# Competition and Cooperation between OCGs: An Analysis of Merseyside (2015-2018)

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## Outline

## Overarching Questions

1. Is there a **relationship** between violence and drug markets in **urban** environments?
2. And what **role** (if any) do OCGs play?
3. **Pragmatically**, can we explain the landscape of the Merseyside area in the years 2015-2018?

- **Classic theme** of in urban criminology (2k papers published on the topic)
- **Typical Result I**: correlations are generally positive and strong: violence and drug dealing cluster in space (hotspots)
- **Typical Result II**: By disaggregating crime volumes: OCGs are more likely to be engaged in episodes of violence surrounding drug dealing

## Brief empirical background on violence/markets

1. **At small geo-level**, rates/counts of drug activity and violent crime are **often correlated** (Gainey and Payne, 2003; Sherman et al., 1995; Weisburd and Mazerolle, 2000)
   - Violence occurs in active drug mkts because it *facilitates the routine activities* of those involved (e.g., Baumer, 1994; Blumstein, 1995, 2000)
   - ... or because violence is a **defining factor** of players existing in the surroundings (, e.g. Pearson and Hobbs, 2001)
2. Strength/Direction **vary** across geography/institutions, everything equal (Duran-Martınez, 2015)
   - Many drug markets being relatively **peaceful** (Reuter, 2009).
   - In some settings, the correlation **fails** to hold! (Lum, 2008)

Geographic nexus (if any) is **ambiguous**: many moving parts at play...


**Figure 1.** The locations of drug and violent crimes in Seattle, 1999–2002.

Lum, 2011b

1. From Lum, 2011a:

   *... More **stable** drug markets may have less violence as **competition wanes**. It is **unclear** how individual routines aggregate into crime patterns and subsequently how drug-violence routines and interactions result in coinciding spatial patterns. Furthermore, the existence of drugs and violence at the same places may **not be due to an interaction between the two**, but both may occur as a result of **other factors***

   *Eight tracts in Seattle show **results counter to expectations**. There are areas with spatial clustering of violence or drugs separately.*

2. From Lum, 2011b

   *Only **social disorganization** (e.g. median-housing value, % public or vacant housing) and **wealth**, **in their expected directions**, are related to the spatial clustering of drug activity and **only social disorganization** is **related to violent crime***

## What about OCGs?

1. Many sociological theories on **competition** to explain OCG violence

   Keeping neighborhood as the unit of measure determinants of competition can be **group identity**, things directly/indirectly related to **(ethnic) cohesiveness**,

   A more recent wave of studies led by G. Papachristos (e.g. Papachristos, 2009, Papachristos et al., 2012, Papachristos, 2014, Papachristos et al., 2015) adopted **network theory** to show that **violence can propagate across OCG through both time and space proximity**.

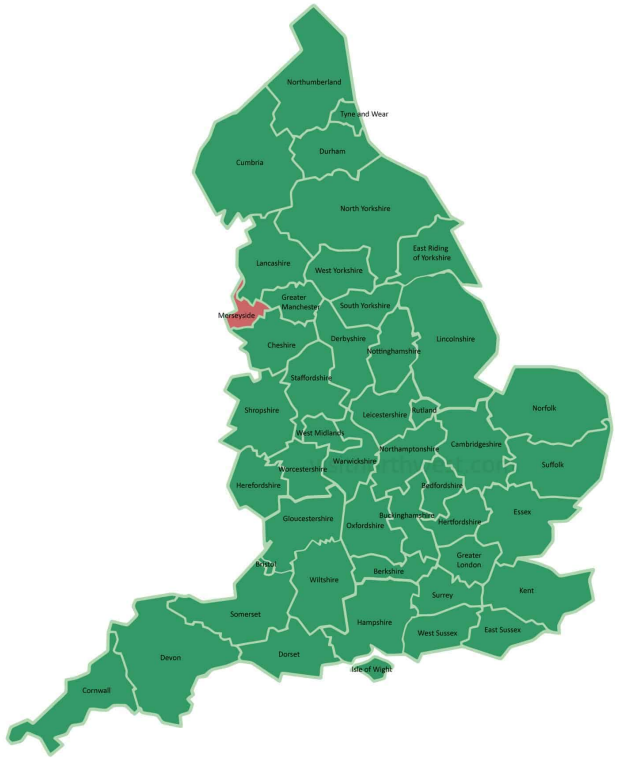
2. **OCGs, Violence and drugs**

   Within the network approach, Coutinho et al. (2020) look at motorcycle OCGs intel data in Canada and find that **in the drug business collaborations are important but selective**:

   **Large** OCGs **tend not** to **collaborate** when their respective illicit (drug) markets **overlap**

**However, A unifying theory** on OCG, Drugs, Violence is missing

# NOW, MERSEYSIDE

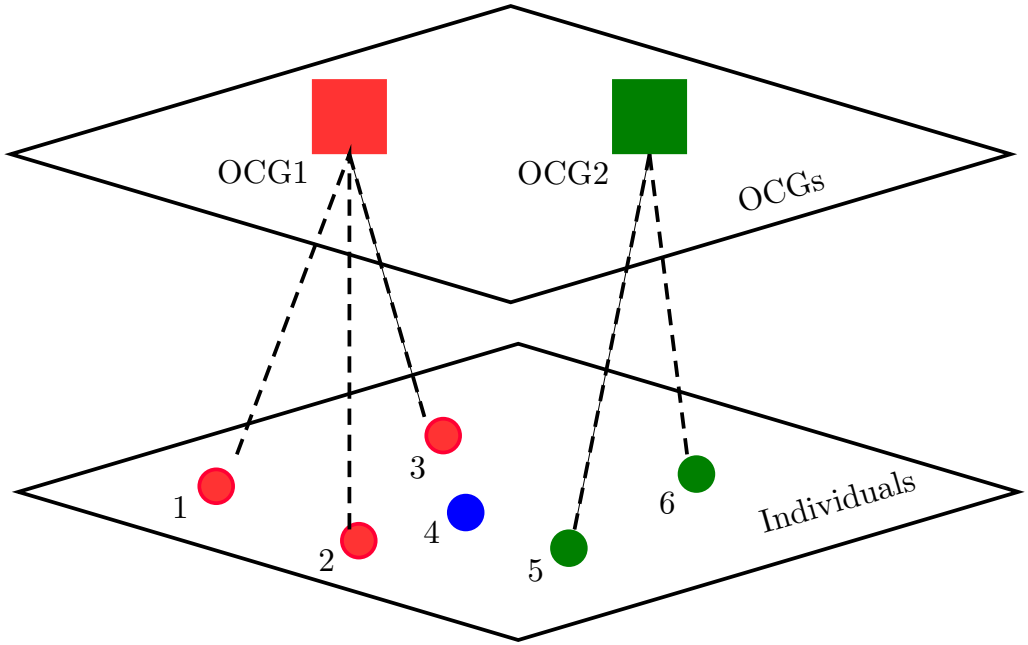



- 4th most populated metropolitan county (22 districts, Liverpool main one)
- Population: 1.38 million
- Highest number of OCGs per million: x2 national average. 25% more groups than Greater London
- Merseyside Police force: “outstanding” in analytics/tackling serious and organized crime

| | MERSEYSIDE | UK |
|---|---|---|
| Demographic Density (per hectare) | 34.698 | 4.1 |
| Fraction residents under 15 | 0.165 | 0.177 |
| Fraction residents between 15 and 24 | 0.137 | 0.131 |
| Fraction residents between 25 and 29 | 0.065 | 0.069 |
| Fraction residents between 30 and 44 | 0.189 | 0.206 |
| Fraction residents between 45 and 64 | 0.268 | 0.254 |
| Fraction residents above 64 | 0.176 | 0.163 |
| Couples on All Family Arrangements | 0.520 | 0.578 |
| Lone Parent Households with Dependent Children | 0.039 | 0.030 |
| Born Abroad on Total | 0.053 | 0.138 |
| Fraction of Minorities of Non-British origin | 0.075 | 0.202 |
| Fraction of Residents with social Grade AB | 0.181 | 0.230 |
| Fraction of Residents with social Grade C1 | 0.314 | 0.309 |
| Fraction of Residents with social Grade C2 | 0.197 | 0.206 |
| Fraction of Residents with social Grade DE | 0.308 | 0.255 |
| Fraction of full-time student aged $\geq 4$ at non term-time address | 0.009 | 0.012 |
| Fraction Unemployment | 0.056 | 0.044 |
| Fraction Employed in Agriculture and Manufacture | 0.014 | 0.084 |
| Fraction Employed in Construction, Utilities, Transport | 0.171 | 0.189 |
| Fraction Employed in Hospitality and Entertainment | 0.062 | 0.085 |
| Fraction Employed in Financial, Real Estates, Professional and Education | 0.178 | 0.357 |
| Fraction Employed in Public Administration, Health and other | 0.065 | 0.077 |
| Fraction Employed in Trade | 0.068 | 0.146 |
| Fraction of Agriculture and Manufacture Businesses | 0.057 | 0.084 |
| Fraction Construction, Utilities, Transport Businesses | 0.085 | 0.189 |
| Fraction Hospitality and Entertainment Businesses | 0.107 | 0.085 |
| Fraction Financial, Real Estates, Professional and Education Businesses | 0.290 | 0.357 |
| Fraction Public Administration, Health and Other Businesses | 0.225 | 0.077 |
| Fraction Trade Businesses | 0.151 | 0.146 |

