

# COMPETITION AND RELATIONAL CONTRACTS: EVIDENCE FROM RWANDA'S COFFEE MILLS

**Rocco Macchiavello**

Warwick

**Ameet Morjaria**

Kellogg School of Management

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- Competition (i.e., availability of additional trading partners) could undermine the relational contract, and hence trade. *e.g. Ghosh & Ray 1994, Kranton 1996*

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→ engineering model predicts *suitability* for location of mills  
→ use *suitability* of neighboring locations to instrument for competition, conditional on *own suitability*

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- 1 Mills use of relational contracts 15 percentile drop
- 2 Mills performance suffers:
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  - receive poor quality of inputs
- 3 Farmers are *not* better off:
  - less coffee sold to mills, process larger proportion at home (inefficient saving technology)
  - do not get higher prices
  - lower *job satisfaction*

# Related Literature

## ■ **Contracts and Firms in Developing Countries**

*e.g. McMillan & Woodruff, 1999; Banerjee & Duflo, 2000; Macchiavello & Morjaria, 2015; Blouin & Macchiavello, 2014*

**Here:** measure informal relationships, response to market structure

## ■ **Empirics of Interlinked Transactions**

*e.g. Ghani & Reed 2014; Casaburi & Reed, 2014; Casaburi & Macchiavello, 2015*

**Here:** causality, industry vs. event study, relations complex & infrequent

## ■ **Trade, Development & Market Structure**

*e.g. Antràs & Costinot, 2011; Mookherjee et al 2015; Atkin & Donaldson, 2015; Fafchamps, 2004*

**Here:** identification, limited search externalities, industrial policy

## ■ **Performance Differences in Seemingly Similar Industries**

*e.g. Syverson, 2004; Hsieh & Klenow, 2009; Bloom et al, 2013; Gibbons & Henderson, 2012*

**Here:** beyond "supply-side" factors, informal relationships govern interactions

# Outline

- 1 Context
- 2 Conceptual Framework
- 3 Empirical Strategy
- 4 Empirical Results
- 5 Concluding Remarks

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## Context: Coffee Farmers



# Context: Home Processing



# Context: Mill Processing



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## Context: Mill



- **2012:** 197
- **Median mill:** \$250,000 revenue; 80 employees; source from 300 farmers

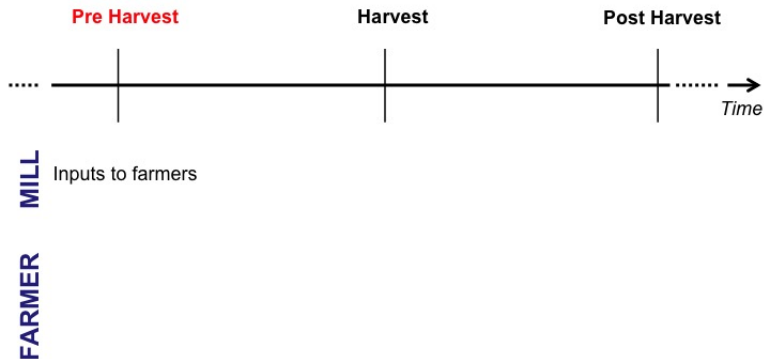
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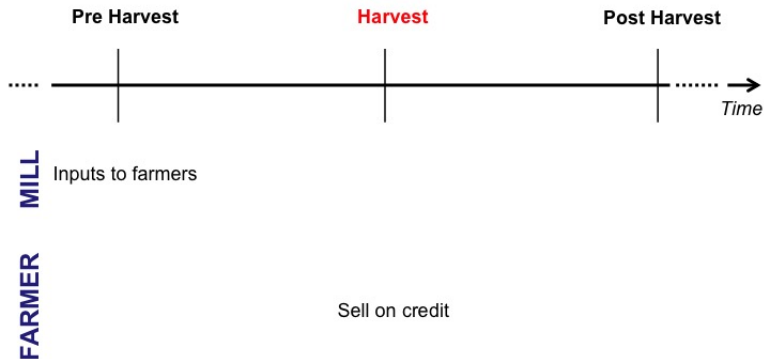
# Conceptual Framework

- **Goal:** Provide a stylized representation of relational contract between a farmer and a mill to guide *measurement*.
  
- **Key Assumptions:**
  - 1 Mill is more efficient than home processing
  - 2 Contracts between mill and farmer are not enforceable
  - 3 Farmer can only save through home processing
  - 4 Farmer cannot borrow

