

What is the state of the manufacturing sector in Mozambique?

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The IIM 2017 enterprise survey paints a gloomy picture of the manufacturing sector – but is it representative?

Background

IIM 2017 Key results

- Among sampled firms, 54% (9,476) of jobs existing in 2009 had been lost in 2017 due to firm closure and decreased firm sizes.
- 20% of firms reported large losses in 2016 - three times as many as in 2011
- 45% of firms in the sample feared being closed by the authorities

IIM 2017 draws a concerning picture of manufacturing in Mozambique...

IIM 2017 Representativity

- The IIM 2017 is a tracer survey based on the IIM 2012, which was not sampled to be nationally representative
- All firms started before 2010 (a consequence of putting a panel dimension of the IIM 2012 sample)

...However, representativeness of sample is largely unknown.

How can we validate and triangulate the results of the IIM 2017?

Objective

- 1 Re-weigh of results of IIM 2017 using population estimates of subgroups
- 2 Compare with alternative sources on the development of the manufacturing sector
 - a. Manufacturing GDP
 - b. Census data
 - c. Satellite imagery

An overview of data sources...

Data sources

Enterprise surveys

IIM 2012

- 739 firms
- Extensive information about each firm
- 7 provinces sampled

IIM 2017

- 523 firms
- Extensive information about each firm
- Panel from 2012
- 7 provinces sampled

Firm censuses

CEMPRE 2002

- 2,757 firms

CEMPRE 2002 (rev 2011)

- 3,245 firms

CEMPRE 2015

- 3,548 firms
- Only basic information about each firm
- All provinces sampled, but excludes some micro companies

Firm # estimate

Schou & Cardoso (2014)

- 9,203 firms
- Imputation based on national and provincial registries

IIM samples 7 out of 11 provinces – with roughly the same ratio of firm sizes as the CEMPRE 2015

Representativeness of IIM 2017

	IIM 2017			CEMPRE 2015			Schou & Cardoso		
	Micro	Small	Medium	Micro	Small	Medium	Micro	Small	Medium
Maputo City	88	38	15	504	238	65	3,205	306	13
Maputo Prov	45	19	6	194	151	74	1,837	170	9
Gaza	41	5	2	151	16	7	134	11	3
Sofala	86	12	3	253	87	26	1,035	100	1
Manica	56	11	3	105	23	14	314	25	3
Nampula	33	13	4	106	71	23	881	68	10
Tete	31	5	2	108	30	7	128	12	1
Inhambane				132	49	5	356	36	0
Zambézia				189	53	6	267	20	4
Niassa				76	11	0	56	4	1
Cabo Delgado				76	18	3	143	12	0
Total	380	103	35	1,893	747	230	8,356	764	44

