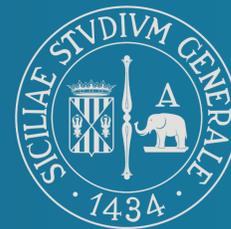# Mafia and bricks:
Concentration in the Sicilian construction industry

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Is there a relationship between the presence of mafia-type organizations and the degree of market concentration? What is the role of anti-mafia policies and how can they affect the competitiveness of the industry?

Entrepreneurial mafia

The infiltration of organized crime in the legal economy is an essential means for the mafia to exercise control over the territory. Mafia firms benefit from illegal competitive advantages and create an hostile and dangerous competitive environment for other firms.
The construction industry has characteristics that are particularly attractive to the mafia: high territorial specificity, low levels of technological innovation and professional skills, labor intensive, not fully open to market competition.

Anti-mafia policies

We assess the efficacy of two anti-mafia policies, namely the dismissal of city councils for mafia infiltration (hereafter DC policy) and the seizure and reassignment of business assets owned by mafia members (SR policy), and their impact on the competitiveness of the construction industry.

We put forward the following hypotheses and assess their validity

H1: The presence of mafia-type criminal organizations in a territory increases the market concentration in the legal economic sectors in which it is engaged.

H2: The enforcement of a DC policy reduces the mafia conditioning effects on local administrations, hindering the mafia infiltration in the legal economy.

H3a: The SR policy lowers the number of firms in the market, thus reducing the level of market competition (short-run effect).

H3b: The SR policy pushes out mafia firms from the market, thus increasing the level of market competition (long-run effect).

Data and variables

Presence of mafia-type organizations

For each municipality, we define a dummy variable, mafia, which is equal to 1 when there is evidence of the presence of mafia organizations according to at least one of the following sources:

- a report from the Sicilian Prefects in 1874
- the map of mafia density developed by Cutrera (1900)
- a parliamentary report from the Italian military police (CG Carabinieri, 1987) in 1987
- a study of the University of Messina, carried out in 1992
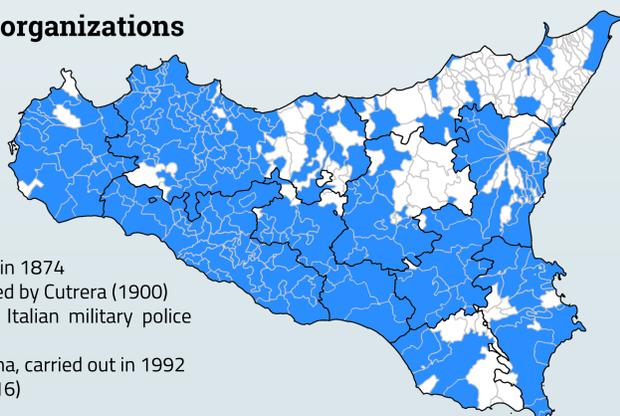- the data published by the DIA (2016)

Figure 1 shows the distribution of mafia families and groups in Sicily according to our variable, mafia.

Figure 1

Degree of market concentration

We develop three alternative indices of market concentration, using data from the Italian Industry and Services Census published by ISTAT, in 1991, 2001 and 2011:

$$HI_m = \sum_{i=1}^{N} v_{im}^2 \qquad NHI_m = \frac{HI_m - \frac{1}{n_m}}{1 - \frac{1}{n_m}} \qquad NPHI_m = \frac{HI_m - \frac{1}{p_m}}{1 - \frac{1}{p_m}}$$

Presence of anti-mafia policies

We use the variables DC and SR, which are equal to 1 if at least one DC or SR policy has been implemented before the analyzed period.

Study sample
Sicilian municipalities with more than 5,000 inhabitants.
This allows to avoid measurement errors of market concentration due to very small local economies.

Restricted sample
Municipalities with a number of inhabitants between 5,000 and 15,000.
It is believed that small and medium-sized municipalities are more exposed to the mafia's ability to exercise political power and control over the territory.

Results

We carry out a chi-square test to show whether the high economic concentration is normally distributed among mafia and non-mafia municipalities.
The dummy variables $High\_HI$, $High\_NHI$, and $High\_NPHI$, equal 1 when the value of the standardized concentration index is ranked in the last quartile of the distribution, and 0 otherwise.
The null hypothesis of no correlation between mafia presence and high market concentration is always rejected at a significance level of 0.05.

Study Sample

High_HI High_NHI	mafia		Total
	0	1	
0	37	104	141
1	5	42	47
Total	42	146	188
Pearson chi²= 4.946 Pr=0.026**			

High_NPHI	mafia		total
	0	1	
0	38	103	141
1	4	43	47
Total	42	146	188
Pearson chi²= 6.901 Pr=0.009***			

Restricted Sample

High_HI High_NHI High_NPHI	mafia		total
	0	1	
0	34	57	91
1	3	28	31
Total	37	85	122
Pearson chi²= 8.388 Pr=0.004***			

Table 1. Distribution of economic concentration in Sicilian municipalities in 2011. ***, **, * denote significance at the 1%, 5% and 10% level.

The mean analysis shows that the average value of market concentration in non-mafia territories is considerable lower than that in mafia territories.