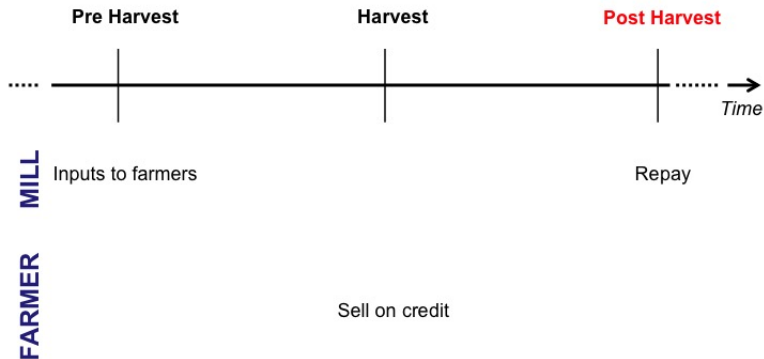
# Stylized Relational Contract



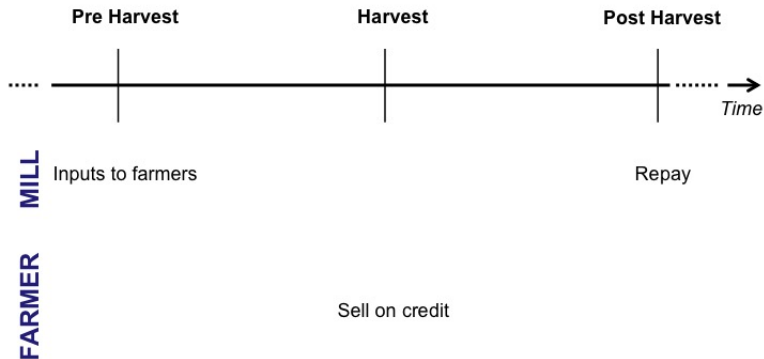
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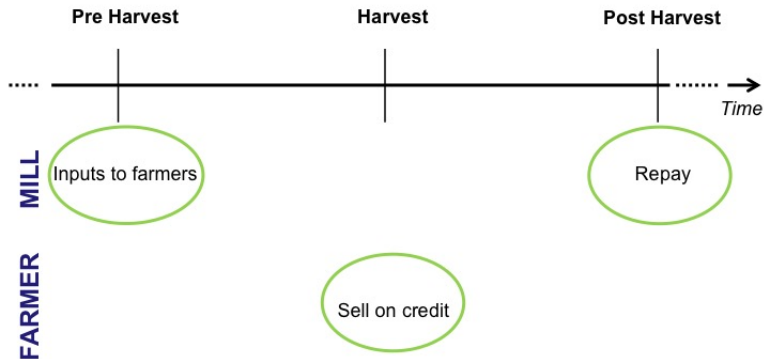
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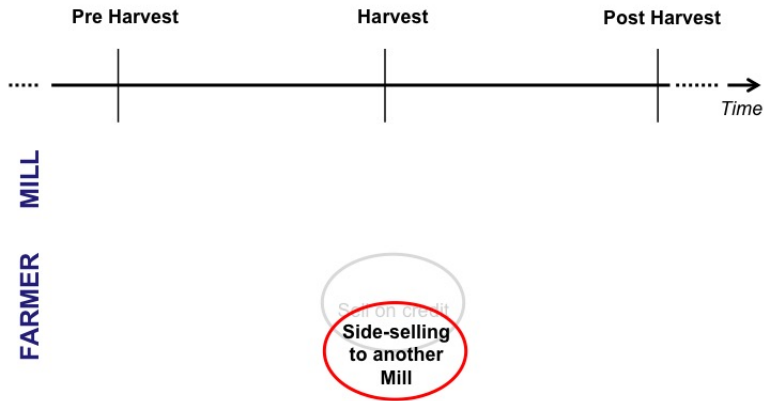


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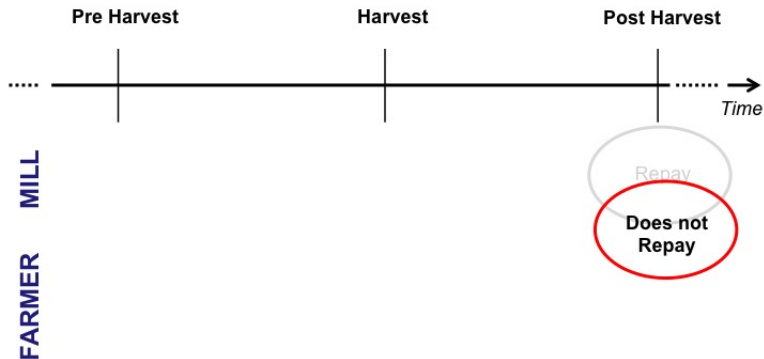
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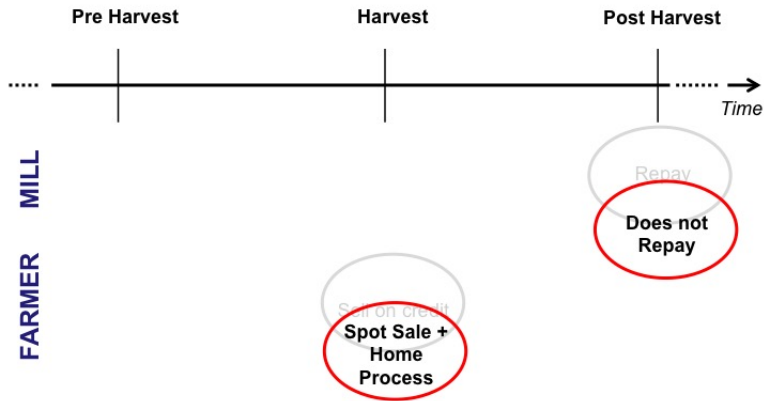
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An agreement that is self-enforcing absent competition might not be self-enforcing with competition.

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## **As a result:**

- 2 Lower capacity utilization and higher processing cost
- 3 Lower quality of inputs
- 4 More home processing
- 5 Ambiguous effect on prices (farmer possibly worse off)

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# Measurement: Relational Contracts

## ■ **Census** of all mills, **random sample** of 5 farmers per mill

→ observe all transactions between farmer and mill

Summary Statistics: Relational Contract Measurers			
Period	Measure from Survey Question	Farmers Response	Mills Response
Pre-Harvest	Fertilizer from Mill	0.476	0.516
		(0.381)	(0.501)
Harvest	Cherries sold on Credit to Mill	0.436	0.459
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## ■ **Validate measures** ▶ Validate RC measures