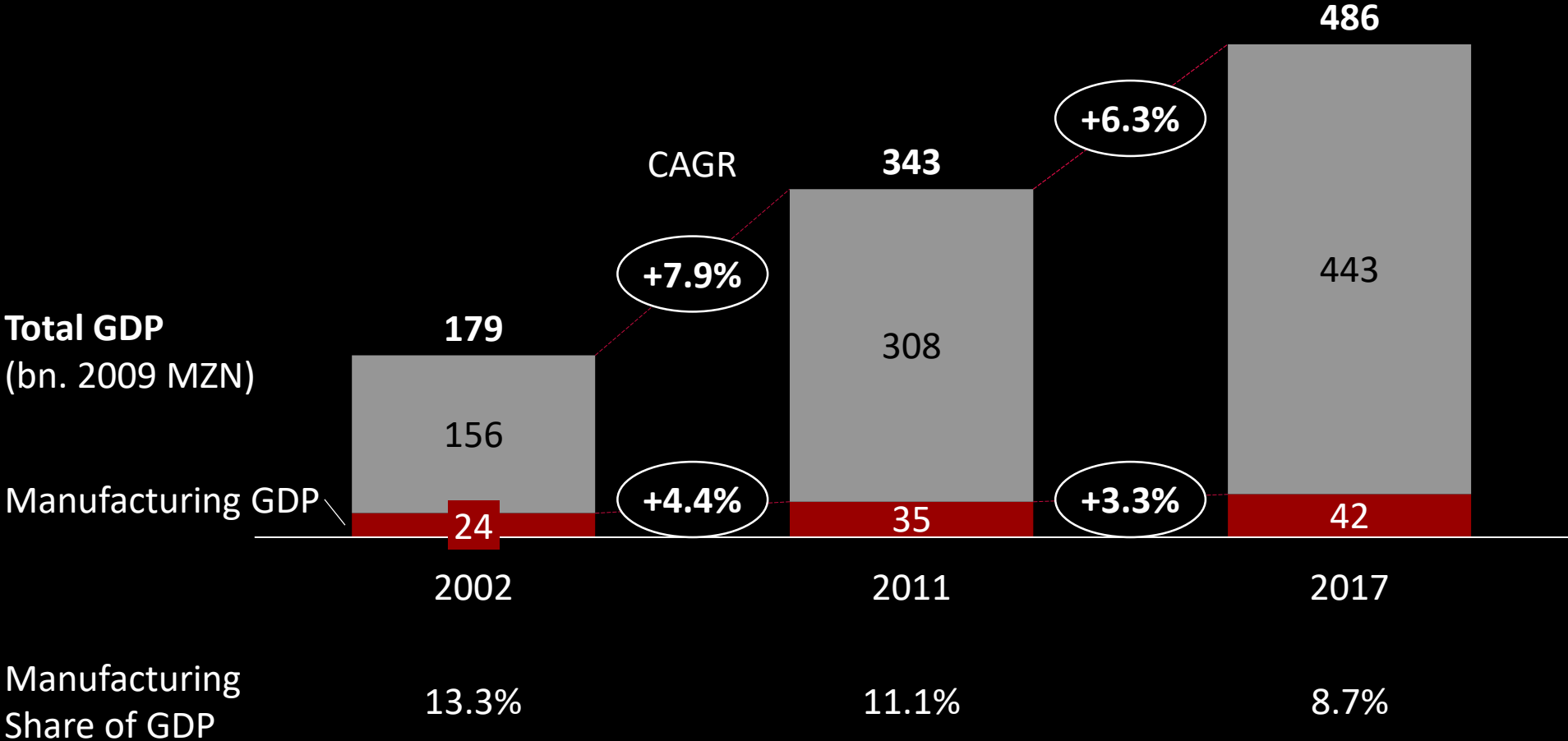
Direction of change depends on population estimate...

Re-weighting of selected results of IIM 2017

	IIM 2017 result	CEMPRE 15 weights	Schou & Cardoso weights
Annual change in workforce (employees)	-6.52	-5.86	-7.76
Average labor productivity (MZN/year)	163,745	208,314	145,878
Share of firms reporting losses	32%	33%	35%
Share of firms keeping formal accounts	36%	44%	28%
Share fearing being shut down	42%	41%	48%
Share that is credit constrained	42%	40%	45%
Share reporting “others” bribe	48%	48%	48%