**Demo/econ indicators (averaged at MSOA level) vs U.K.**
Source: *NOMIS*, 2011

# OCGs




- **Our data**: crime reports involving OCGMs
- OCGs (and their interaction) are our **unit of analysis**
- OCGM: "*Individuals, normally working with others, with the capacity and capability to commit serious crime on a continuing basis*" (OCG Mapping Manual)

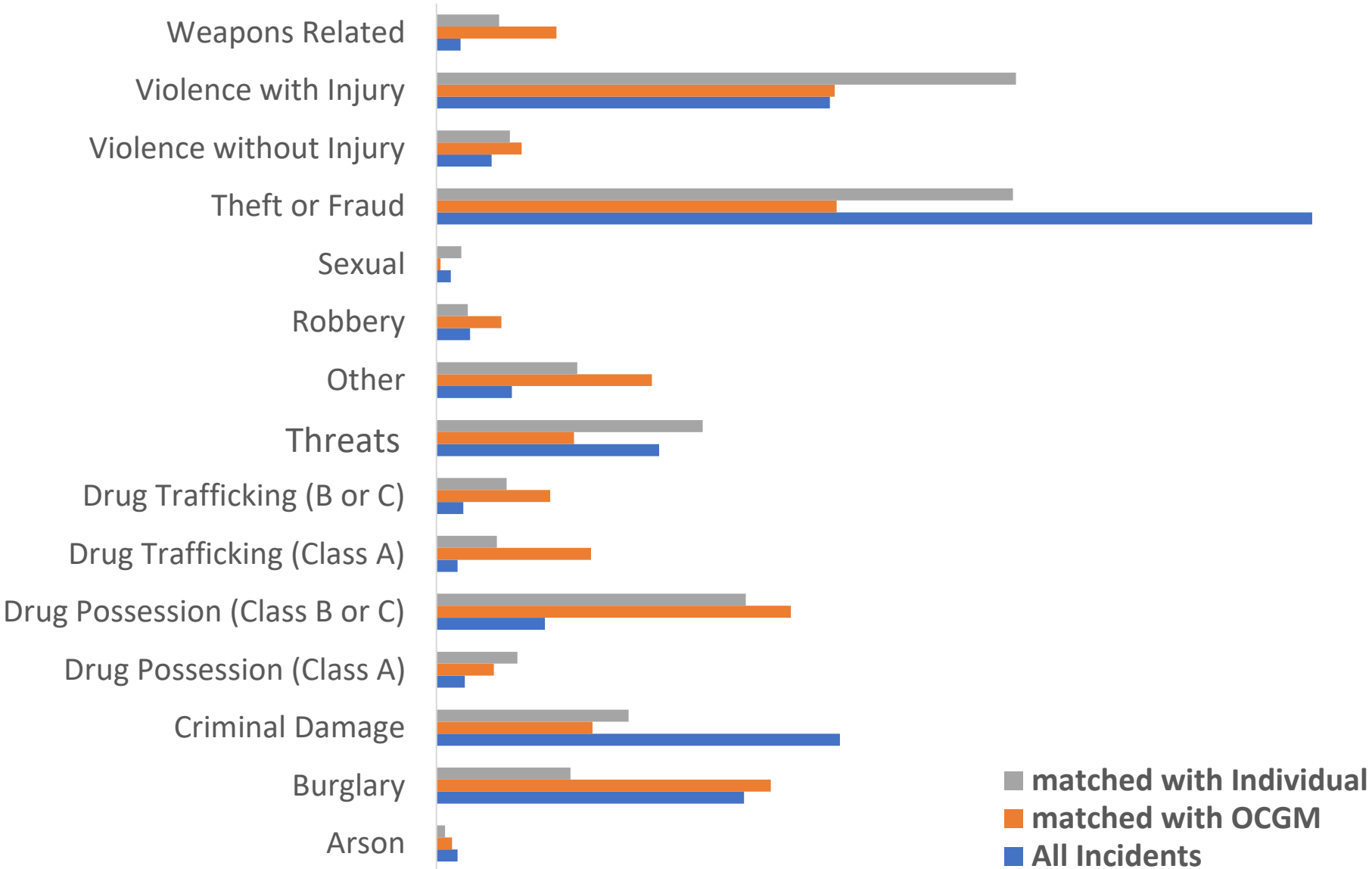
- **375,599 crime reports** (corresponding to **353,530 individual incidents**)
- **62,948 actors**, of which: **1,211 OCGMs**
- **134 OCGs**

# CRIMES

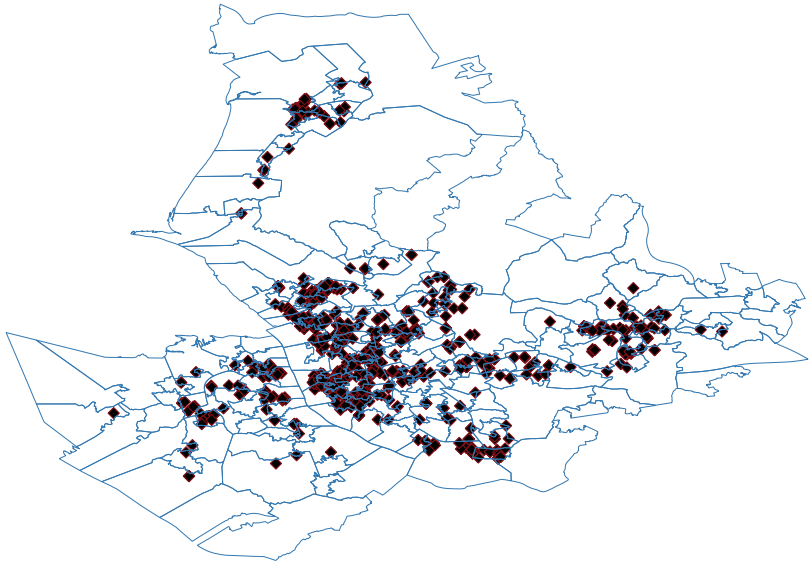
| CRIME CLASS | ALL INCIDENTS | | WITH INDIVIDUAL | | WITH OCGM | | MATCHED |
|---|---|---|---|---|---|---|---|
| | COUNT | % | COUNT | % | COUNT | % | |
| Arson | 3,037 | 0.81 | 422 | 0.33 | 31 | 0.59 | 13.90 |
| Burglary | 44,226 | 11.78 | 6,615 | 5.13 | 671 | 12.81 | 14.96 |
| Criminal Damage | 57,985 | 15.45 | 9,481 | 7.36 | 313 | 5.97 | 16.35 |
| Drug Possession (A) | 4,056 | 1.08 | 3,990 | 3.10 | 115 | 2.20 | 98.37 |
| Drug Possession (B/C) | 15,597 | 4.16 | 15,263 | 11.85 | 711 | 13.57 | 97.86 |
| Drug Trafficking (A) | 3,029 | 0.81 | 2,974 | 2.31 | 310 | 5.92 | 98.18 |
| Drug Trafficking (B/C) | 3,844 | 1.02 | 3,462 | 2.69 | 228 | 4.35 | 90.06 |
| Harassment | 32,022 | 8.53 | 13,143 | 10.20 | 276 | 5.27 | 41.04 |
| Other | 10,825 | 2.88 | 6,952 | 5.40 | 432 | 8.25 | 64.22 |
| Robbery | 4,824 | 1.29 | 1,550 | 1.20 | 130 | 2.48 | 32.13 |
| Sexual | 2,070 | 0.55 | 1,221 | 0.95 | 8 | 0.15 | 58.99 |
| Theft or Fraud | 125,882 | 33.54 | 28,451 | 22.08 | 803 | 15.33 | 22.60 |
| Violence without Injury | 7,942 | 2.12 | 3,625 | 2.81 | 171 | 3.26 | 45.64 |
| Violence with Injury | 56,550 | 15.07 | 28,598 | 22.20 | 799 | 15.25 | 50.57 |
| Weapons Related | 3,450 | 0.92 | 3,096 | 2.40 | 241 | 4.60 | 89.74 |
| Sum | 375,339 | 100 | 128,843 | 100 | 5,239 | 100 | 34.33* |

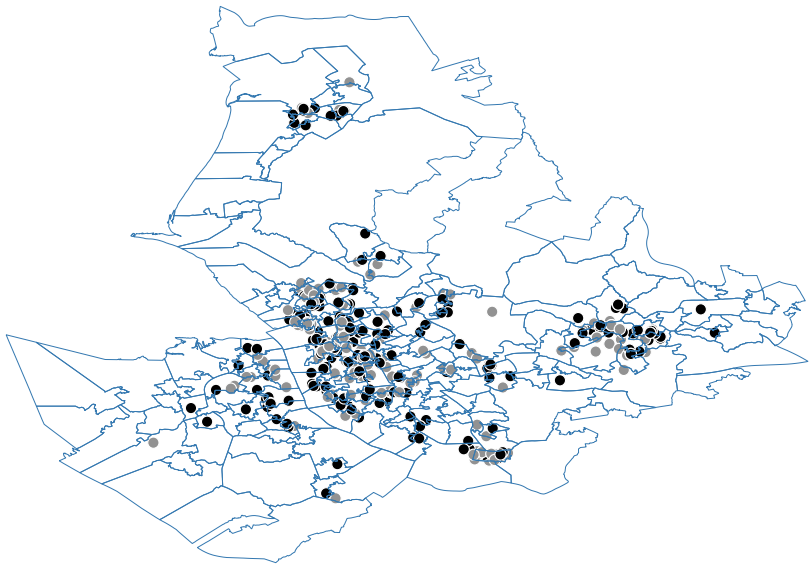
* On total crimes
Source: Merseyside Police Force