# Measurement: Competition



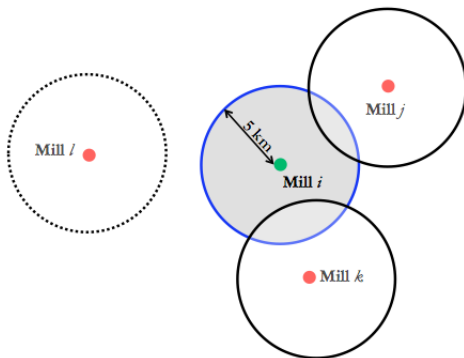
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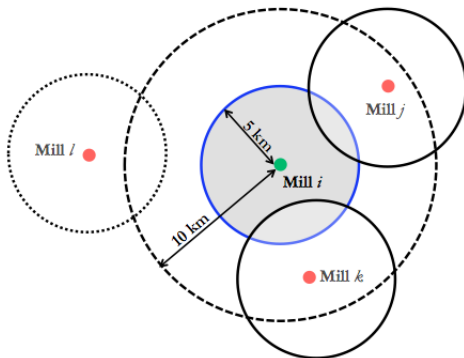
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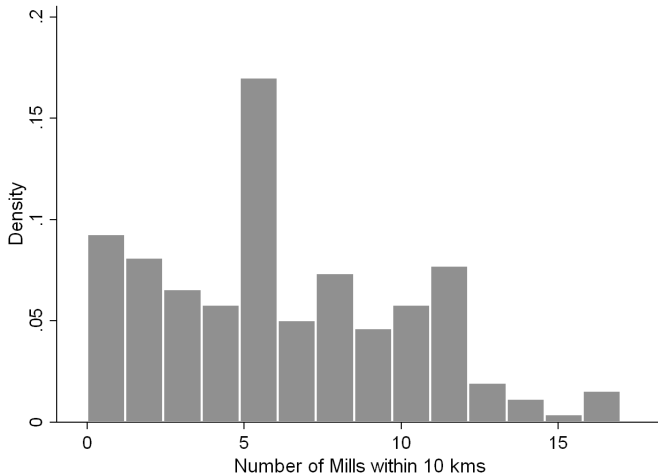
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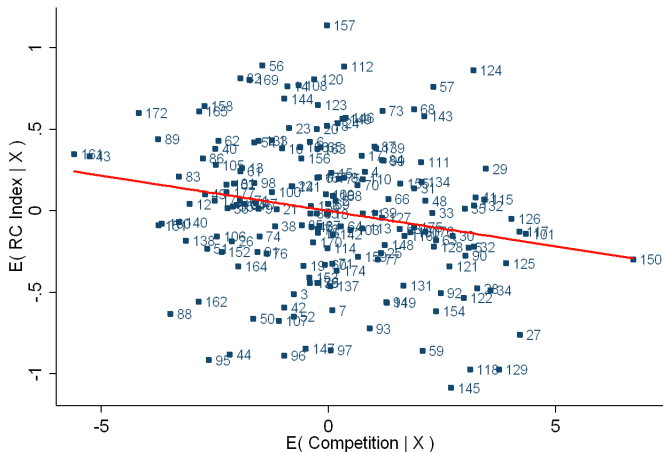
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# Measurement: Variation in Competition



# OLS: Competition and Relational Contracts



coef = -.043, (robust) se = .015, t = -2.9

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- **Measure of Competition** ( $C_i$ ): number of mills  $\leq 10$  km of mill
- **Mill controls** ( $X_i$ ): capacity installed, age (and age square) of mill, ownership type
- **Geographical conditions  $\leq 5$  km of mill** ( $Z_i$ ): elevation, slope, soil suitability, length of river and road, tree density, latitude and longitude

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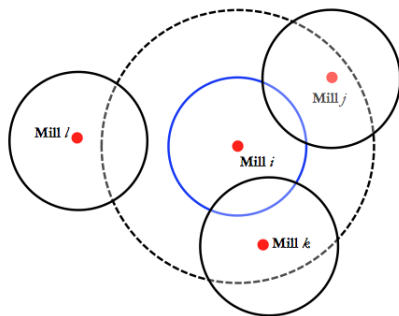
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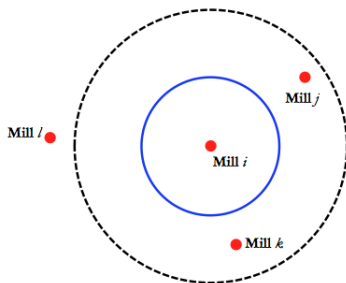
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- **Challenges in causality**: omitted variables, reverse causality, measurement error
- **Approach**: IV, a variable that relates to how many mills compete with mill  $i$  but has no direct effect on  $R_i$

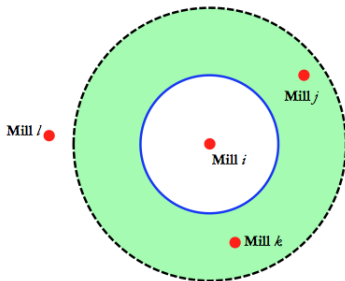
# Concept: Instrumenting for Competition



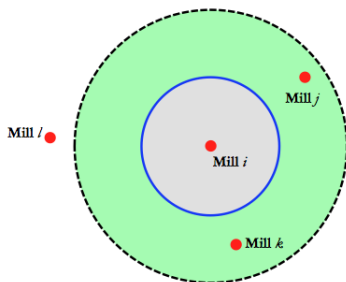
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## Identifying assumption:

conditional on costs drivers within the mill catchment area, suitability for placement outside the catchment area affects mills operations only through its impact on the number of competitors

# Concept: Instrumenting for Competition

- **Step 1:** Engineering model to create measure of *suitability* for mill placement across the whole of Rwanda (*USAID 2006*)
- **Step 2:** Instrument for competition using suitability *around* the catchment area (conditional on suitability and other controls within)

# Engineering Model: Instrumenting for Competition

## ■ **Step 1:** Criteria for site eligibility (*USAID 2006*):

- 1 **Land Cover:** some not eligible (e.g. national parks, forests)
- 2 **Coffee Trees:** Select *sectors* with tree count of  $\geq 30,000$
- 3 **Road:** Within  $\leq 1\text{km}$  of *any* type of road
- 4 **Water Spring:** Within  $\leq 3\text{km}$ , at an elevation window of -30m to -10m

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→ high resolution ortho-photos 0.25m, hydrological network & shutter radar topography mission 10m

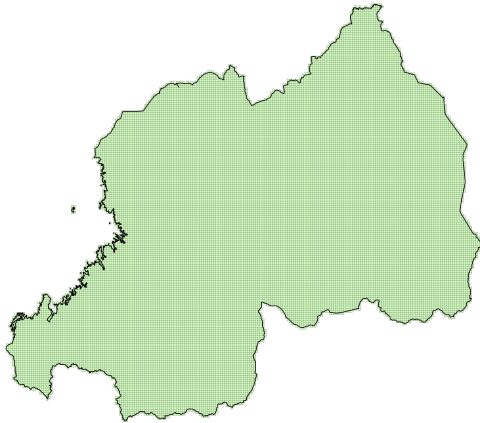
# High Resolution Aerial Photograph: Example



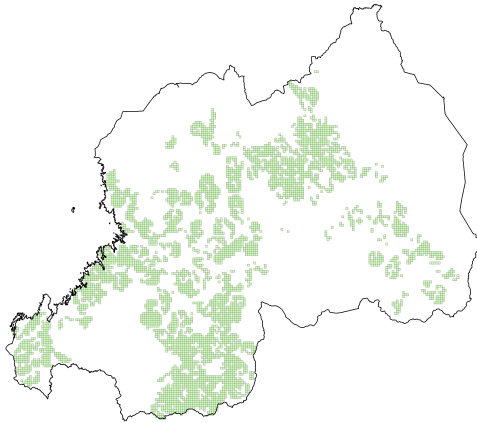
# High Resolution Aerial Photograph: GIS Extraction



