Organised crime's infiltration in the legitimate private economy: A network analysis approach

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1. Some facts

- It seems that Italian mafias registered €135 billion only in 2010 (SOS Impresa, 2010). This money must go somewhere.
- The D-Company possesses a trading company in Dubai and several construction companies in the Gulf (Ray and Tare, 2011).
- The Yakuza invests in Asian stock markets (Grennan, 2000: 239)

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2. The research question

In what kind of economic sectors and companies does organised crime infiltrate?

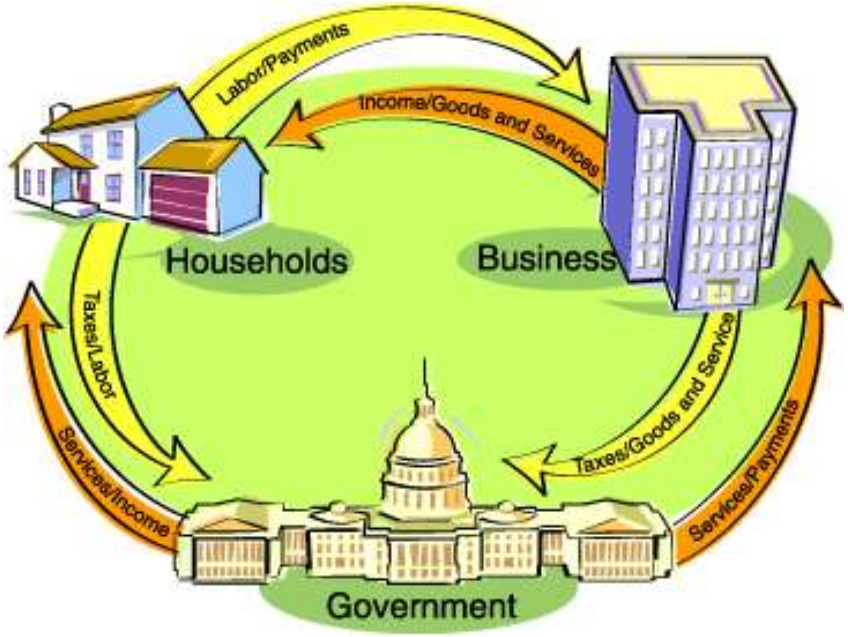
3. But first… Concepts