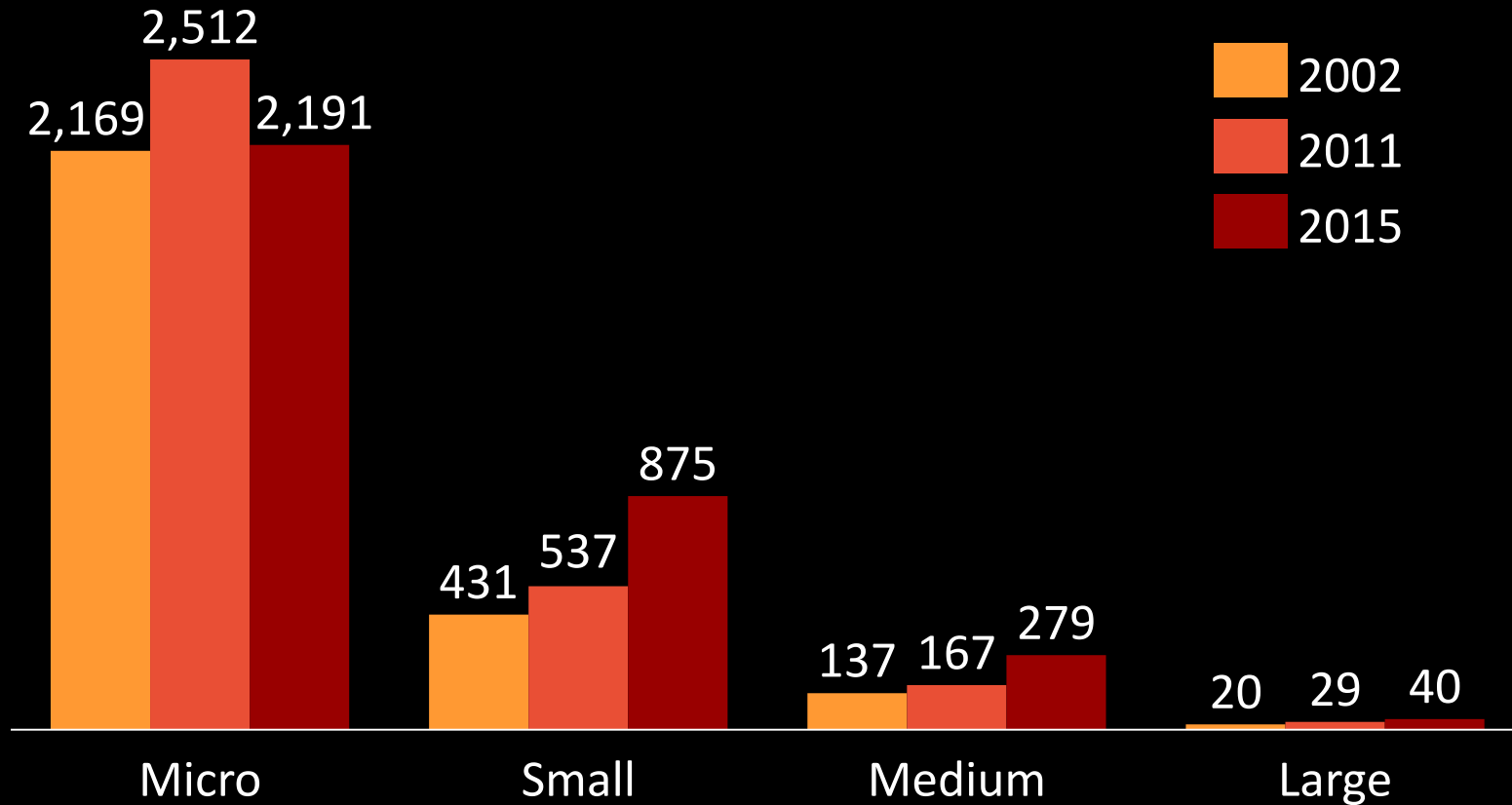
Manufacturing GDP has been increasing slowly but steadily during the period 2002-2017

Manufacturing GDP



The number of small, medium and large companies has increased by some 100% since 2002

