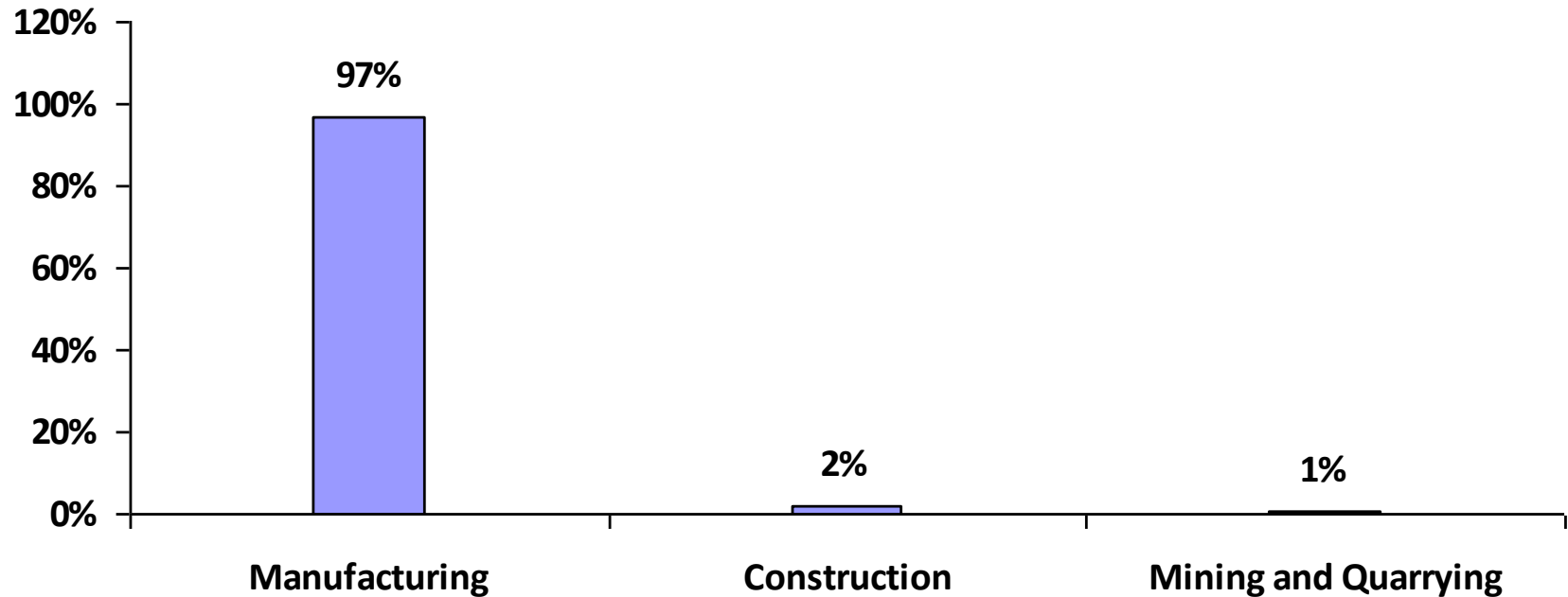
# 93% of firms in mfg, mining & construction in Rwanda have less than 10 workers



Source: Establishment Census 2011



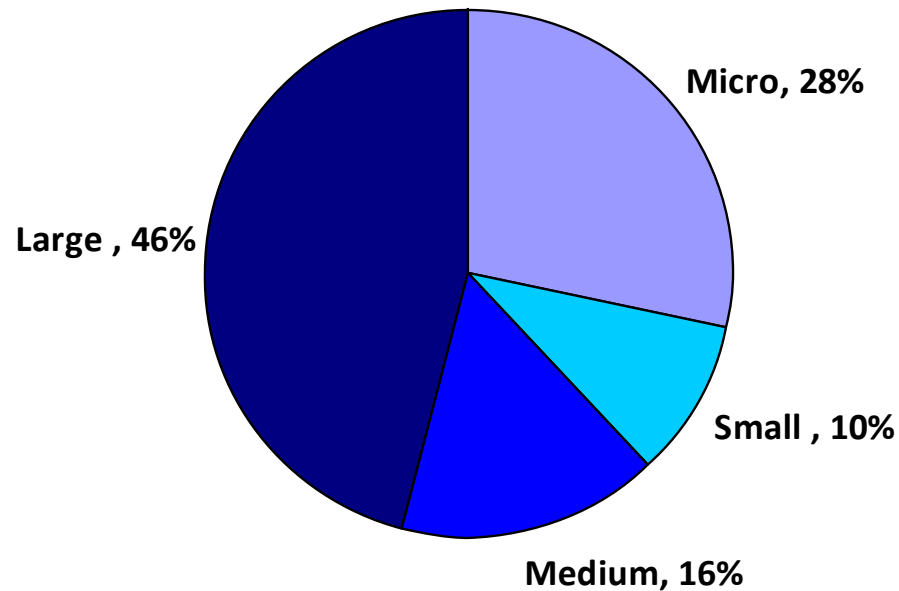
# Most firms are in manufacturing..