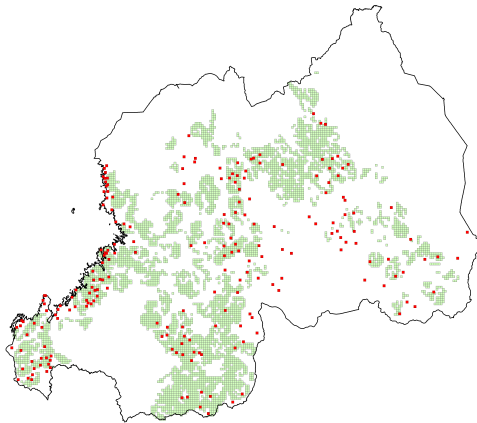
# Engineering Model: Validate



# Engineering Model: Validate Criteria 1, 2, 3 and 4



# Engineering Model and Actual Mill Placement



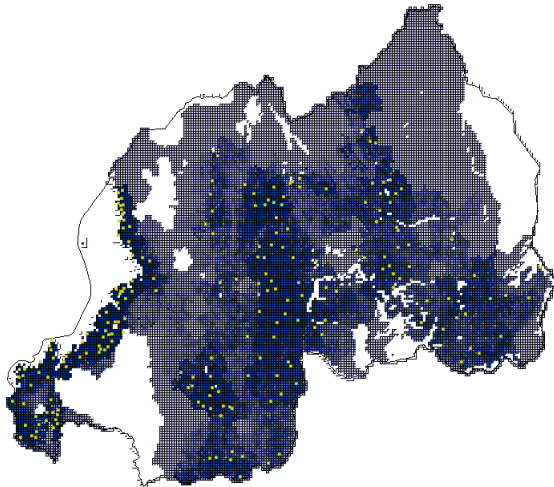
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→ suitability of mill placement for each 1 square km grid in Rwanda [» Probit](#)

# Engineering Model: Prediction and Actual Mill Placement



# Engineering Model: Instrumenting for Competition

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## ■ Step 2: Instrument for competition

→ aggregate suitability scores at the catchment and "donut" areas

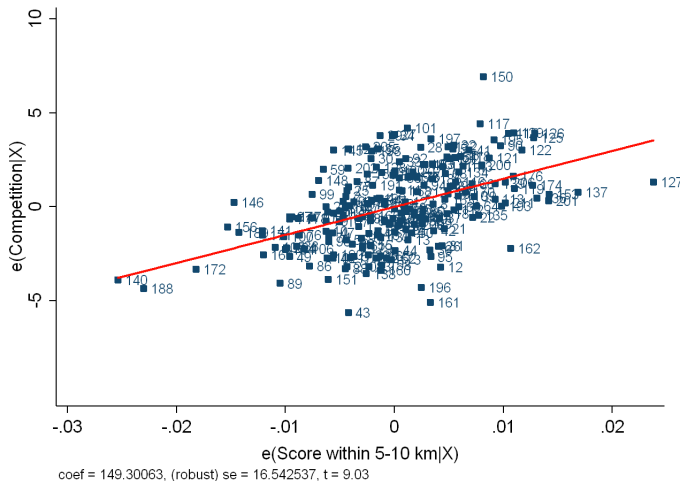
→ catchment: 0-5 km radius, **control**

→ donut: 5-10 km area, **IV**

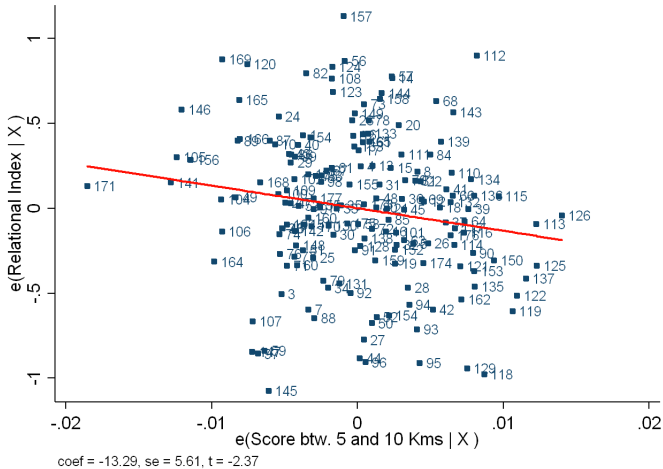
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# First Stage: Competition and Instrument



# Reduced Form: Relational Contracts and Instrument



# IV: Competition and Relational Contracts

		First Stage	Reduced Form	IV
	[1]	[2]	[3]	[4]
Model	OLS	OLS	OLS	2SLS
Dependent Variable	Relational Contract	Competition	Relational Contract	Relational Contract
Competition	-0.044** (0.015)			<b>-0.085** (0.041)</b>
Score within 5-10 km of Mill (predict)		151.40*** (23.642)	-13.29** (5.61)	
Score within 5 km of Mill (predict)	yes	yes	yes	yes
Eng Model Criteria	yes	yes	yes	yes
Geographical Controls	yes	yes	yes	yes
Mill Controls	yes	yes	yes	yes
Adjusted R square	0.170	0.762	0.159	0.210
Observations	178	178	178	178

- Bias, Magnitude
- Unpack IV   ▶▶ Unpack IV
- Intuition of IV   ▶▶ Intuition of IV
- Exclusion Restriction   ▶▶ Exclusion Discussion
- Robustness Checks   ▶▶ Robustness Checks
- Dynamic Entry   ▶▶ Dynamic

# Predictions: Increase in Competition

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An agreement that is self-enforcing absent competition might not be self-enforcing with competition.

- 1 Less likely to see parties engaged in attributes that constitute a relational contract.