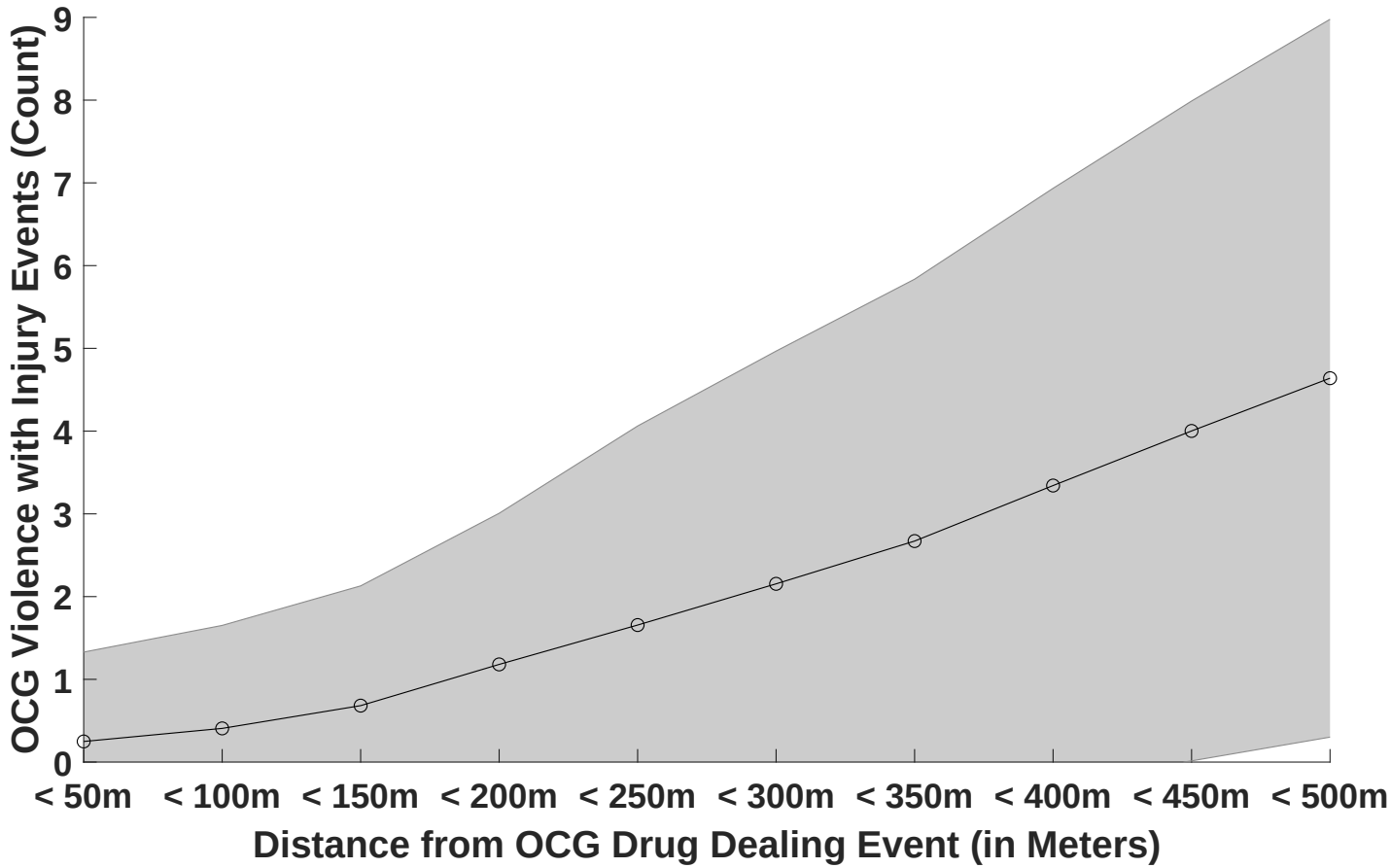
# Matching Rates



# STATIC ANALYSIS (MSOAS)



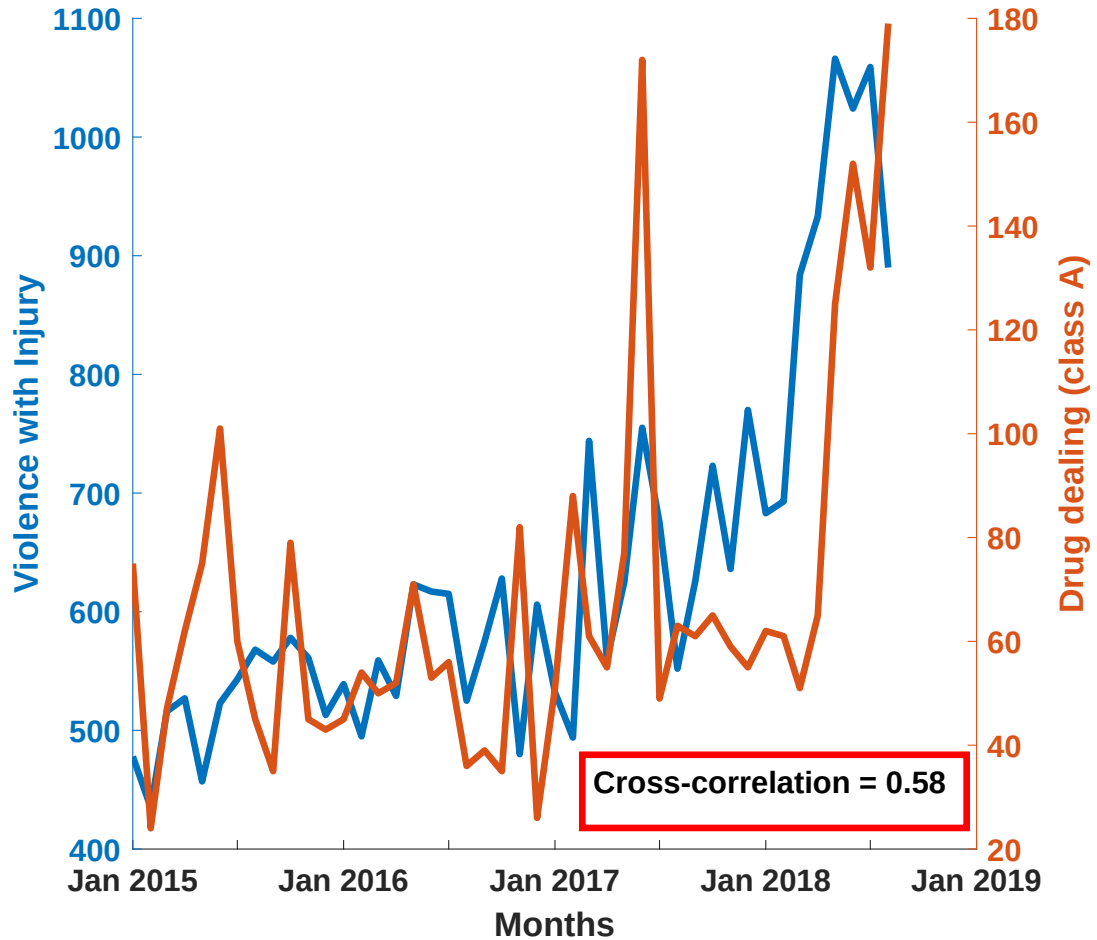





## Stable Drug Markets and Violence Coexist

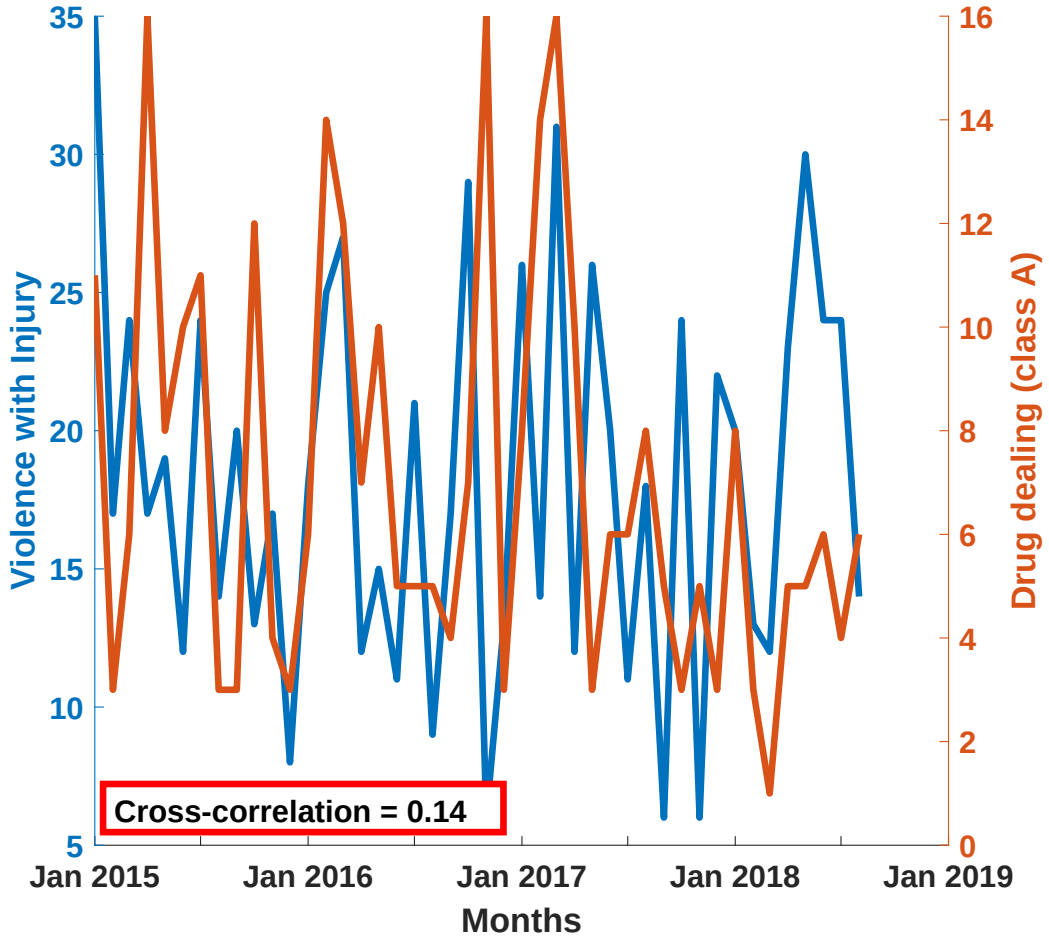
- In a **static** approach, clustering of drug dealing events and OCG violence is stable and widespread also in Merseyside
- Typical result of **neighborhood disorganization** literature is confirmed