Source: Establishment Census 2011

# Firms with 10+ workers account for 72% of total employment

Total Employment: 33,488



Source: *Establishment Census 2011*

---

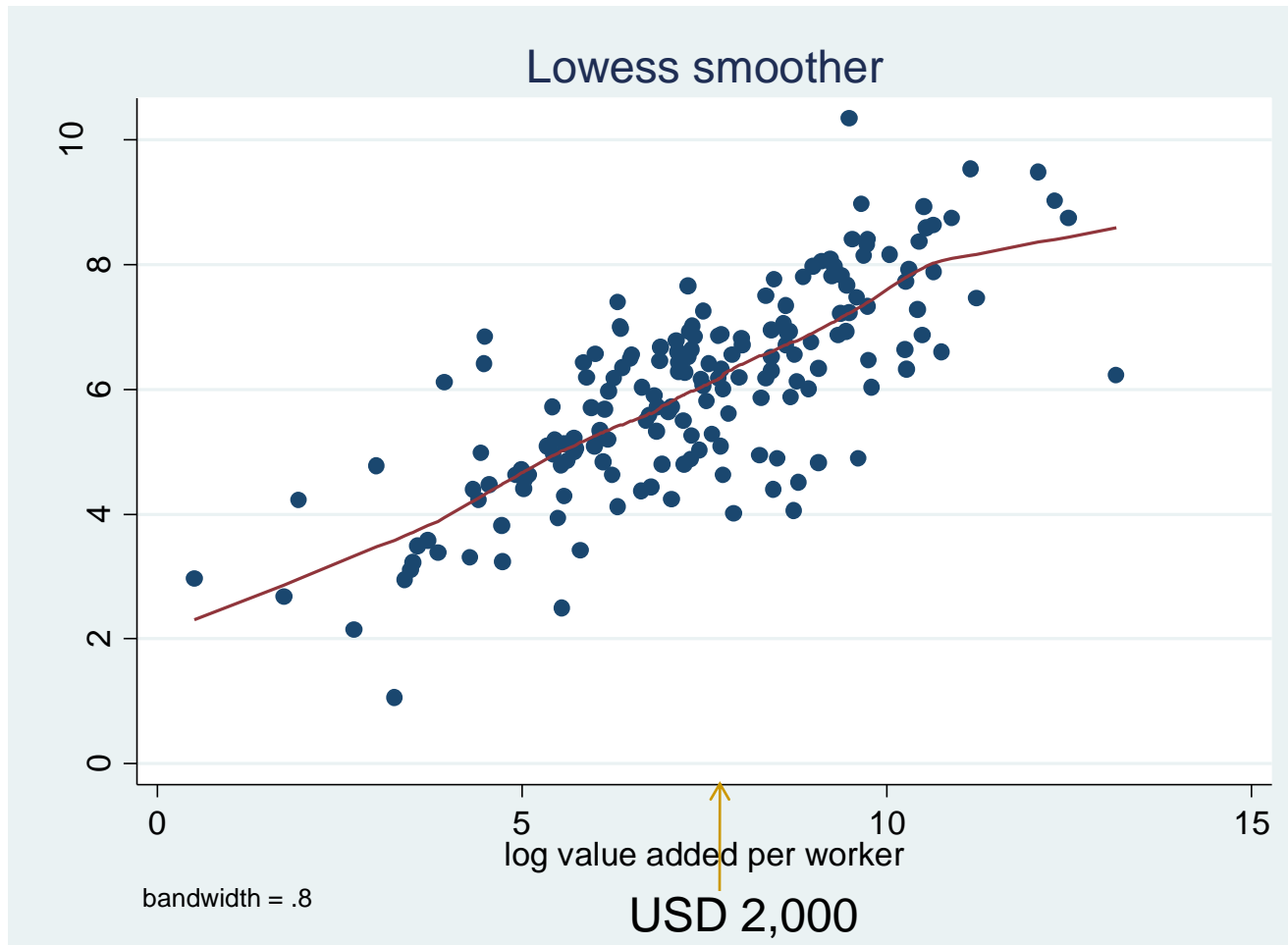
Evidence from the survey data:  
Productivity, exports, and investment