## **As a result:**

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- 5 Ambiguous effect on prices (farmer possibly worse off)

# Mill outcomes

Dependent Variable	[1] Processing Unit Costs (Ln)	[2] Capacity Utilization	[3] Weeks Mill Processed	[4] "Days without enough cherries"
<b>Panel A: IV</b>				
Competition	<b>0.069**</b> (0.029)	<b>-7.791**</b> (3.922)	-0.229 (0.424)	<b>0.056*</b> (0.029)
<b>Panel B: OLS</b>				
Competition	0.015 (0.012)	-1.239 (1.372)	0.06 (0.162)	0.033** (0.016)
Score within 5 km of Mill (predict)	yes	yes	yes	yes
Eng Model Criteria	yes	yes	yes	yes
Geographic Controls	yes	yes	yes	yes
Mill Controls	yes	yes	yes	yes
Adjusted R square	0.045	0.012	0.181	0.234
Observations (mills)	178	178	178	178

# Mill gets worse inputs

	[1]	[2]	[3]	[4]	[5]
Test	PHYSICAL EXAMINATION		CUPPING LAB		
Attribute Responsibility	Mill	Farmer	Farmer	Genetic	Mill
Dependent Variable	Ideal Moisture Range	Bean Size 16.05+	No. of Severe Insect Damage	No. of Shell	No. of Floaters
<b>Panel A: IV</b>					
Competition	0.003 (0.041)	-0.096** (0.041)	0.084** (0.040)	0.008 (0.033)	0.097 (0.111)
<b>Panel B: OLS</b>					
Competition	-0.019 (0.015)	-0.010 (0.015)	0.043*** (0.016)	0.003 (0.012)	0.046 (0.044)
Score within 5 km of Mill (predict)	yes	yes	yes	yes	yes
Eng Model Criteria	yes	yes	yes	yes	yes
Geographical Controls	yes	yes	yes	yes	yes
Mill Controls	yes	yes	yes	yes	yes
Adjusted R square	0.300	0.031	0.171	0.075	0.123
Observations (mills)	178	178	178	178	178

Representative coffee sample from each mill, 350 grams

# Farmer outcomes

Dependent Variable	[1]	[2]	[3]	[4]	[5]	[6]
	Share Sold as Cherries	Self financed Inputs (RWF)	Total Yields	Reason Home Processing: Saving	Job Satisfaction	Prices (Ln)
<b>Panel A: IV</b>						
Competition	<b>-0.014*</b> (0.007)	2569.06 (1878.12)	-0.011 (0.052)	<b>0.057***</b> (0.016)	<b>-0.208***</b> (0.036)	0.001 (0.003)
<b>Panel B: OLS</b>						
Competition	-0.006 (0.004)	2525.01*** (727.39)	0.050** (0.007)	0.011 (0.024)	-0.056*** (0.015)	0.002 (0.002)
Score within 5 km of Mill (predict)	yes	yes	yes	yes	yes	yes
Eng Model Criteria	yes	yes	yes	yes	yes	yes
Geographical Controls	yes	yes	yes	yes	yes	yes
Mill Controls	yes	yes	yes	yes	yes	yes
Farmer Controls	yes	yes	yes	yes	yes	yes
Adjusted R square	0.084	0.258	0.178	0.045	0.066	0.366
Observations (farmers)	890	890	890	890	890	890

# Trust weakens between Farmers and Mill Managers

Respondent	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	FARMER				MANAGER			
Dependent Variable	General Trust	Trust in Family & Neighbors	Trust people from Kigali	Trust in Coffee Collectors	General Trust	Trust in Family & Neighbors	Trust farmers around Mill	Trust in Coffee Collectors
<b>Panel A: IV</b>								
Competition	-0.013 (0.009)	-0.010 (0.020)	<b>-0.086***</b> <b>(0.027)</b>	<b>-0.086***</b> <b>(0.030)</b>	-0.071 (0.161)	0.045 (0.167)	<b>-0.050*</b> <b>(0.028)</b>	-0.050 (0.052)
<b>Panel B: OLS</b>								
Competition	-0.004 (0.005)	-0.007 (0.008)	-0.019 (0.013)	-0.028** (0.013)	-0.110* (0.067)	0.003 (0.012)	-0.020 (0.029)	-0.03 (0.054)
Score within 5 km of Mill (predict)	yes	yes	yes	yes	yes	yes	yes	yes
Eng Model Criteria	yes	yes	yes	yes	yes	yes	yes	yes
Geographical Controls	yes	yes	yes	yes	yes	yes	yes	yes
Mill Controls	yes	yes	yes	yes	yes	yes	yes	yes
Respondent's Control	yes	yes	yes	yes	yes	yes	yes	yes
Adjusted R square	0.054	0.084	0.052	0.096	0.001	0.02	0.02	0.168
Observations	890	890	890	890	178	178	178	178

» Conclusion

# Econometric Concerns: Exclusion Restrictions

## ■ Possible violations:

- 1 Sourcing beyond the catchment area and into the “donut”?

→ No, 70% of mills procurement brought by farmers within 3.5 km radius

Source: *Census of Mills, 2012*

- 2 Financial/urbanization development in the “donut”?

- Weakens relations, social structure?

→ No, instrument (5-10 km, suitability score)  $\perp$  Pop. growth 2002-12

Source: *LandScan population at 1 km*

- Introduces input providers?

→ No, instrument (5-10 km, suitability score)  $\perp$  Density of SACCOs

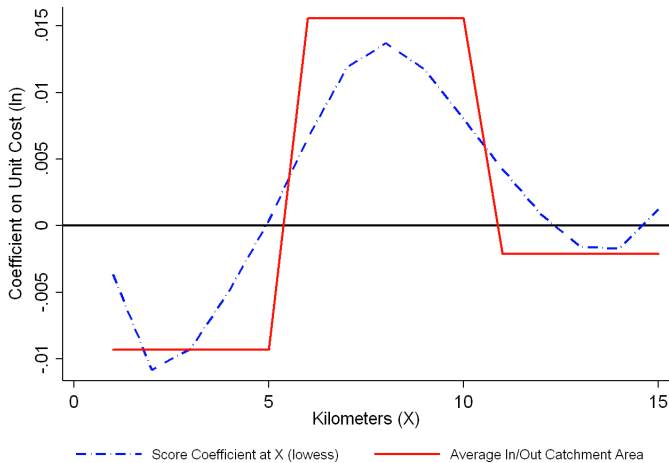
Source: *GIS data from FinScope, Financial Inclusion 2008-12*