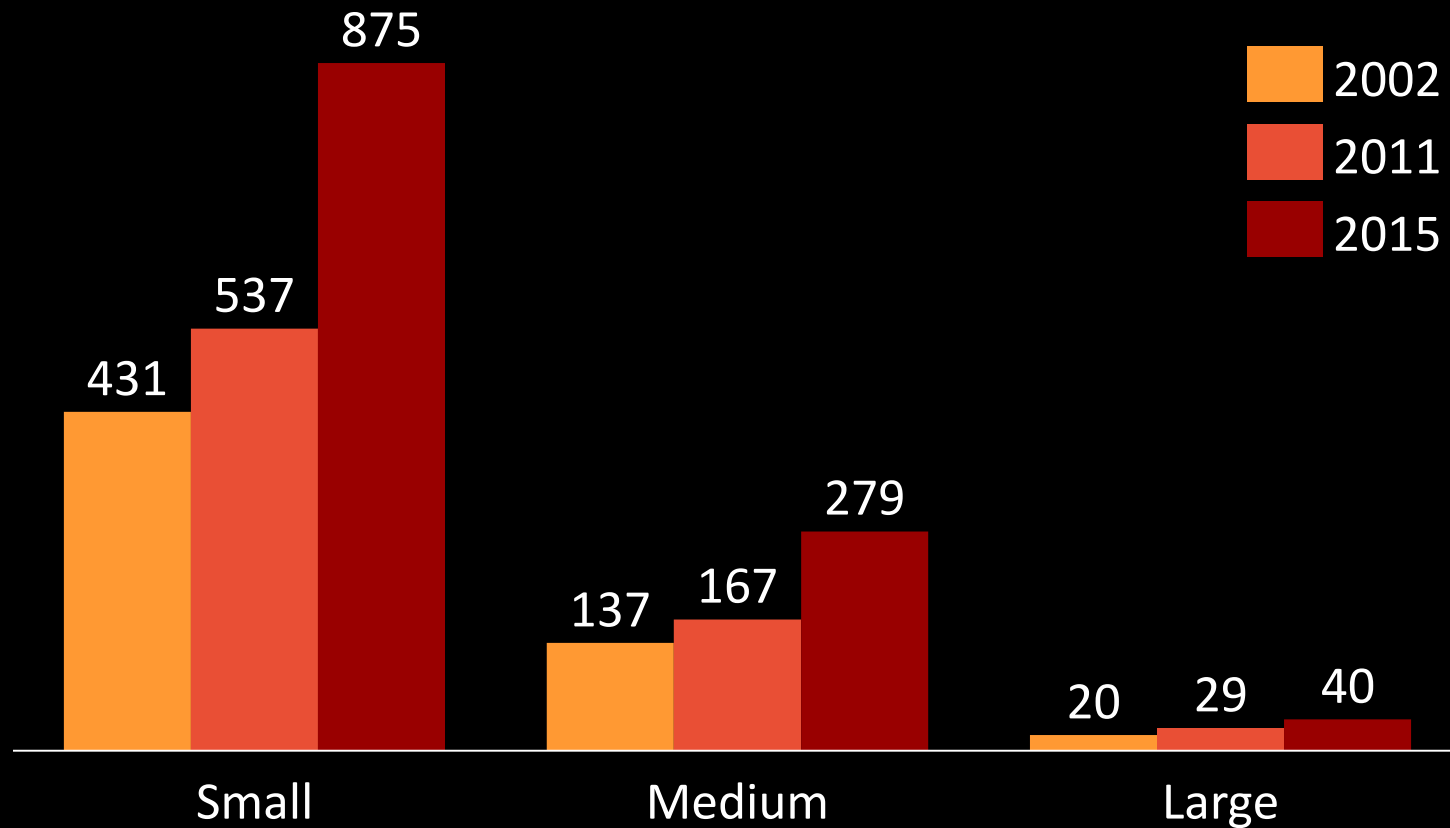
Number of mfg. companies in three latest enterprise censuses



Over time the censuses have registered more small, medium, and large firms, while the number of micro firms is almost constant – perhaps artificially?