Variable	Study sample		Restricted sample	
	Mean	SD	Mean	SD
HI	0.041	0.058	0.051	0.068
mafia=0	0.032	0.016	0.034**	0.015
mafia=1	0.043	0.06	0.059**	0.080
NHI	0.026	0.056	0.032	0.068
mafia=0	0.016*	0.011	0.017**	0.012
mafia=1	0.029*	0.064	0.039**	0.080
NPHI	0.025	0.057	0.030	0.069
mafia=0	0.011**	0.015	0.011**	0.016
mafia=1	0.029**	0.057	0.039**	0.081

Table 2. Economic concentration in mafia and non-mafia municipalities. ***, **, * denote significance at the 1%, 5% and 10% level.

We improve a multivariate regression analysis to disentangle the role of SR and DC policies on our dependent variable represented by the index of market concentration. The following random effects regressions is performed over a panel dataset of Sicilian municipalities in three different observation periods (1991-2001-2011):

$$Market\_conc_{mt} = \alpha + \beta SR\_S_{mt} + \delta SR\_L_{mt} + \eta DC_{mt} + \eta INT_{mt} + \theta mafia_m + \gamma_t + \varepsilon_{mt}$$

$Market\_conc_{mt}$ = values of HI, NHI or $NPHI$ in the municipality m in the observed period t
SR_S = 1 when a SR policy was implemented no more than 2 years before the time t
SR_L = 1 when a SR policy was implemented more than 2 years before the time t
DC = 1 when a DC policy was implemented
$INT = SR\_L \cdot DC$ (interaction term to test the joint effect of DC and SR policies)

	Study Sample						Restricted Sample					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	HI	HI	NHI	NHI	NPHI	NPHI	HI	HI	NHI	NHI	NPHI	NPHI
SR_S	0.0214	0.0214	0.0156	0.0157	0.0237*	0.0235*	0.0461***	0.0472***	0.0291*	0.0291*	0.0507***	0.0523***
	(0.0151)	(0.0149)	(0.0112)	(0.0113)	(0.0145)	(0.0144)	(0.0126)	(0.0125)	(0.0171)	(0.0185)	(0.0118)	(0.0117)
SR_L	-0.0150**	-0.0150**	-0.0088*	-0.0089*	-0.0134**	-0.0126**	-0.0279***	-0.0176**	-0.0208**	-0.0126**	-0.0257***	-0.0146**
	(0.0063)	(0.0060)	(0.0051)	(0.0047)	(0.0059)	(0.0055)	(0.0093)	(0.0074)	(0.0078)	(0.0053)	(0.0092)	(0.0068)
DC	-0.0055	-0.0056	-0.0052	-0.0053	-0.0048	-0.0041	-0.0262	-0.0164	-0.0256	-0.0178	-0.0263	-0.0159
	(0.0120)	(0.0116)	(0.0120)	(0.0117)	(0.0121)	(0.0121)	(0.0197)	(0.0174)	(0.0208)	(0.0182)	(0.0202)	(0.0178)
INT		-0.0001		0.0006		-0.0037		-0.0676**		-0.0532*		-0.0723**
		(0.0180)		(0.0158)		(0.0179)		(0.0312)		(0.0301)		(0.0308)
mafia	0.0037	0.0037	0.0056	0.0056	0.0140*	0.0140*	0.0174	0.0181*	0.0146	0.0152	0.0225**	0.0232**
	(0.0083)	(0.0083)	(0.0072)	(0.0072)	(0.0082)	(0.0083)	(0.0113)	(0.0113)	(0.0103)	(0.0104)	(0.0116)	(0.0116)
Constant	0.0955***	0.0955***	0.0587***	0.0587***	0.0568***	0.0567***	0.0996***	0.0988***	0.0599***	0.0593***	0.0552***	0.0544***
	(0.0075)	(0.0075)	(0.0058)	(0.0058)	(0.0077)	(0.0076)	(0.0090)	(0.0088)	(0.0068)	(0.0066)	(0.0094)	(0.0092)
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	564	564	564	564	564	564	366	366	366	366	366	366
Number of groups	188	188	188	188	188	188	122	122	122	122	122	122
R-squared	0.0955	0.0955	0.0491	0.0491	0.0572	0.0572	0.0879	0.0863	0.0439	0.0426	0.0475	0.0455

Table 3. Estimation results. Random effects model.
***, **, * denote significance at the 1%, 5% and 10% level. Robust standard errors clustered by municipality in parenthesis.

The coefficients of $mafia$ are always positive, thus providing a further validation for our hypothesis H1.
The SR policy is negatively associated with our indices of market concentration when the seizure and reassignment of firms was implemented at least two years before the observation period. H3b seems to be empirically supported. In the restricted sample, the reduction of the number of firms due to a SR policy increases the market concentration in the short-run (hypothesis H3a).
The DC policy appears to not affect our dependent variables. However, in the restricted sample we find that the interaction between SR_L and DC is negative and statistically significant. This supports, partially, our H2 hypothesis: the DC policy yields a positive effect only when it is enforced together with a SR policy.

Conclusion

Municipalities with a high presence of mafia groups have a higher probability of being associated with a high level of economic concentration.

Market concentration is sensitive to the implementation of anti-mafia policies.

In particular, the seizure and reassignment of business assets owned by the mafia lowers the number of firms in the market, thus reducing the level of market competition in the short-run.

In the long-run, however, the exit of mafia firms from the market reduces the competitive disadvantage for legal business and new ventures, thus increasing the level of market competition.