# Snapshot & Some Cross-Country Differences

	Rwanda			Ethiopia	Kenya
	Manufacturing	Construction	Mining	Manufacturing	Manufacturing
Employees (median)	24	33	46	21	50
Value-added per worker (median; USD)	1,565			1,631	9,306
Capital stock per worker (median; USD)	1,912			643	6,616
Firm age (years in operation)	8.5	10.8	3.8	11.3	22.3
Any exporting?	15%	0%	23%	4%	44%
Any investment in new equipment?	68%	76%	80%	47%	55%
Any foreign ownership?	8%	10%	24%	6%	52%
Number of firms	262	24	31	1682	389
Year		2010		2007/08	2006
Source	Rwanda Industrial Survey			CSA census	IC survey

Note: The Kenyan survey is a sample.

# Why higher productivity may improve the lives of ordinary Rwandans



$\Delta$  VAD/L 10%  
 $\Leftrightarrow$   
 $\Delta$  wage 6%

# Differences in Value-Added and Capital-Intensity across Small & Large Firms

	Rwanda			Ethiopia			Kenya		
	Small firms (emp <= 30)	Large firms (emp > 30)	Difference	Small firms (emp <= 30)	Large firms (emp > 30)	Difference	Small firms (emp <= 30)	Large firms (emp > 30)	Difference
Value-added per worker (median; USD)	1,307	2,844	118%	1,121	3,274	192%	8,225	10,120	23%
Capital stock per worker (median; USD)	1,462	4,237	190%	315	1,782	465%	5,750	6,688	16%

- Large firms (30+ emp) more than twice as productive as small firms in Rwanda
- In Ethiopia this difference is even bigger
- But in Kenya, the productivity differences across differing size are much smaller
  - Small Kenyan firms 630% more productive than small Rwandan firms
  - Large Kenyan firms 360% more productive than large Rwandan firms

# Differences in Exports, Investment & Ownership: Small & Large Firms

	Rwanda			Ethiopia			Kenya		
	Small firms (emp <= 30)	Large firms (emp > 30)	Difference	Small firms (emp <= 30)	Large firms (emp > 30)	Difference	Small firms (emp <= 30)	Large firms (emp > 30)	Difference
Any exports?	9%	26%	0.17	0%	9%	0.09	14%	63%	0.49
Any investment?	72%	75%	0.04	36%	63%	0.28	49%	58%	0.09
Any foreign ownership?	3%	13%	0.11	1%	15%	0.14	36%	62%	0.26

- Strong association between firm size and exporting
- Large proportion of the Rwandan firms are investing in new equipment.
- This is true for the small Rwandan firms also

# Correlates of Total Factor Productivity

Simple model:

$$\text{Value Added} = \text{TFP} \cdot (\text{Labor})^{\alpha} \cdot (\text{Capital})^{\beta}$$

$$\log \text{Value Added} = \log \text{TFP} + \alpha \cdot \log(\text{Labor}) + \beta \cdot \log(\text{Capital})$$

where log TFP correlates with exports, ownership, firm age etc.

- *Do exporters have higher TFP than non-exporters?*
- *Do foreign owned firms have higher TFP than domestically owned firms?*
- *Do firms improve TFP as they grow older?*



# Correlates of TFP: Summary of OLS Estimates

	Rwanda	Ethiopia	Kenya
Do exporters have higher TFP?	Yes: 2.4 times higher	No	No
Do foreign owned firms have higher TFP?	Yes: 4.5 times higher	No	No
Are older firms more productive?	Yes: 4% per year	Yes: 0.7% per year	No
Are firms in the capital city more productive?	Yes: 1.5 times higher	No	

- Very large differences across different types of firms in Rwanda
- These results are conditional on firm size.