# DYNAMICS (VIOLENCE VS DRUGS - TOTAL VOLUMES)



**However, at OCG level...**

# DYNAMICS (VIOLENCE VS DRUGS - OCGS VOLUMES)



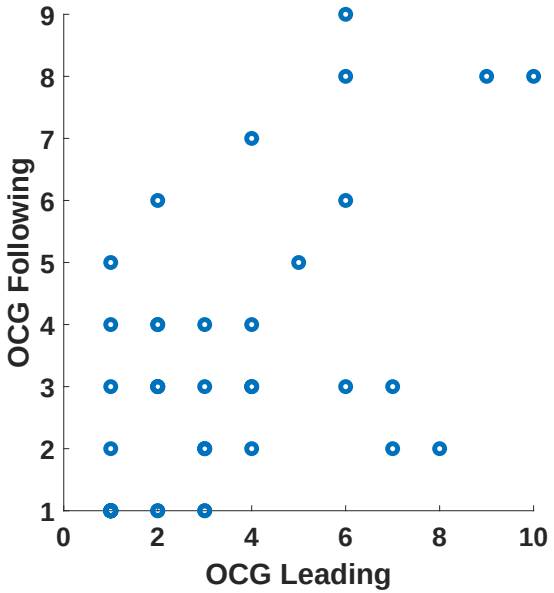
# Our Approach:

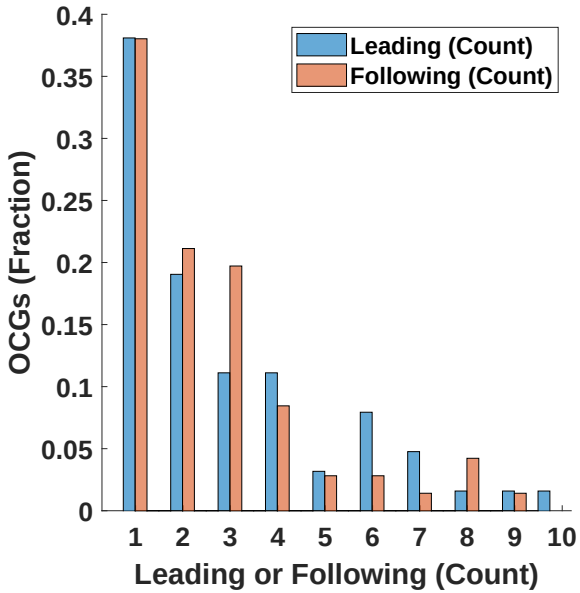
(Giovannetti and Campana, 2024; Rozzi, Giovannetti, Pin, Campana, 2024)

- To address the relationship between violence and drugs, we take a **market-based approach**.
- We observe that drugs are predominantly traded by OCGs and that drug dealing is a predominant business for OCGs. Therefore, we identify drug suppliers as OCGs

**Working Assumptions**:

1. Drugs are profit-generating goods that follow the laws of demand and supply (inverse relationship between price/quantity) and that are exchanged in ”markets”
2. **Suppliers are profit-driven, aware of competition and opportunistic**: they weight expected revenue versus expected costs in deciding:
   - How to deal with other OCGs (e.g. form alliances and/or fight)
   - This includes which markets to elect for their trade