# Econometric Concerns: Robustness Checks

## ■ Definition of Catchment (and surrounding) areas:

- 1 Exogenous boundaries: ▶ Exogenous Boundary  
→ Not a concern, LATE confirms intuition
- 2 Mill Specific boundaries: ▶ Mill Specific Boundaries  
→ Results robust to accounting for individual capacity (double up to satisfy capacity), and catchment area by road distance (7 km)
- 3 Instruments as criteria averaged over catchment and surrounding area ▶ Criteria as Instruments  
→ Results similar to baseline
- 4 Alternative measures of competition ▶ Definition of Competition  
→ Results robust to total capacity within 10 kms and distance to the 7th nearest mill (to compare to baseline)

# Intuition of Identification Strategy



# Econometric Concerns: Dynamic Entry

IV strategy relies on cross-sectional variation in suitability but entry happens over time. Potential concerns:

- 1 Managers seek “oasis” anticipating fewer competition in future? → No, first mover entrants seek higher suitability in 5 km catchment area, no pattern in surrounding area of suitability 5-10 km [▶▶ Seeking Oasis](#)
- 2 Less forward looking managers choose area's which subsequently have more entry? → No, quality of mill's management does not negatively correlate with competition [▶▶ Manager Quality](#)
- 3 Does unit cost of exiting mills in 2012 predict future entrants location? → No, checked for new entry in 2013 and 2014 [▶▶ Future Entry](#)

# Outline

- 1 Context
- 2 Conceptual Framework
- 3 Empirical Strategy
- 4 Empirical Results
- 5 Concluding Remarks**

# Concluding Remarks

- **Let us take a step back**

# Concluding Remarks

## ■ Let us take a step back

Year	Constructed Mills	Operational Mills	% Coffee Exports Processed by Mill	Mean Capacity Utilization of Mills
------	----------------------	----------------------	---------------------------------------	---------------------------------------

# Concluding Remarks

## ■ Let us take a step back

Year	Constructed Mills	Operational Mills	% Coffee Exports Processed by Mill	Mean Capacity Utilization of Mills
2002	5	2	<1%	

# Concluding Remarks

## ■ Let us take a step back

Year	Constructed Mills	Operational Mills	% Coffee Exports Processed by Mill	Mean Capacity Utilization of Mills
2002	5	2	<1%	
.				
.				

# Concluding Remarks

## ■ Let us take a step back

Year	Constructed Mills	Operational Mills	% Coffee Exports Processed by Mill	Mean Capacity Utilization of Mills
2002	5	2	<1%	
.				
2012	214	197	34.56%	

# Concluding Remarks

## ■ Let us take a step back

Year	Constructed Mills	Operational Mills	% Coffee Exports Processed by Mill	Mean Capacity Utilization of Mills
2002	5	2	<1%	
.				
.				
2012	214	197	34.56%	55%

# Concluding Remarks

## ■ Let us take a step back

Year	Constructed Mills	Operational Mills	% Coffee Exports Processed by Mill	Mean Capacity Utilization of Mills
2002	5	2	<1%	
.				
2012	214	197	34.56%	55%
2013	217	194	33.83%	

# Concluding Remarks

## ■ Let us take a step back

Year	Constructed Mills	Operational Mills	% Coffee Exports Processed by Mill	Mean Capacity Utilization of Mills
2002	5	2	<1%	
.				
2012	214	197	34.56%	55%
2013	217	194	33.83%	52%

# Concluding Remarks

## ■ Let us take a step back

Year	Constructed Mills	Operational Mills	% Coffee Exports Processed by Mill	Mean Capacity Utilization of Mills
2002	5	2	<1%	
.				
.				
2012	214	197	34.56%	55%
2013	217	194	33.83%	52%
2014	235	198	35.90%	

# Concluding Remarks

## ■ Let us take a step back

Year	Constructed Mills	Operational Mills	% Coffee Exports Processed by Mill	Mean Capacity Utilization of Mills
2002	5	2	<1%	
.				
2012	214	197	34.56%	55%
2013	217	194	33.83%	52%
2014	235	198	35.90%	50%

# Concluding Remarks

- **Implications of findings:**

# Concluding Remarks

- **Implications of findings:**

- 1 Improve contract enforcement along value chain

# Concluding Remarks

## ■ Implications of findings:

### 1 Improve contract enforcement along value chain

- Potentially *first best*...
- ..if improvement in contract enforcement sufficiently large (*Baker, Gibbons & Murphy 1994*)

# Concluding Remarks

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- **Costa Rica** (*Paige 1997*)

# Concluding Remarks

## ■ Implications of findings:

### 1 Improve contract enforcement along value chain

- Potentially *first best*...
- ..if improvement in contract enforcement sufficiently large (*Baker, Gibbons & Murphy 1994*)
- **Costa Rica** (*Paige 1997*)
  - institutional environment role for information technology

# Concluding Remarks

## ■ Implications of findings:

- 1 Improve contract enforcement along value chain
  - Potentially *first best*...
  - ..if improvement in contract enforcement sufficiently large (*Baker, Gibbons & Murphy 1994*)
  - **Costa Rica** (*Paige 1997*)
    - institutional environment role for information technology
- 2 Policies aimed at influencing spatial distribution of entrants

# Concluding Remarks

## ■ Implications of findings:

### 1 Improve contract enforcement along value chain

- Potentially *first best*...
- ..if improvement in contract enforcement sufficiently large (*Baker, Gibbons & Murphy 1994*)
- **Costa Rica** (*Paige 1997*)
  - institutional environment role for information technology

### 2 Policies aimed at influencing spatial distribution of entrants

- Zoning Regulations
- Monopsony Licenses
- Minimum Distance Rules
  - easy to enforce but prone to abuse

# Concluding Remarks

## ■ Implications of findings:

- 1 Improve contract enforcement along value chain
  - Potentially *first best*...
  - ..if improvement in contract enforcement sufficiently large (*Baker, Gibbons & Murphy 1994*)
  - **Costa Rica** (*Paige 1997*)
    - institutional environment role for information technology
- 2 Policies aimed at influencing spatial distribution of entrants
  - Zoning Regulations
  - Monopsony Licenses
  - Minimum Distance Rules
    - easy to enforce but prone to abuse
- 3 Better understanding why industrial activity remains low in some countries