Table 1 UN and proposed definition of organised crime

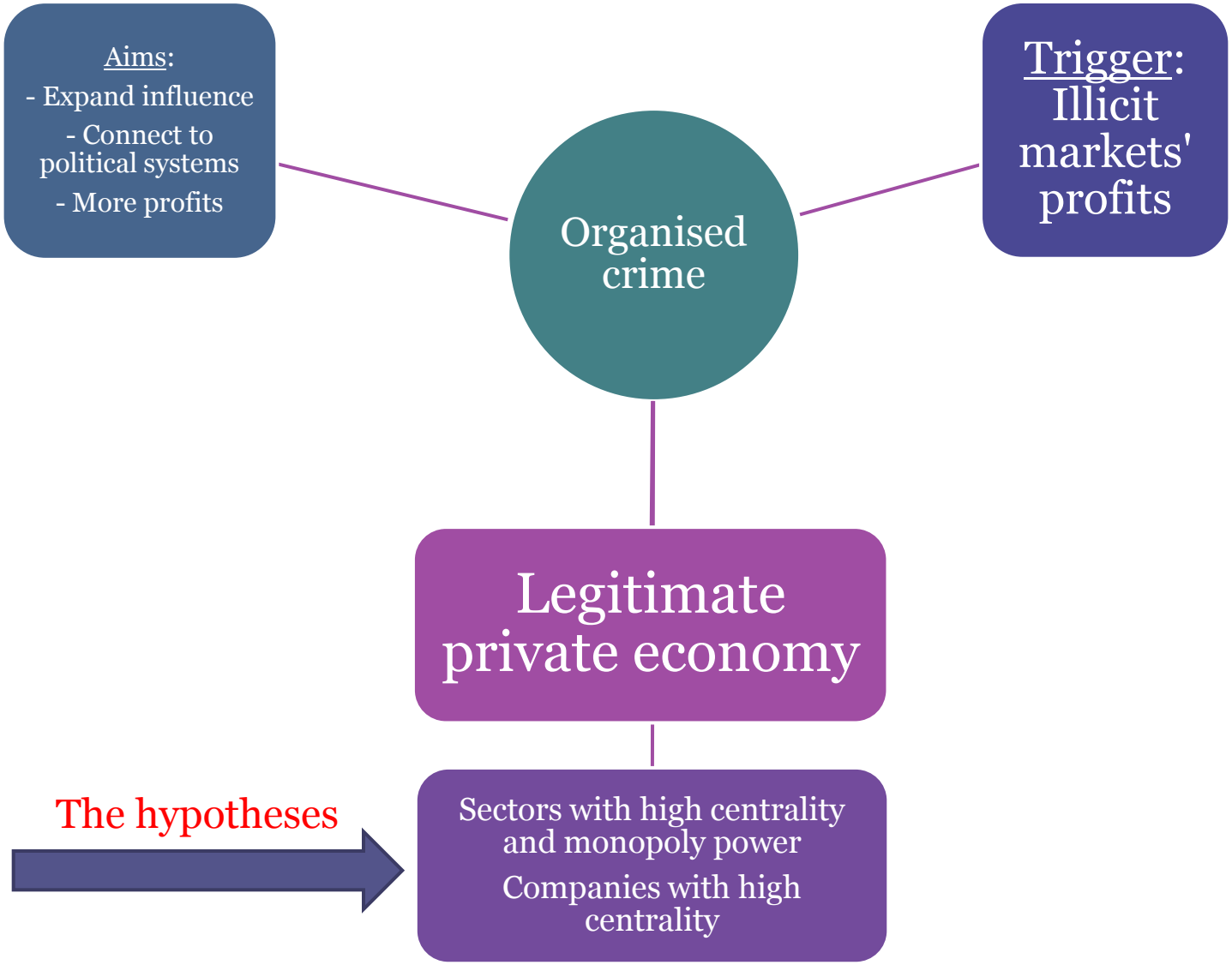
	Properties	UN definition	Proposed definition
Nature of the organisation	Structured	✓	✓
	Three or more individuals engaged	✓	✓
	Prolonged period of activity	✓	✓
Aims	Serious crimes	✓	✓
	Material benefit and power	✓	✓
	Infiltration into the political system	✗	✓
Methods	Intimidation and violence	✓	✓
	Corruption	✓	✓
	Entrepreneurial planning	✗	✓
Consequences	Threat to stability of state	✗	✓

3. But first… Concepts

The **legitimate economy** is defined as the assemblage of economic activities that embodies actions that are not punishable by the law of a state, and are formally recorded by an authority (ISTAT, 2006).