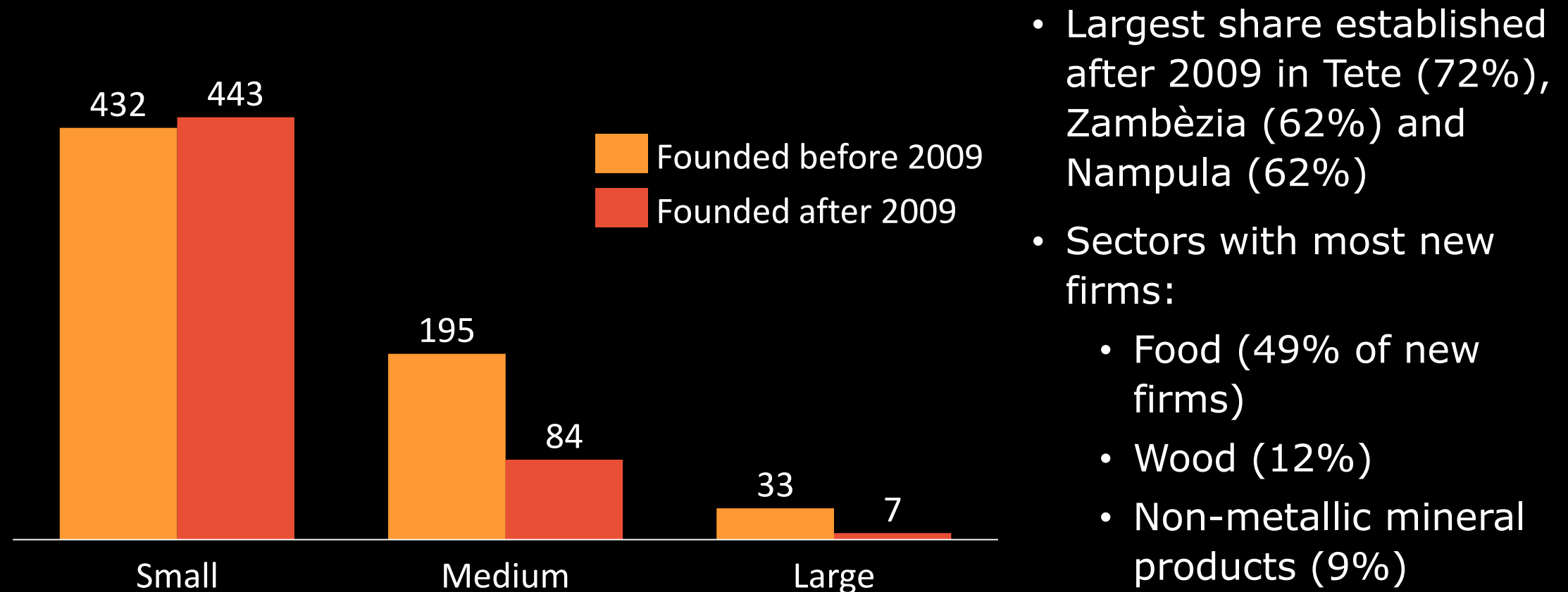
The number of small, medium and large companies has increased by some 100% since 2002 (by 62% since '11)