Thank you

# Appendix Material

# Relational Contract Measures: Validate

- **Heterogeneity** across mills in the use of relational contracts
- Within-period indices of survey responses **correlate with each other**
  - unconditional correlations ▶ unconditional within RC
  - conditional correlations ▶ conditional within RC
- Aggregate index of relational contract **correlates** with mill's capacity utilization and unit processing cost ▶ RC and Mill Performance

# Relational Contract Measures: Validate

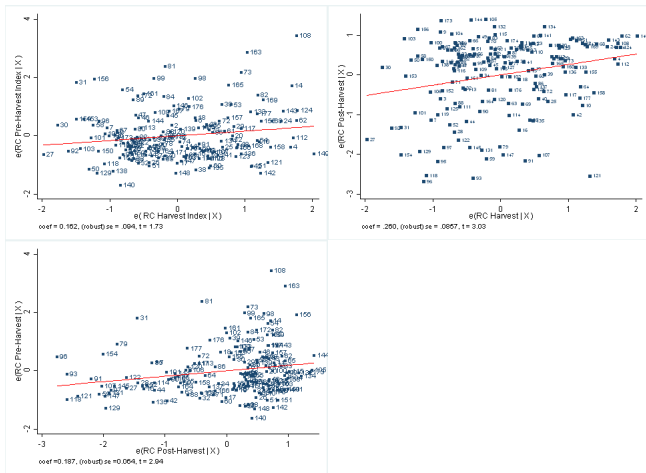
## ■ unconditional correlations within-period indices

Correlation Matrix of RC Measures		
	Pre-Harvest RC Index	Harvest RC Index
Harvest RC Index	0.211***	
Post Harvest RC Index	0.221***	0.321***

[◀ Back to Validate RC Measures](#)

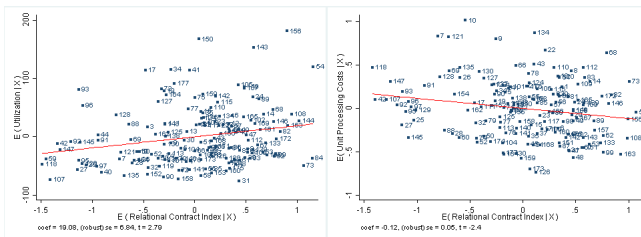
# Relational Contract Measures: Validate

## ■ Conditional Correlations within-period indices



# Relational Contract Measures: Validate

## ■ Aggregate relational contracts index and firm performance



◀ Back to Validate RC Measures

# Competition and Relational Contracts: Unpack OLS

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Pre-Harvest Farmer	Pre-Harvest Manager	Pre-Harvest	Harvest Farmer	Harvest Manager	Harvest	Post-Harvest Farmer	Post-Harvest Manager	Post-Harvest	Relational Contract
Dependent Variable	Received Fertilizer from Mill	Fertilizer given to Farmers	Index	Sold Cherries on Credit	Has purchased cherries on credit	index	Received Second Payment	Has made Second Payment	Index	Index
Competition	-0.075*** (0.024)	-0.048* (0.029)	-0.062** (0.024)	-0.003 (0.003)	-0.039 (0.003)	-0.024 (0.025)	-0.129*** (0.029)	-0.051* (0.031)	-0.089*** (0.024)	-0.059*** (0.014)
Geographical Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Mill Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Farmer Controls	yes	-	-	yes	-	-	yes	-	-	-
Adjusted R square	0.353	0.160	0.251	0.094	0.146	0.116	0.198	0.076	0.194	0.229
Observations	890	178	178	890	178	178	890	178	178	178

◀ Back to Competition and RC - OLS

# Validating the Engineering Model: Probit Estimation

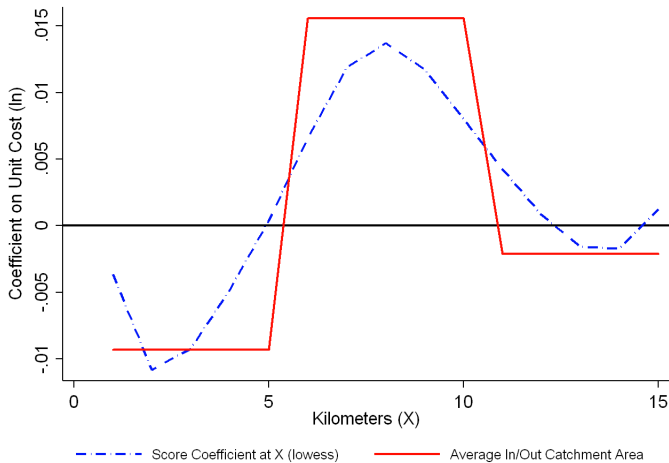
Dependent Variable	Mill in Grid Box =1			
	(1)	(2)	(3)	(4)
Spring within 3 km of grid box at elevation window=1	0.422** (0.166)		0.423** (0.166)	-3.931*** (0.107)
Untarred Local Road within 1 km of grid box=1		0.362*** (0.137)	0.362*** (0.137)	0.336** (0.137)
(Spring within 3 km at elevation window of grid box=1)* (Untarred Local Road within 1 km of grid box=1)				4.379*** (0.264)
Geographical Polynomials	yes	yes	yes	yes
Geographical Polynomials & Interactions	yes	yes	yes	yes
Pseudo R2	0.120	0.121	0.124	0.125
Observations (grid boxes)	13970	13970	13970	13970