4. A model of organised crime infiltration



5. The case study

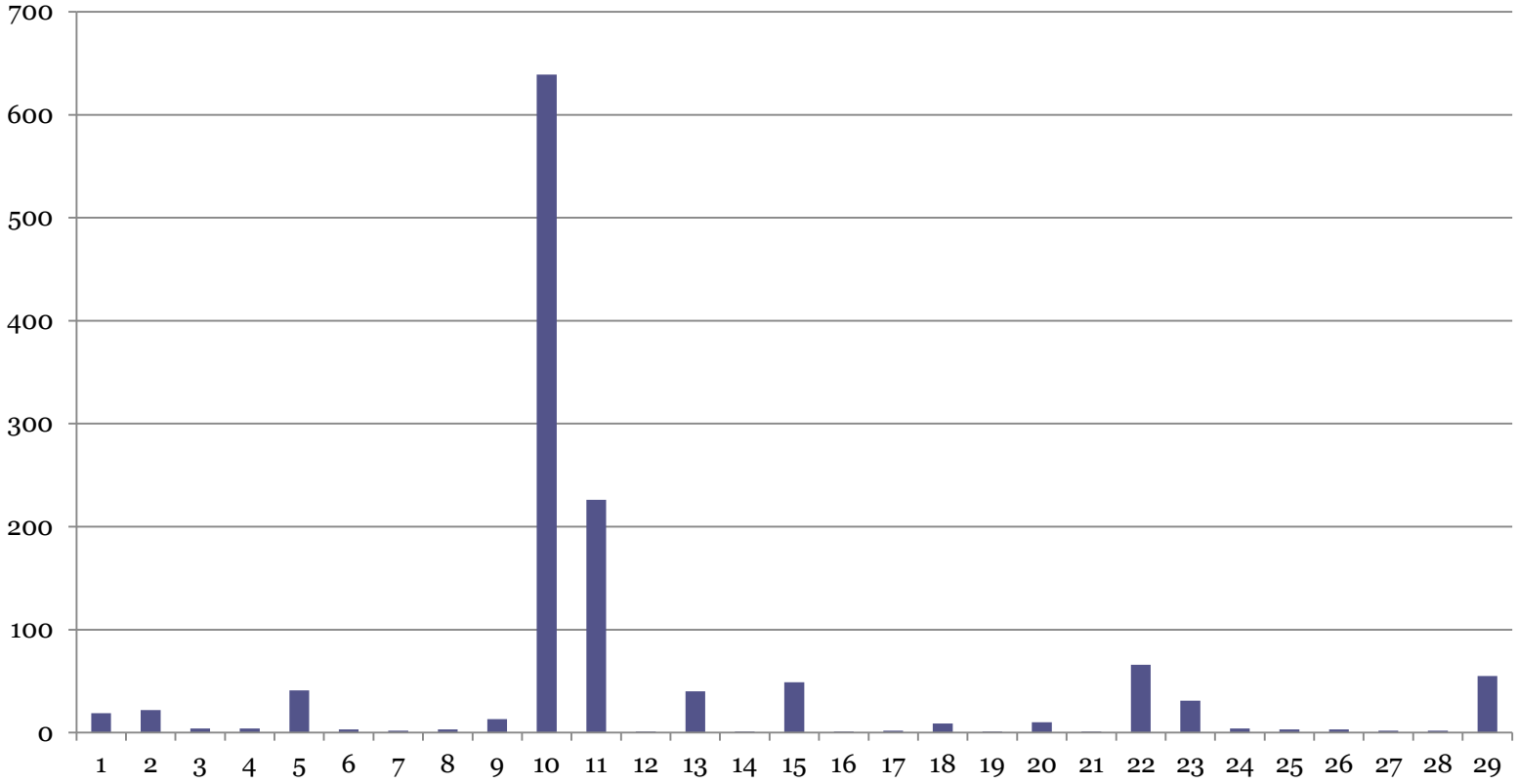
Table 2 Basic demographic and economic characteristics of the case-study

Population (2008)	17,261
Area	414,091 km²
Number of firms	1380
Firms with more than 4 employees registered (%)	30.5
Firms with more than 10 employees registered (%)	0.05

Note: Data refers to year 2002 unless otherwise stated.
Sources: ISTAT (2009) and Camera di Commercio di Agrigento (2012a, 2012b, 2012c, 2012d, 2012e, 2012f).

5. The case study

Figure 1 Number of firms according to economic sector



Sources: Camera di Commercio di Agrigento (2012a, 2012b, 2012c, 2012d, 2012e, 2012f).

5. The case study – What happened

According to investigative documents reporting facts occurred in 2002, the local mafioso family

"operated in the construction sector using intimidation and violence. These methods were aimed at constituting ***a monopoly in the production and supply of construction material*** *in the territory [...] and to force construction firms to buy the material they needed from it [the Mafioso firm] (translated from DDA, 2005a: 2)"*

- Collusion with **two entrepreneurs** aimed at providing concrete to all construction firm in the market.
- Documents identified Mafioso influence in **four** other firms.

6. Network analysis of the case study

H_1: Sectors penetrated by organised crime show a higher than average Index of Centrality and Concentration.

$$ICC = Rank\big(d(x_i)\big) + Rank\big(f(x_i)\big)$$

Where $d(x_i)$ and $f(x_i)$ are respectively the nodal degree of and number of firms in sector x_i.

Each value is ranked according to its position in the interquartile range of the series. Sectors with an extremely high concentration of firms are assigned lower numbers, and higher numbers are associated as the concentration diminishes. For the sake of consistency of the index, the same operation is performed on nodal degrees (the higher the degree of a node, the higher is the number assigned to it).