Number of mfg. companies in three latest firm censuses by firm size



Some 45 % of firms in the latest census were established after 2009

CEMPRE 15: Number of companies by founding date and firm size

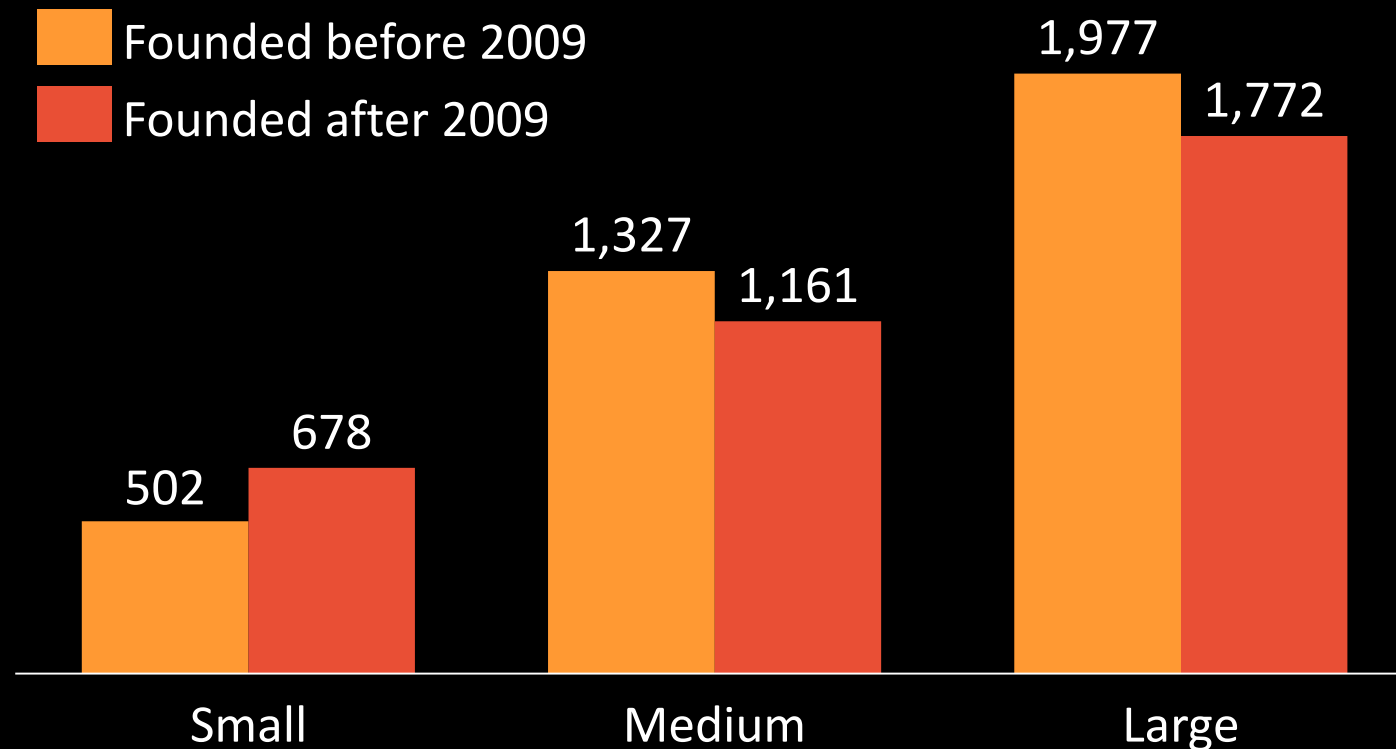


- Largest share established after 2009 in Tete (72%), Zambèzia (62%) and Nampula (62%)
- Sectors with most new firms:
 - Food (49% of new firms)
 - Wood (12%)
 - Non-metallic mineral products (9%)

New firms are generally not more productive than older firms in the medium and large categories

CEMPRE 15: Revenue per employee by founding date and firm size

1,000 MZN



Satellite imagery from Google Earth can be used to compare areas visually

Satellite imagery: Methodology

Method

- Define radius of 500 meters around small, medium, large firms in IIM 2017
- Mark all buildings that could be used for production in 2017 and 2009
- Count increase in potential production units for each of 132 areas
- Calculate total and average increases by province