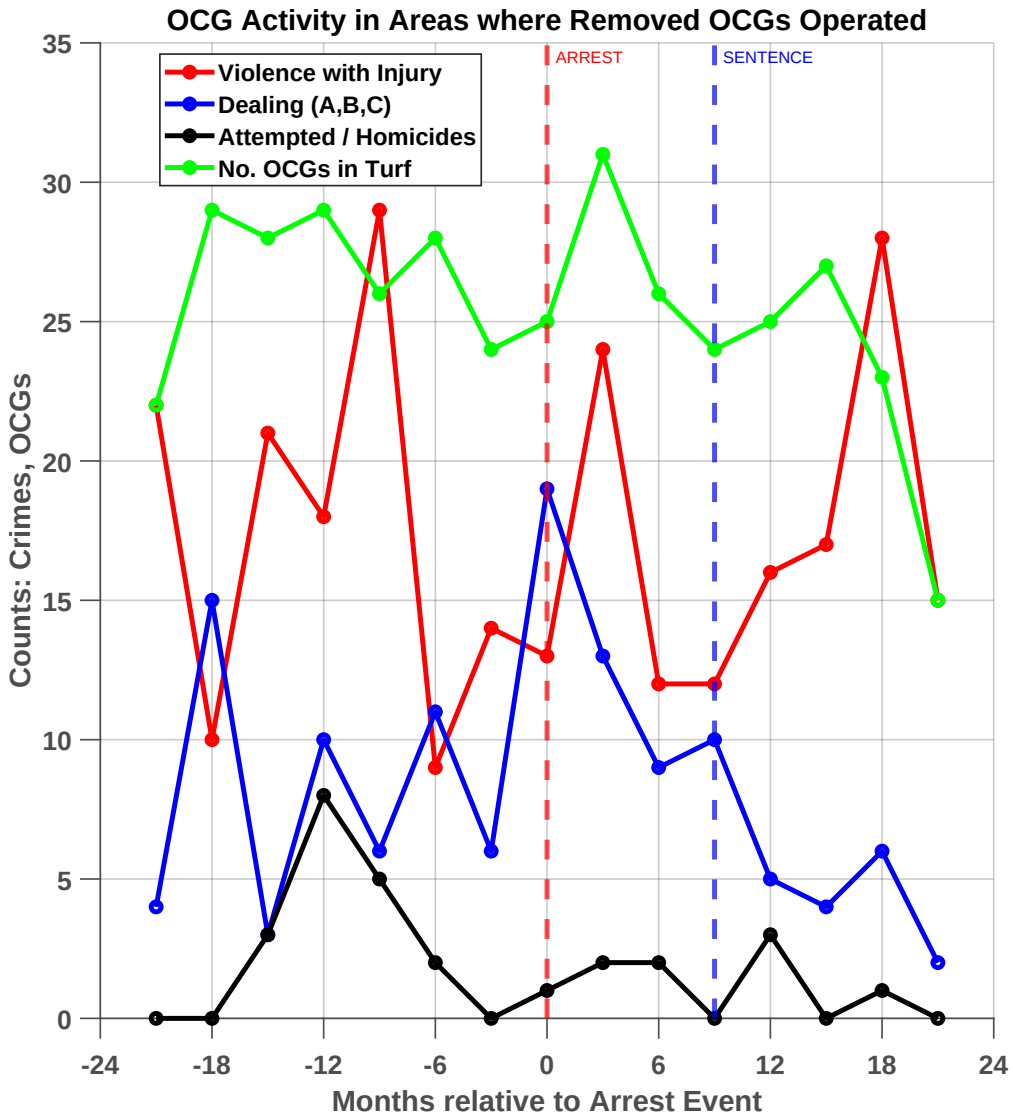

## Areas are contendible...

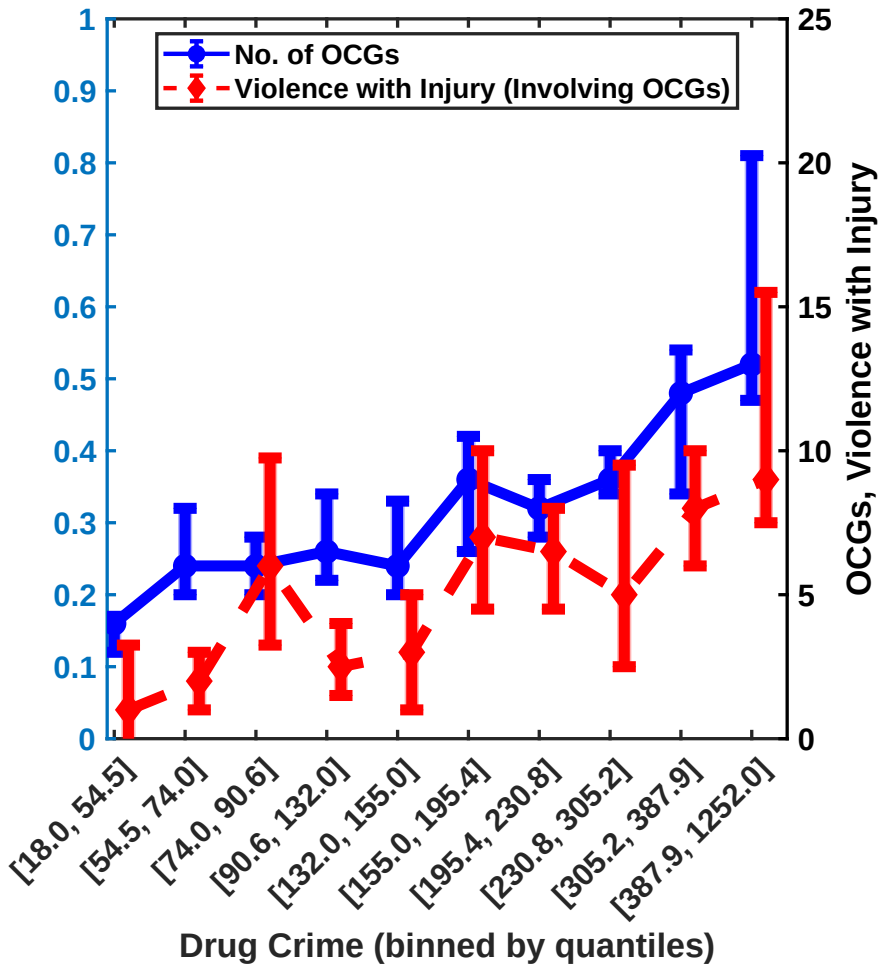
- **Frequent overlaps**. OCGs are dominant in some areas **and** second-dominant elsewhere
- (Very **different** from a **consolidated** mkt where observations are squeezed on the X axis, no overlaps)

## ...and in fact, are actively contended!

- Market is **competitive**: leaders/followers fall in number of turfs
- OCGs active in multiple areas are more likely to be dominant rather than second-dominant in those areas
- Hence, areas are actively contended and **defeat is costly**

# A Dense Environment...






## OCGs are opportunistic

- More profitable areas (i.e. higher drug dealing) attract a **higher density of OCGs** but also **higher violence**
- **Qualitatively**, it seems that **at least three** segments exist
- **To explore drivers of area selection, we need a model**

# MODEL 1/3

(Rozzi, Giovannetti, Pin, Campana, 2024)

- Imagine Merseyside is made of **10 drug dealing spots** and is populated by **10 OCGs** only.
- OCGs are symmetric in every aspect
- Spots have an **objective** profitability: $u_{10} > u_9 > u_8$, etc.. which all OCGs know
- Each spot can be occupied by one OCG per period: **first come, first served.**
- If two OCGs step on each other, there will be a **costly fight**

# MODEL 2/3

## Behavioural Assumptions

- **OCGs are rational**: the value of an area does not depend on the **profitability** of the location only, **but also on the risk of finding that area occupied already**

  (OCGs like profits and do not like to step on each-other feet)

- OCGs only know the objective value of areas and remember the occupation pattern they **directly** observed in the past.

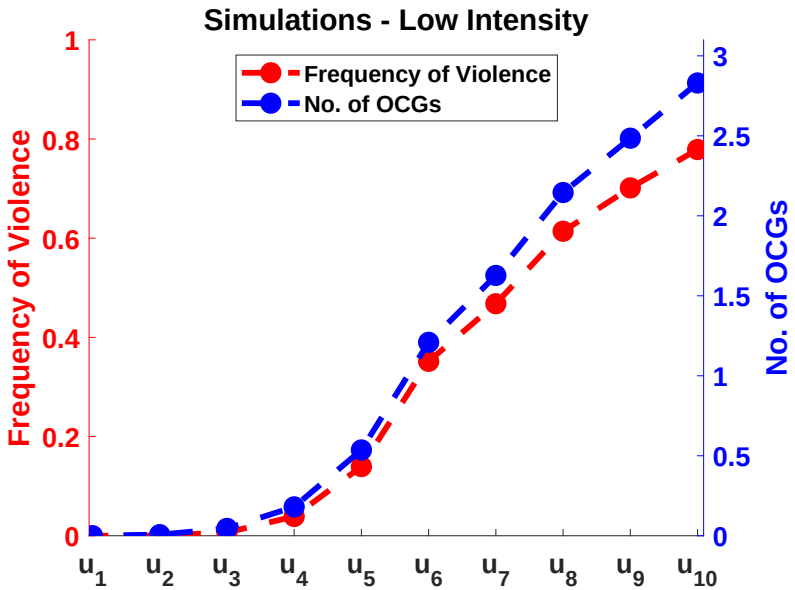
# MODEL 3/3

- Overnight, each OCG hides in its hideout outside Merseyside
- Each morning, each OCG decides whether to leave the hideout, explore the city, settle in a spot, sell drugs, and then go back to the hideout.
- The decision depends on an external parameter (”intensity”)
- **If No:**
  - They do nothing until the next morning
- **If Yes:**
  - They rank areas by their subjective value and start the exploration according to the ranking. Once they find an empty spot, they settle for the day and then go back to the hideout overnight

- Every morning, each OCG **compute the subjective value** of each area and makes a ranking

# EQUILIBRIUM

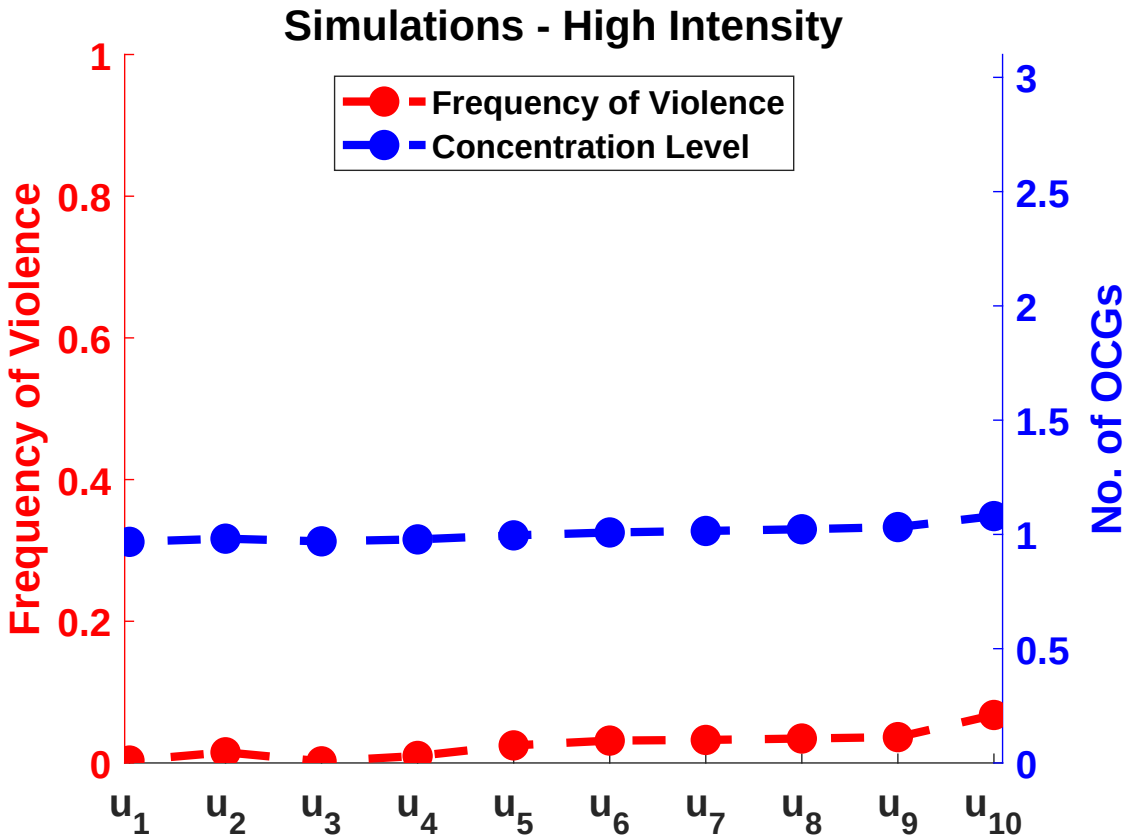
## WITH LOW INTENSITY




- With low intensity, all OCGs try their chance on high-value area (and end up stepping on each-other)