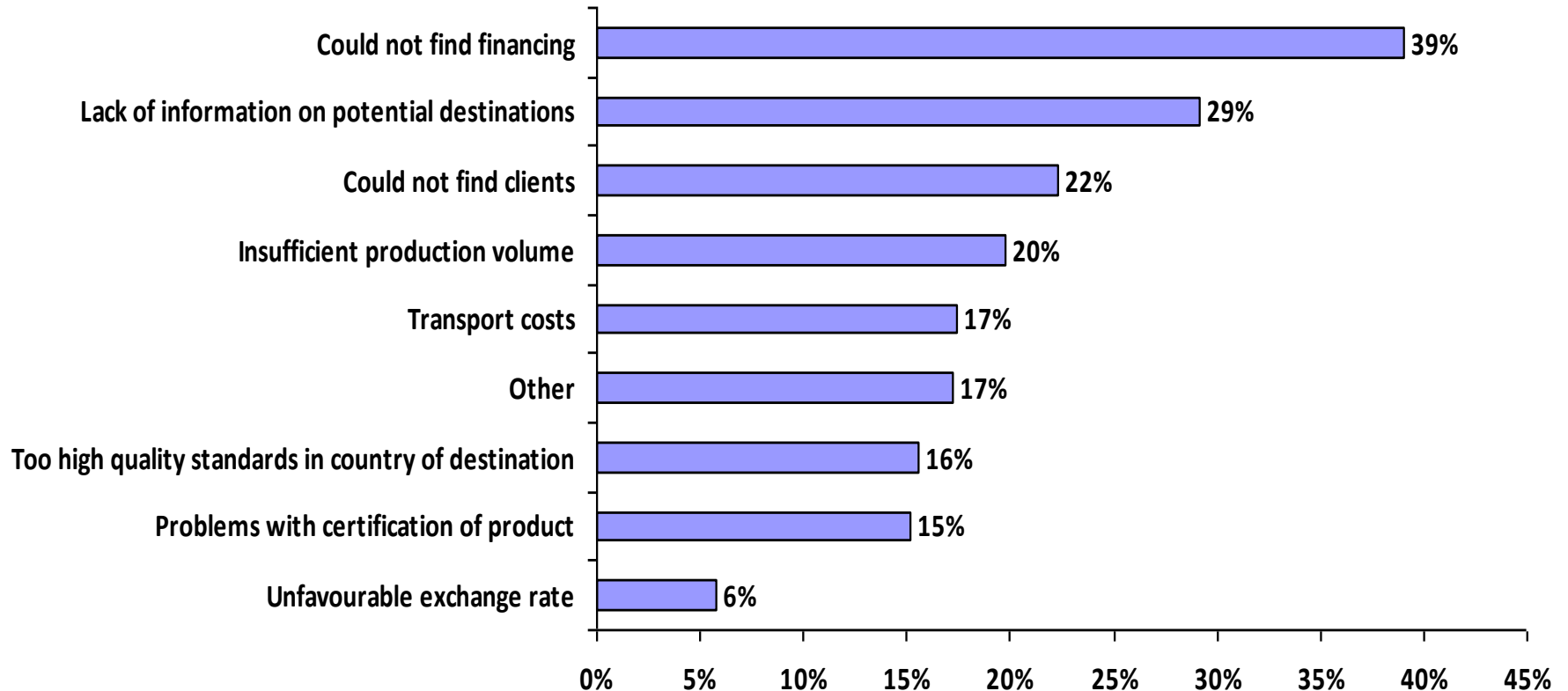
---

Why do most Rwandan firms not export?

Which firms invest?

# Exports

85% of firms did not export in the year 2010. Why?



Source: Rwanda Industrial Survey 2011

---

# Modeling the decision to export: Summary of regression results

- 14% of the firms exported in 2010
- Strong association between firm size & exporting
- Some (weak) evidence that foreign owned firms tend to export more
- Some (weak) evidence that young firms tend to export more than older firms

---

# Modeling the decision to invest: Summary of regression results

- 71% of firms made an investment in 2010
- Investment more common amongst **young firms** (true for all countries)
- Firms with high **labor productivity** (VAD/worker) record more investment...

.... which leads to even higher labor productivity through the increase in the capital labor ratio

- Access to **credit** has a surprisingly small & insignificant effect on investment. Self-finance.

# Questions and (preliminary) answers

- How well do Rwandan mfg firms perform?
  - A small number of firms perform well.
  - On average, however, labor productivity is lower than in the comparison countries.
  - Especially small firms seem to lag far behind comparable firms in Ethiopia & Kenya. Why is unclear.
- How big are productivity differences across Rwandan firms?
  - Quite big! Exporters, foreign owned firms and older firms have much higher TFP.
  - We don't find such big differences within the other countries

---

# Questions and (preliminary) answers

- What factors distinguish the top performing firms from other firms?
  - They are large
  - They export
  - They have been operating for some time
  - They are relatively capital-intensive, highlighting the importance of investment.