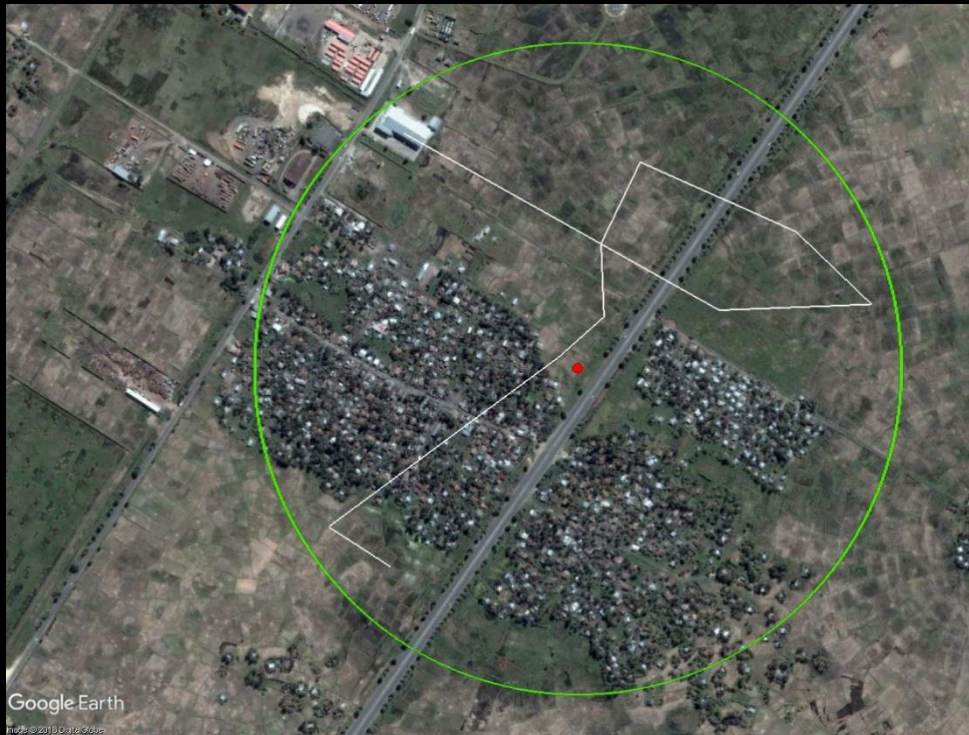
Assumptions

- Same amount of mistakes made in categorizing buildings in 2017 and 2009
- The share of potential production units that actually are manufacturing firms is constant over time

In some places, industrialization is visible

Satellite imagery: Example

Area in Northern Beira in 2009: 1 firm



Area in Northern Beira in 2017: 10 firms



Analysis of satellite imagery suggests a 24% increase in the number of “production units” from 2009-2017

Satellite imagery: Results

Province	Production units 2009	Production units 2017	Change	Change in percent
Maputo City	320	375	55	17%
Maputo Prov.	71	94	23	32%
Gaza	5	9	4	80%
Sofala	88	112	24	27%
Manica	48	68	20	42%
Nampula	39	42	3	8%
Tete	20	30	10	50%
Total	591	730	139	24%

The Mozambican manufacturing sector is growing, but not much more than population growth

Conclusions

- Re-weighting the results of IIM 2017 depends somewhat on population structure, but the **overall negative trends persist**
- But judging from other sources, the Mozambican manufacturing sector appears to be growing steadily (albeit slowly)
 - **Manufacturing GDP** increased by 23 % from 2011-2017
 - Evidence from **satellite imagery** suggest that the number of production units could have increased with around 24 % between 2009 and 2017 in areas around IIM sample of small/medium/large firms
 - Numbers from **firm censuses** suggest that the number of small/medium/large firm has increased by 62% since 2011 – and 45 % of firms in the latest have started operating after 2009
- However, growth in manufacturing is not much larger than population growth, and new firms are generally **not in complex, high-productivity sectors**

Appendix

Re-weighting methodology

Methodology: Re-weighting main results of IIM 2017

Methods

- Define 21 subgroups of Province*size category
- Calculate weight as the inverse of the probability of a firm being in the IIM 2017 sample

Assumptions

- Either CEMPRE or Schou and Cardoso (2013) represent a valid population estimate
- IIM 2017 is a somewhat random sample of the population

$$W(\text{CEMPRE})_{ps} = N_{ps}/n_{ps}$$

$$W(\text{SC})_{ps} = N_{ps}/n_{ps}$$