# Competition and Relational Contracts: Unpacking IV

	[1]	[2]	[3]	[4]	[5]	[6]
Time	Pre-Harvest	Pre-Harvest	Harvest	Harvest	Post-Harvest	Post-Harvest
Response	Farmer	Manager	Farmer	Manager	Farmer	Manager
Dependent Variable	Received Fertilizer from Mill	Fertilizer given to Farmers	Sold Cherries on Credit	Has purchased cherries on credit	Received Second Payment	Has made Second Payment
<b>Panel A: IV</b>						
Competition	-0.178*** (0.072)	-0.055* (0.033)	-0.082* (0.048)	-0.062* (0.036)	-0.192*** (0.072)	-0.097** (0.066)
<b>Panel B: OLS</b>						
Competition	-0.010* (0.006)	-0.025* (0.015)	-0.002 (0.006)	-0.018 (0.014)	-0.038*** (0.008)	-0.021 (0.014)
Score within 5 km of Mill (predict)	yes	yes	yes	yes	yes	yes
Eng Model Criteria	yes	yes	yes	yes	yes	yes
Geographical Controls	yes	yes	yes	yes	yes	yes
Mill Controls	yes	yes	yes	yes	yes	yes
Farmer Controls	yes	-	yes	-	yes	-
Adjusted R square	0.137	0.006	0.239	0.079	0.152	0.173
Observations	890 (farmer)	178 (mill)	890 (farmer)	178 (mill)	890 (farmer)	178 (mill)

◀ Back to IV Main

# Intuition of Identification Strategy



# Robustness Check: Changing Catchment Boundaries

	[1]	[2]	[3]
<b>Panel A: IV</b>			
Dependent Variable	Relational Contract Index		
Competition	-0.085** (0.041)	-0.136* (0.075)	-0.036* (0.019)
<b>Panel B: First Stage</b>			
Dependent Variable	N. of mills within 10Km	N. of mills within 7Km	N. of mills within 15 Km
Instrument	151.40*** (23.21)	80.295*** (18.996)	320.58*** (34.761)
F-test	42.469	22.485	65.662
Instrument	Average Score btw. 5-10 km	Average Score btw. 3-7 km	Average Score 7-15 km
Observations (mills)	178	178	178

[← Back to Robustness Check](#)

# Robustness Check: Mill Specific Boundaries

	[1]	[2]
<b>Panel A: IV</b>		
Dependent Variable	Relational Contract Index	
Competition	-0.051* (0.031)	-0.075** (0.035)
<b>Panel B: First Stage</b>		
Dependent Variable	N. of mills around catchment area	N. of mills within 7Km by road
Instrument	220.26*** (20.52)	32.638* (17.309)
F-test	52.71	21.578
Instrument	Av. Score around catchment area	Average score btw. 3-7 Km by road
Observations (mills)	178	178

[◀ Back to Robustness Check](#)

# Robustness Check:

## Criteria as instruments in Catchment Area

[1]	
<b>Panel A: IV</b>	
Dependent Variable	Relational Contract Index
Competition	-0.111** (0.036)
<b>Panel B: First Stage</b>	
Dependent Variable	N. of mills within 10Km
Instrument	–
F-test	10.19
Instrument	Components of score btw. 5-10Km
Observations (mills)	178

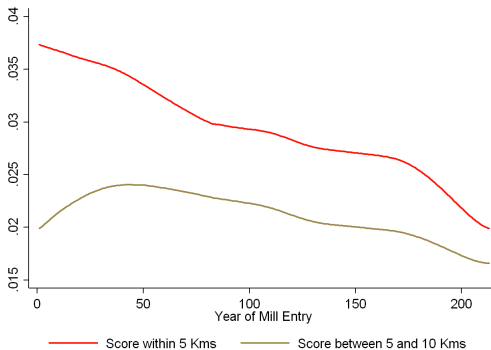
[◀ Back to Robustness Check](#)

# Robustness Check: Different Definitions of Competition

	[1]	[2]
<b>Panel A: IV</b>		
Dependent Variable	Relational Contract Index	
Competition	-0.623* (0.436)	0.025*** (0.011)
<b>Panel B: First Stage</b>		
Dependent Variable	Capacity Installed within 10 Km (log)	(-) Distance to the 7th nearest mill
Instrument	19.23*** (2.37)	-103.15*** (14.35)
F-test	8.84	47.4
Instrument	Average Score btw. 5-10 km	Average Score btw. 5-10 km
Observations (mills)	178	178

◀ Back to Robustness Check

# Dynamic Entry: No oasis!



[◀ Back to Dynamic](#)

# Dynamic Entry: Manager Quality and Entry

Dependent Variable	(1) Age	(2) Education	(3) Cognitive Tests	(4) Tenure at Mill (years)	(5) Months work full-time at Mill	(6) Received Training?	(7) Income from Mill (log)	(8) Incentive from Mil
<b>Panel A: IV</b>								
Competition	-0.161 (1.066)	0.035 (0.094)	-0.014 (0.063)	0.145 (0.157)	-0.08 (0.341)	-0.039 (0.050)	0.040 (0.051)	-0.003 (0.033)
<b>Panel B: OLS</b>								
Competition	-0.375 (0.362)	0.015 (0.094)	-0.008 (0.027)	-0.014 (0.063)	0.024 (0.113)	-0.006 (0.015)	-0.040 (0.051)	-0.002 (0.011)
Score within 5 km of Mill (predict)	yes	yes	yes	yes	yes	yes	yes	yes
Eng Model Criteria	yes	yes	yes	yes	yes	yes	yes	yes
Geographical Controls	yes	yes	yes	yes	yes	yes	yes	yes
Mill Controls	yes	yes	yes	yes	yes	yes	yes	yes
Adjusted R square	0.108	0.121	0.079	0.227	0.299	0.135	0.503	0.111
Observations (mills)	178	178	178	178	178	178	178	178

◀ Back to Dynamic

# Dynamic Entry: Entry in 2013 and 2014

	(1)	(2)	(3)	(4)
Dependent Variable	New Mill Entry in 2013 and 2014 (Sector level)			
Unit Costs of Mill in Sector (2012)	-0.006 (0.172)	-0.024 (0.171)	0.024 (0.168)	0.05 (0.166)
Capacity in Sector, 2012	58.96 (42.42)	54.62 (44.46)	0.067 (0.054)	-6.86 (55.15)
Unit Costs of Neighbours, 2012		0.08 (0.06)	4.589 (58.68)	0.08 (0.06)
Capacity in Neighbouring Sectors, 2012		3.07 (7.88)	-15.74* (8.36)	-16.72* (9.09)
Average Score in Sector			5.48*** (1.61)	3.43* (1.81)
Eng Model Criteria & Geographical Controls	no	no	no	yes
Adjusted R square	0.08	0.101	0.14	0.15
Observations (sectors)	416	416	416	416