# EQUILIBRIUM

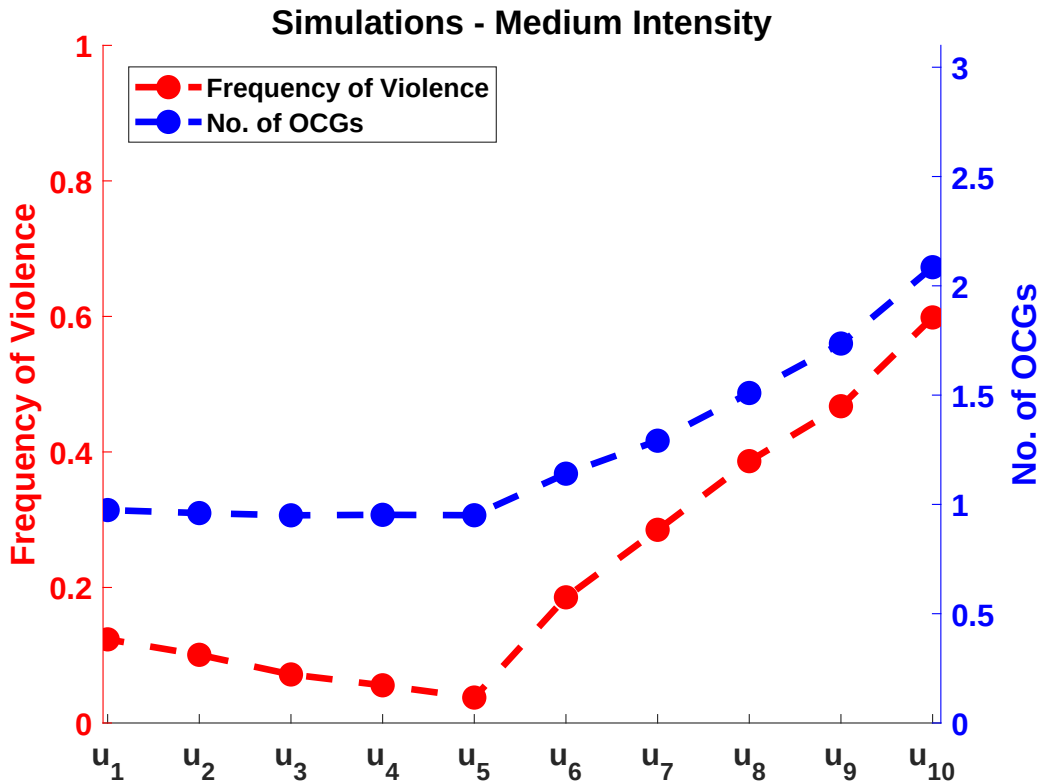
## WITH HIGH INTENSITY




- With high intensity, OCGs efficiently sort themselves

# EQUILIBRIUM

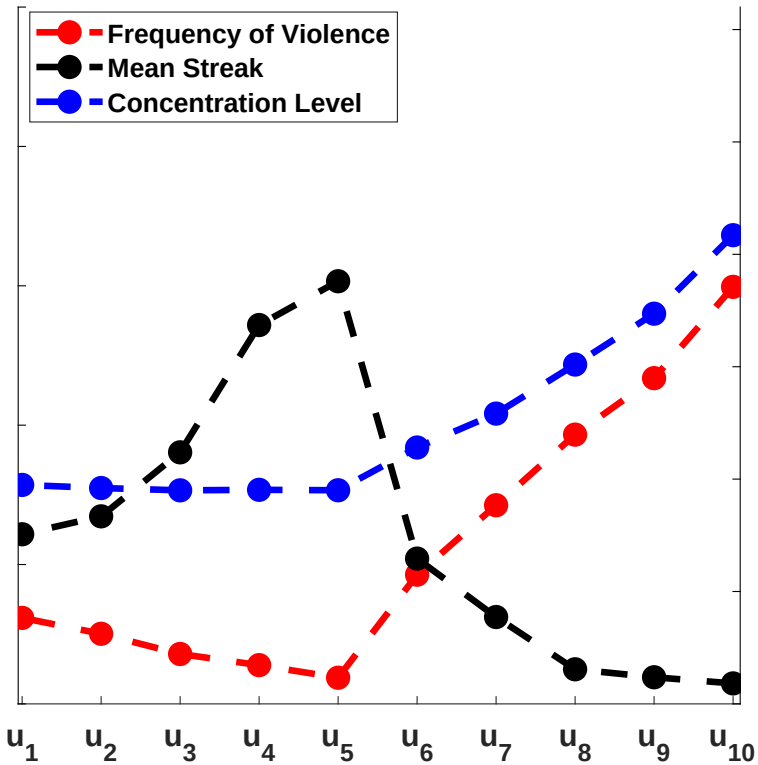
## WITH MEDIUM INTENSITY




- With medium intensity, equilibrium dynamics are rich

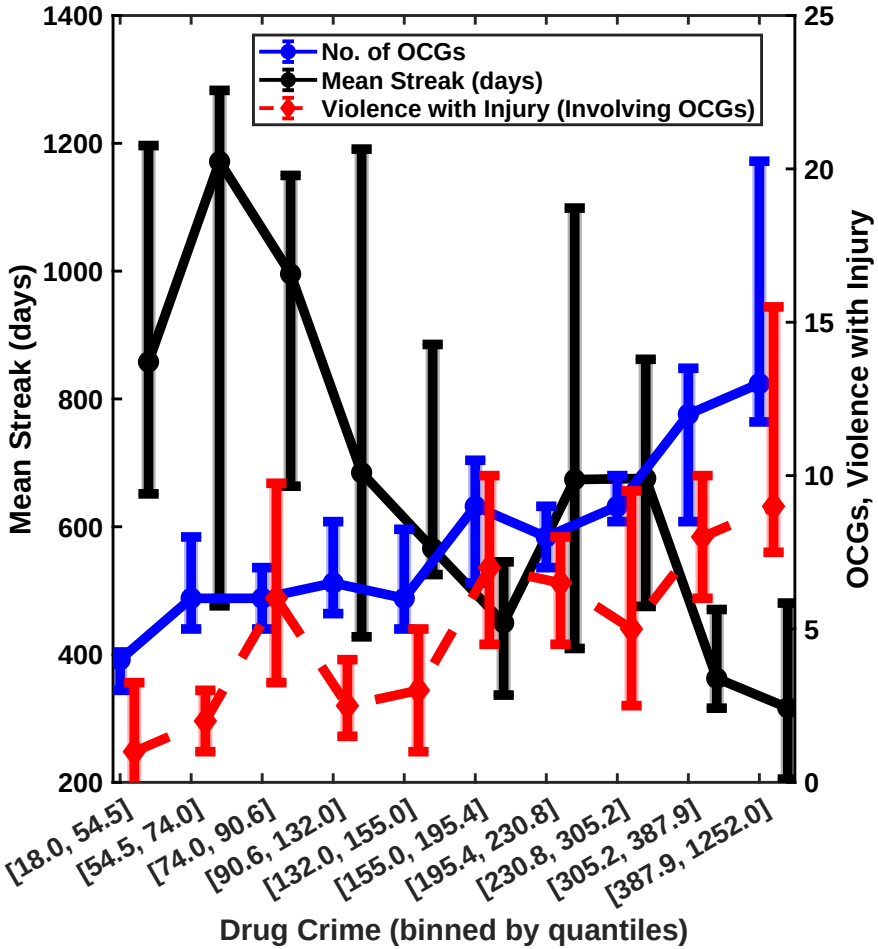
# EQUILIBRIUM

## WITH MEDIUM INTENSITY (PLOTTING STREAKS)

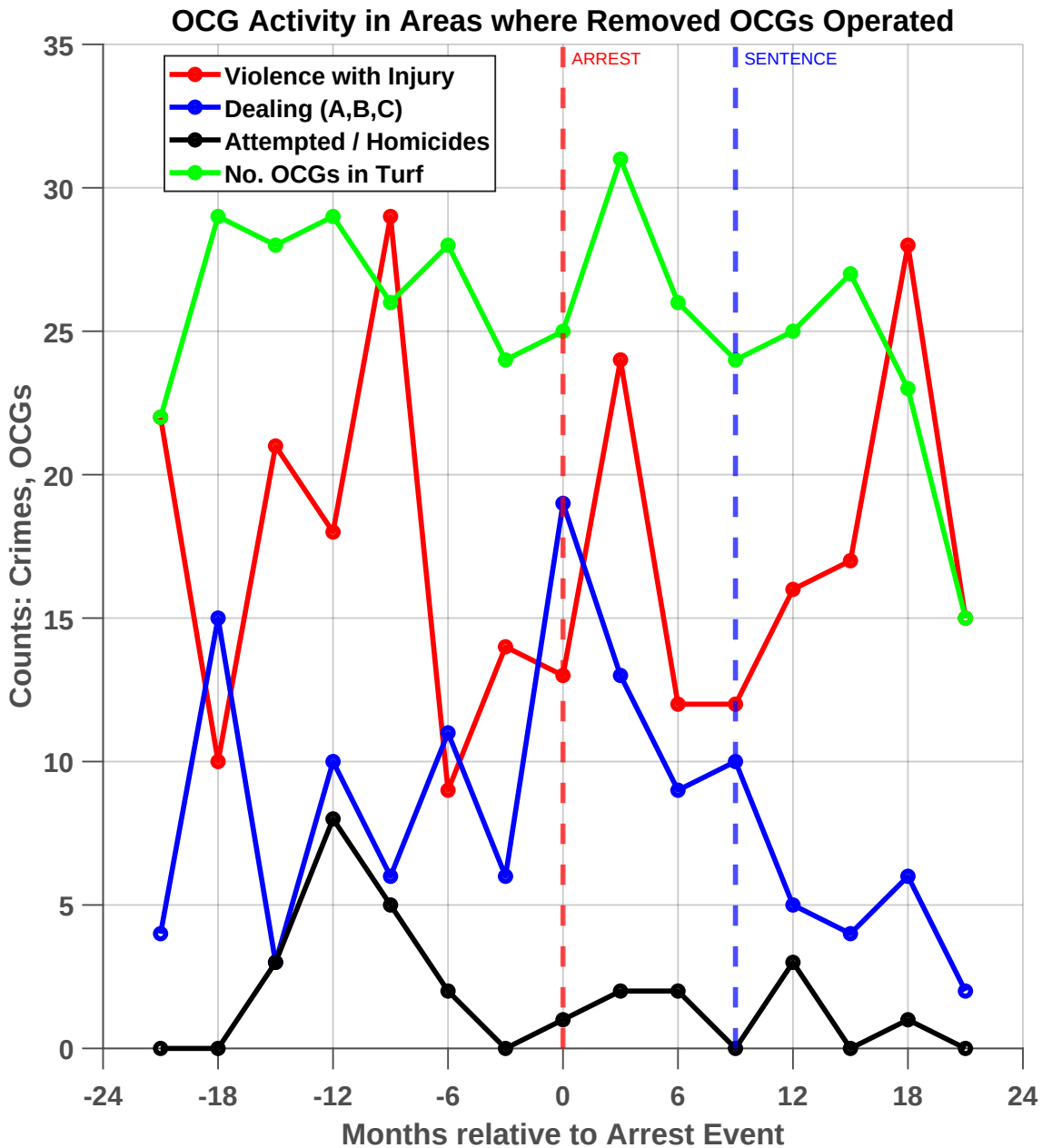



- With medium intensity, equilibrium dynamics are rich