---

# Preliminary Conclusions

- The results **suggest** the following:
  - International influences are (very) beneficial for firm performance in Rwanda
  - Very hard for small mfg firms to export – because of high transport costs, lack of information about distribution channels / markets, and lack of credit(?)
  - Rwandan firms are gaining much from experience (4% per year TFP) - building capabilities.
  - Demand may be a stronger determinant of investment than credit.



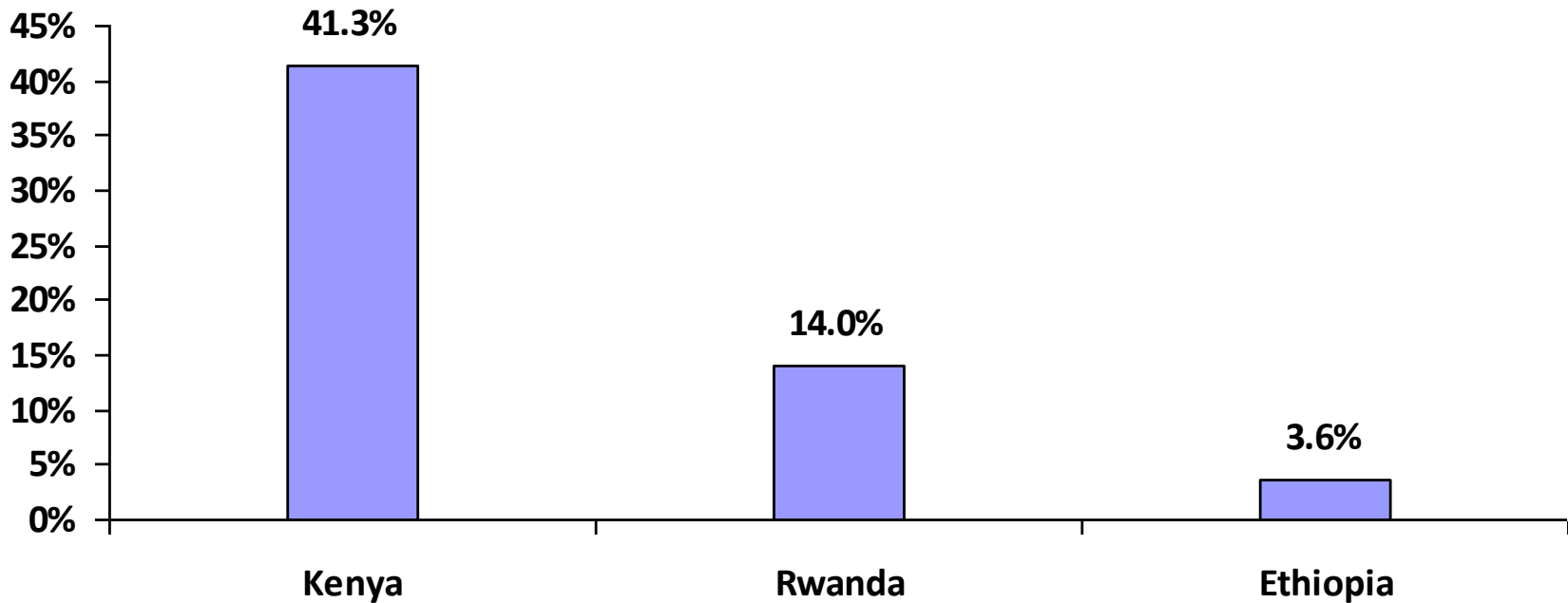
---

Thank you for your attention.