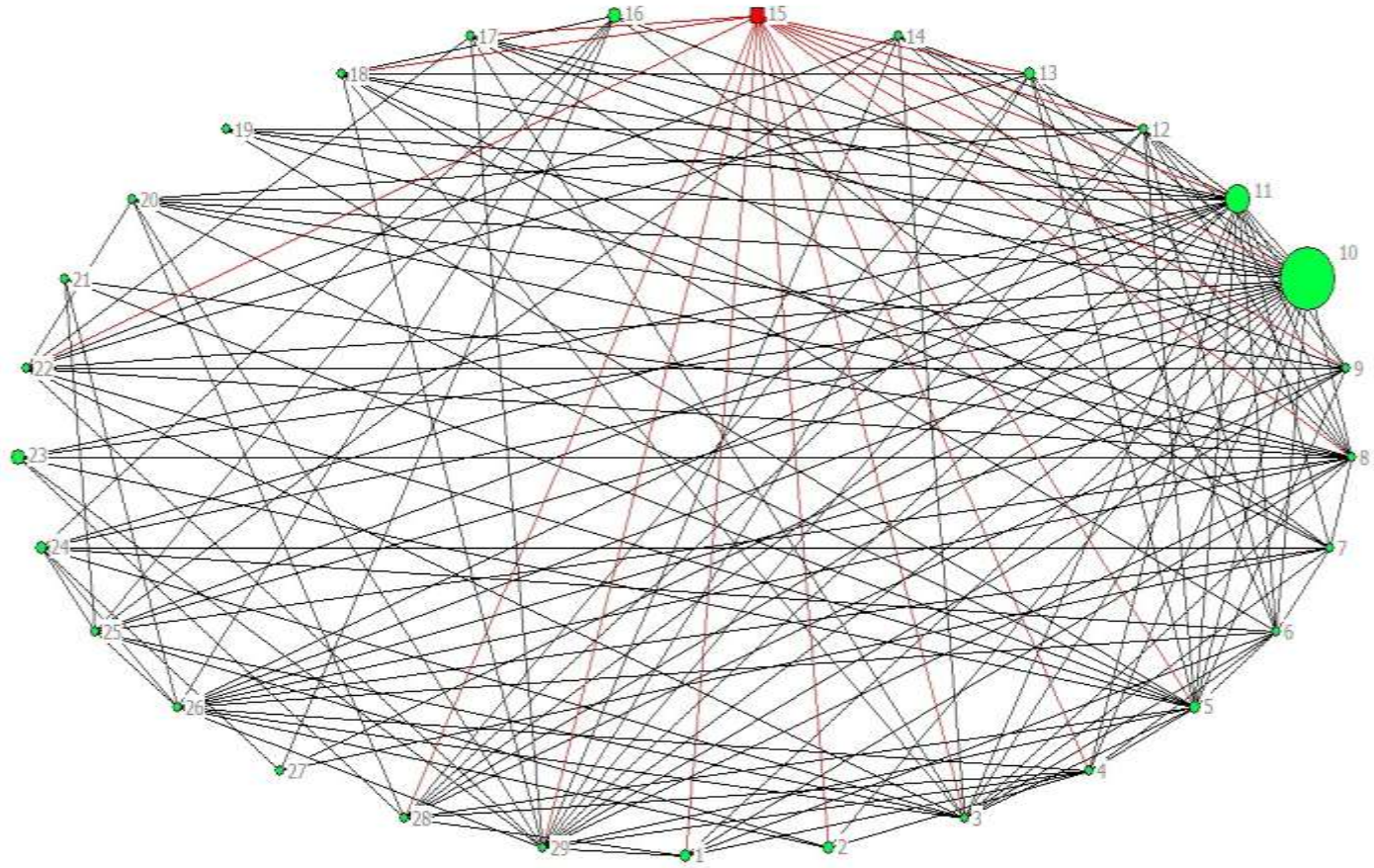
6. Network analysis of the case study

***H_2*: One of the firms experiencing Mafioso infiltration possesses the highest nodal degree in the sector's sub-network.**

(this one is quite straightforward…)