# STREAKS IN THE DATA

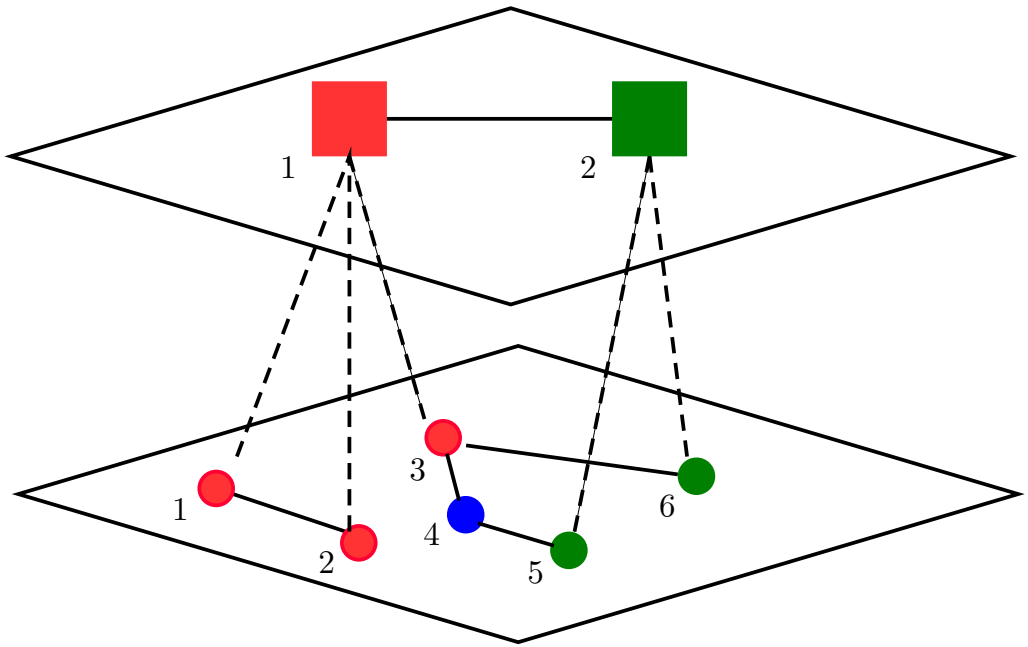


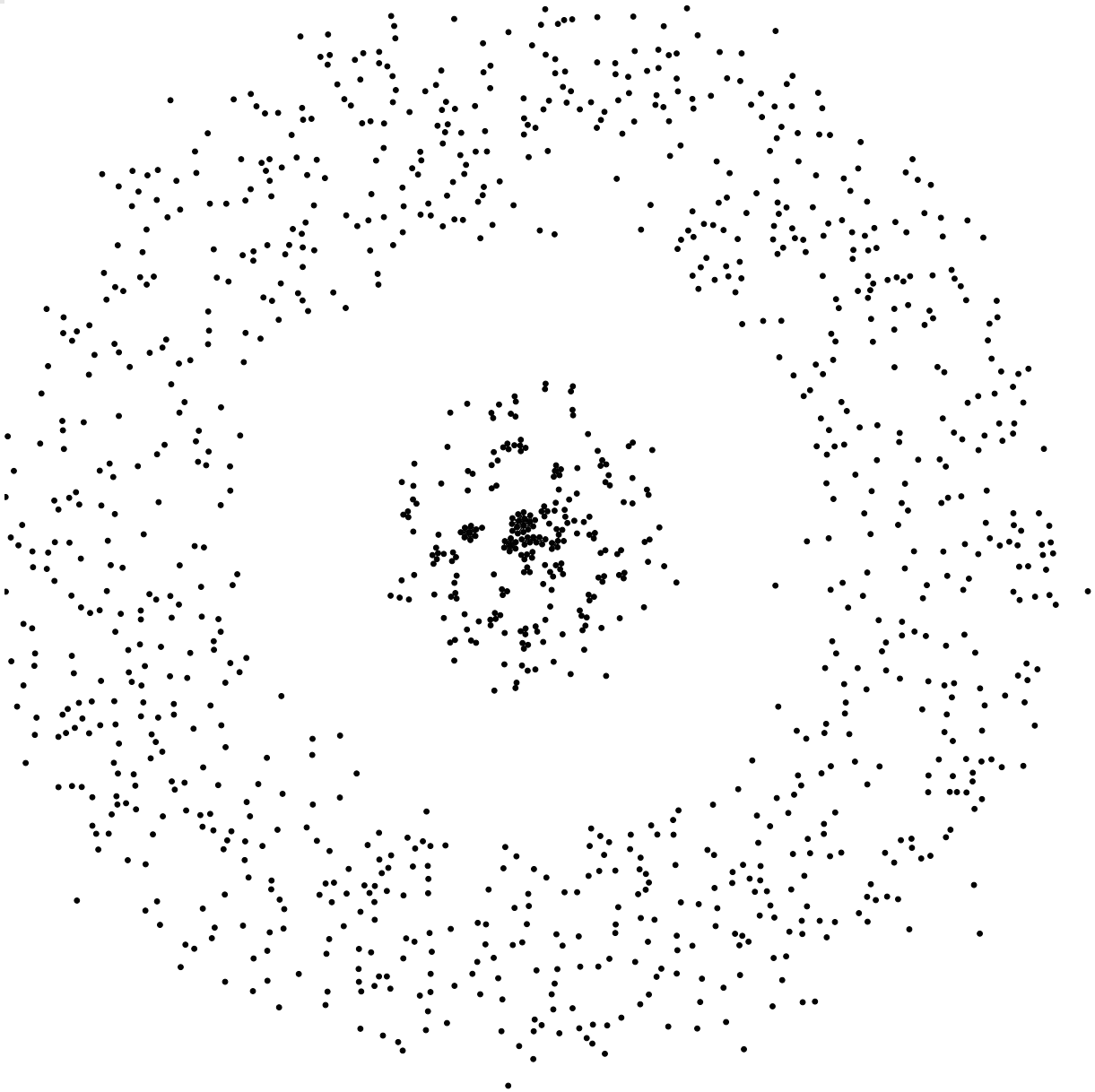

- The streak structure appears in the data too. This highlights the criticality of the mezzanine for targeting purpose


OCG Activity in Areas where Removed OCGs Operated
Violence with Injury
Dealing (A,B,C)
Attempted / Homicides
No. OCGs in Turf
ARREST
SENTENCE
Counts: Crimes, OCGs
Months relative to Arrest Event
35
30
25
20
15
10
5
0
-24
-18
-12
-6
0
6
12
18
24