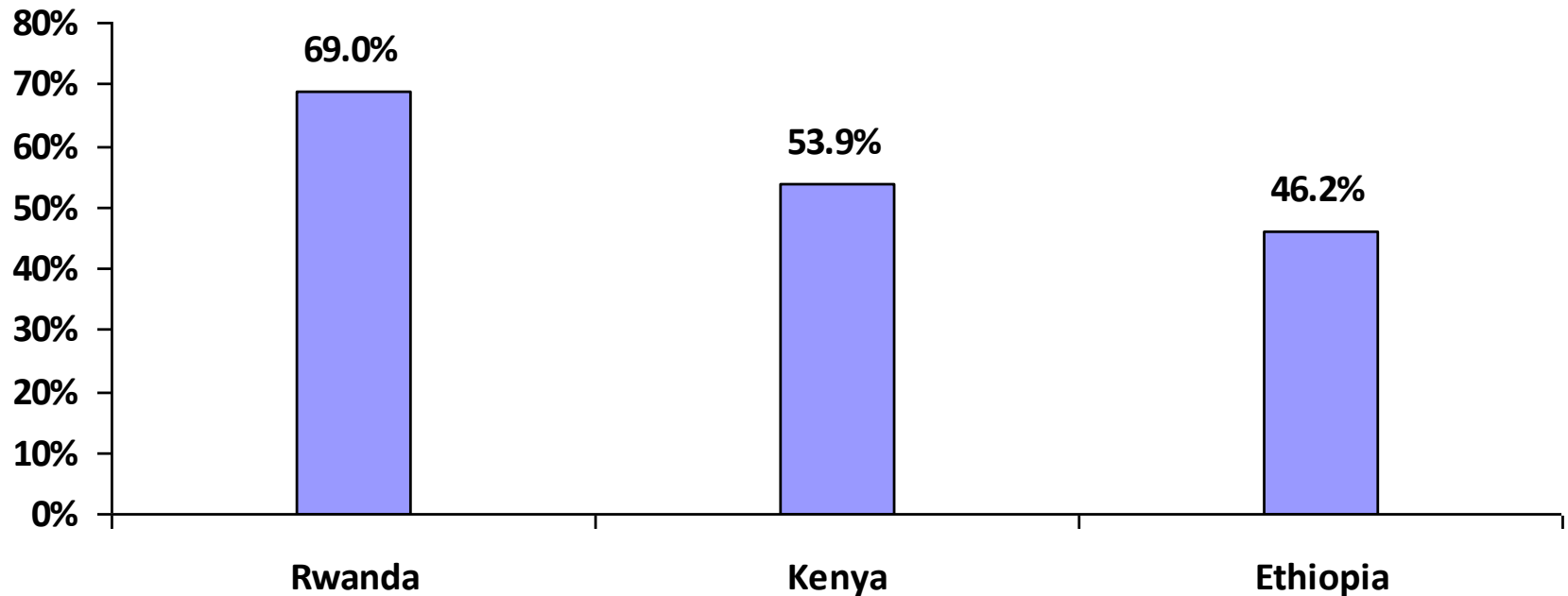
# Cross Country Benchmarking

	<b>Rwanda</b>	<b>Ethiopia</b>	<b>Kenya</b>
<b>Year</b>	2010	2007/08	2006
<b>Sector</b>	Manufacturing	Manufacturing	Manufacturing
<b>Firm size</b>	Employing more than 10 people	Large and Medium Scale Firms	Small, Medium and Large firms
<b>Sample Size</b>	262	1734	453
<b>Source</b>	Rwanda Industrial Survey	Survey of Large and Medium Scale Manufacturing Industries	Productivity and Investment Climate Survey

# Exports: Manufacturing



# Investment: Manufacturing firms



# Snapshot & Some Cross-Country Differences

	Rwanda			Ethiopia	Kenya
	Manufacturing	Construction	Mining	Manufacturing	Manufacturing
Employees (median)	24	33	46	21	50
Value-added per worker (median; USD)	1,565			1,631	9,306
Capital stock per worker (median; USD)	1,912			643	6,616
Firm age (years in operation)	8.5	10.8	3.8	11.3	22.3
Any exporting?	15%	0%	23%	4%	44%
Any investment in new equipment?	68%	76%	80%	47%	55%
Any foreign ownership?	8%	10%	24%	6%	52%
Male owner / manager	83%	100%	97%		
Owner / manager has at least					
secondary schooling	65%	95%	57%		
Located in Kigali province (Addis)	32%	86%	13%	47%	
Number of firms	262	24	31	1682	389
Year		2010		2007/08	2006
Source		Rwanda Industrial Survey		CSA census	IC survey

Note: The Kenyan survey is a sample.

---

# A Case Study of Rwanda

- High overall growth in the last decade.
- 85% of employment in agriculture.
- Compared to most other African countries, manufacturing in Rwanda is small.
- Share of manufacturing falling – from 12% in 1997 to 6% in 2009.
- Is the “deindustrialization” a cause for concern?



This work is licensed under a  
Creative Commons  
Attribution – NonCommercial - NoDerivs 4.0 License.

To view a copy of the license please see:  
<http://creativecommons.org/licenses/by-nc-nd/4.0/>

This is a download from the BLDS Digital Library on OpenDocs  
<http://opendocs.ids.ac.uk/opendocs/>