6. Network analysis of the case study

Figure 3 Network of economic sectors of the case study



6. Network analysis of the case study

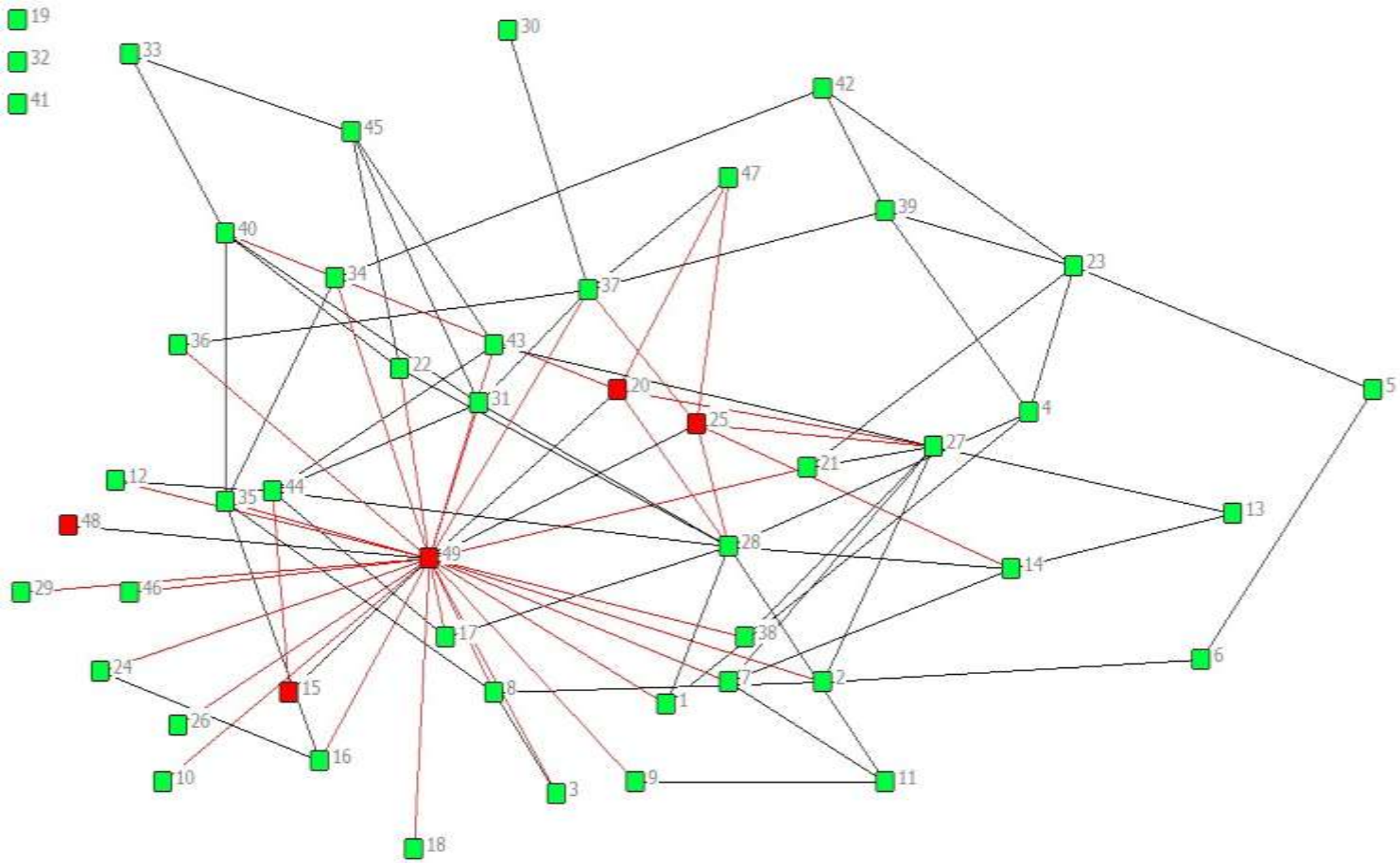
- The node of interest is no. 15 and is highlighted in red. It presents an ICC value of **14**, which is higher than the arithmetic average, 11.07. H_1 *is therefore not discarded*.

- The construction sector's ICC is placed *third* in the network, together with other sectors such as food and restaurant and wholesale. Sectors featuring higher ICCs are administration and office support, retail, postal services and transportation via land.

ID	Description	Degree Centrality	Number of firms	Rank - Degree Centrality	Rank - Number of Firms	Index of Centrality and Concentration
1	Hotel and Hospitality	0.25	19	4	4	8
2	Personal Care and Services	0.179	22	2	3	5
3	Installation and Repair	0.5	4	10	4	14
4	Travel Services	0.357	4	7	4	11
5	Food and restaurant	0.571	41	11	3	14
6	Accounting and Finance	0.429	3	9	5	14
7	Media entertainment	0.357	2	7	5	12
8	Administration and Office support	0.607	3	12	5	17
9	Agriculture and Environment	0.357	13	7	4	11
10	Retail (except vehicles)	0.893	639	14	1	15
11	Wholesale (except vehicles and final consumption products)	0.786	226	13	1	14
12	Wholesale of final consumption product	0.429	1	9	5	14
13	Retail, Wholesale and Repair of Vehicles	0.321	40	6	3	9
14	Clothing Production	0.286	1	5	5	10
15	Construction	0.571	49	11	3	14
16	Electronic Manufacture	0.250	1	4	5	9
17	Chemical Products Manufacture	0.286	2	5	5	10
18	Metal Products Manufacture	0.321	9	6	4	10
19	Beverage Processing	0.179	1	2	5	7
20	Food Processing	0.321	10	6	4	10
21	Education	0.143	1	1	5	6
22	Warehousing	0.393	66	8	2	10
23	Fishing	0.214	31	3	3	6
24	Software Engineering	0.321	4	6	4	10
25	Computer Services	0.357	3	7	5	12
26	Postal Services	0.500	3	10	5	15
27	Telecommunications	0.143	2	1	5	6

6. Network analysis of the case study

Figure 4 Network of firms in the construction sector



6. Network analysis of the case study

- The most central company is a Mafioso one, 49. Thus, H_2 *is not rejected*. Company 49 furnishes concrete to all local construction firms using it. This explains its outstanding centrality index.

- Companies 20 and 25 show also relatively high connections with other nodes, while firms 15 and 48 are nearly isolate.

- **Mafioso infiltration index** (number of ties of penetrated companies over total number of ties in the network) is around **23%**.

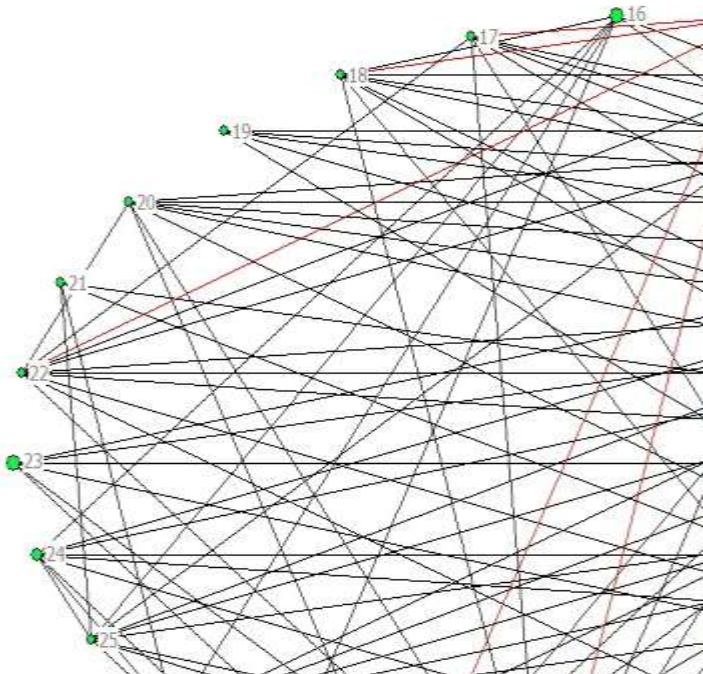
Nodes	Nodal degree	Nodes	Degree Centrality
49	0.583	34	0.063
28	0.208	42	0.063
27	0.167	47	0.063
37	0.146	3	0.042
25	0.125	5	0.042
31	0.125	6	0.042
44	0.125	9	0.042
20	0.104	12	0.042
23	0.104	13	0.042
35	0.104	15	0.042
40	0.104	24	0.042
2	0.083	33	0.042
4	0.083	36	0.042
7	0.083	38	0.042
8	0.083	10	0.021
14	0.083	18	0.021
22	0.083	26	0.021
39	0.083	29	0.021
43	0.083	30	0.021
45	0.083	46	0.021
1	0.063	48	0.021
11	0.063	19	0.000
16	0.063	32	0.000
17	0.063	41	0.000

7. Some complications

Uncertainty

Investigation files provide extensive evidence regarding the Mafioso presence in the construction sector, yet it is very possible that organised crime penetrated into other markets.

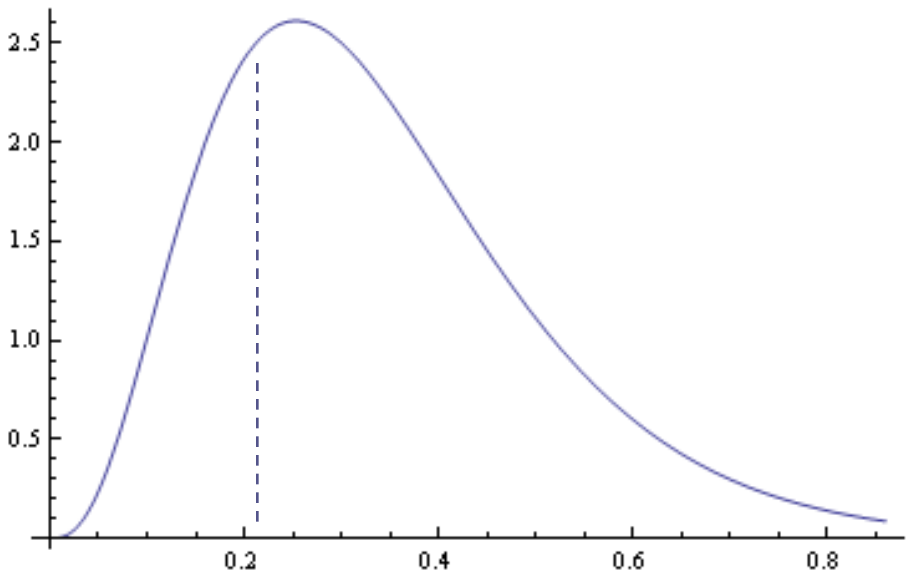
Furthermore, it is likely that more firms have experienced organised crime's action, although the exact number is not known.



7. Some complications

A solution for the second source: creating a **gamma probability function** of the Mafioso Infiltration Index.

Its factors are weighted against expert information and theoretical behavioural assumptions.



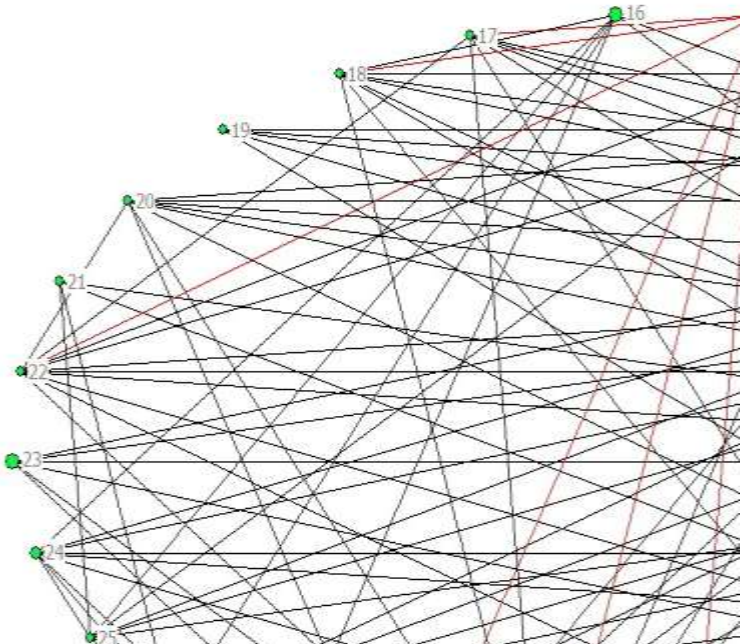
$$0.233 \leq M \leq 0.512$$

7. Some complications

Operationalisation of economic agents and economic relations

The legitimate private economy comprises not only producers but also consumers.

One financial transaction over a year might not be enough to state that two actors are linked.



8. Implications for security policy making

- The method is *simple* and *scalable* – applicable to economies of any size.
- Can be used for other kinds of criminal activities.
- Creation of a *network map* that monitors criminal activities.
  - Network dynamics to understand patterns
  - Prevention and disruption policies
- Can be complemented with *probabilistic models* to cope with uncertainty.

But

Data is needed

Thank you for your attention!

Any questions?

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