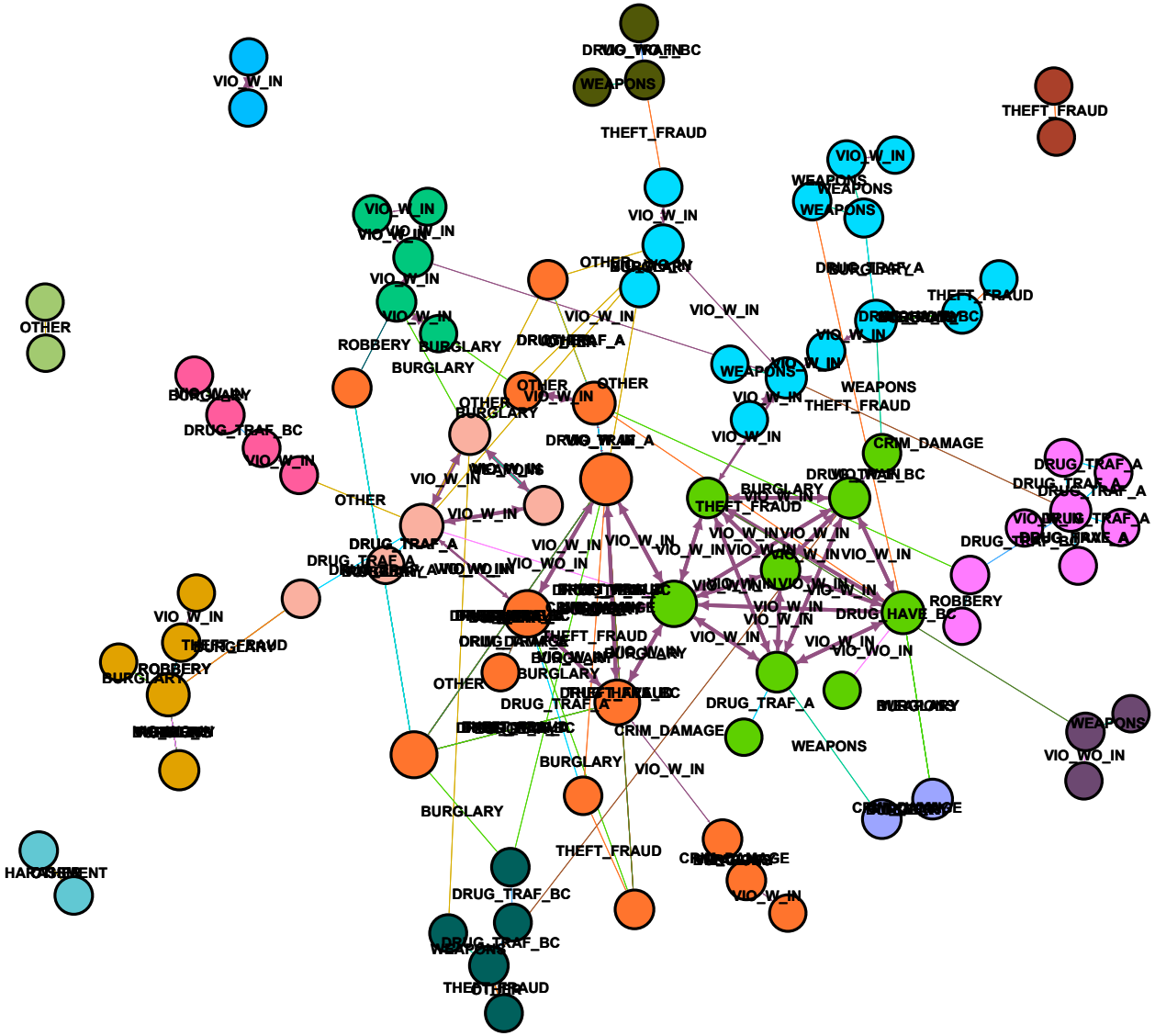
# Cooperation

# Cooperation Between OCGs

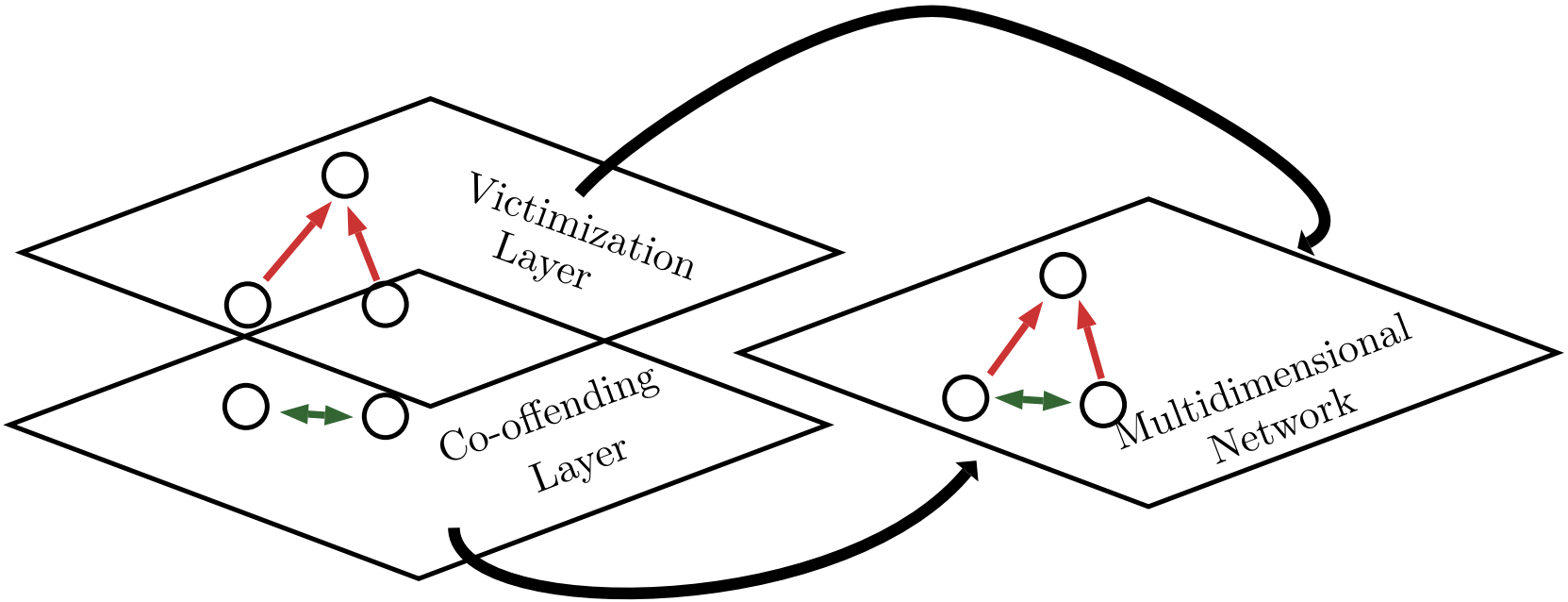




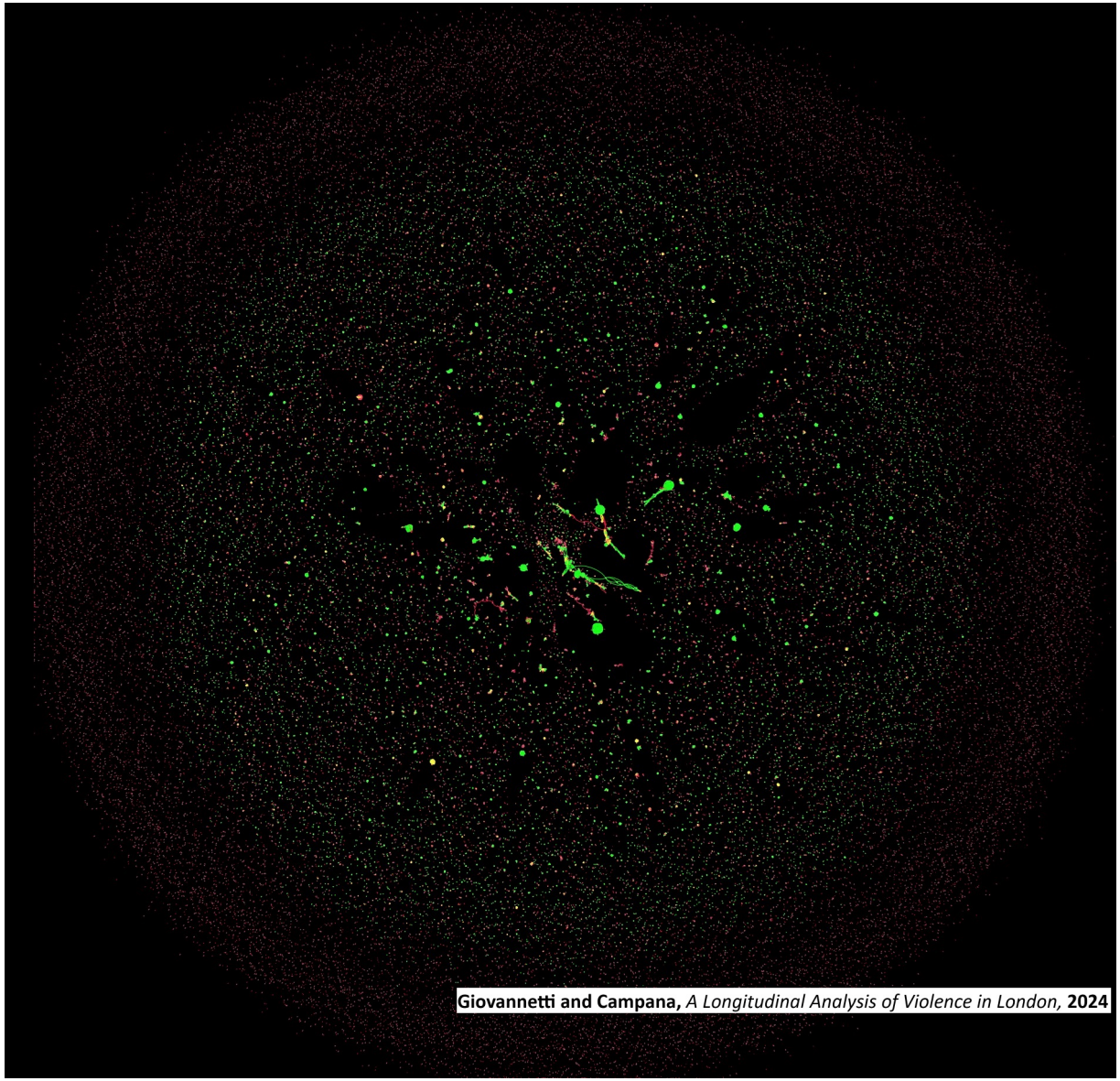
**From this...**


VIO_W_IN
WEAPONS
THEFT_FRAUD
OTHER
ROBBERY
BURGLARY
DRUG_TRAF_BC
DRUG_TRAF_A
VIO_WO_IN
CRIM_DAMAGE
DRUG_HAVE_BC

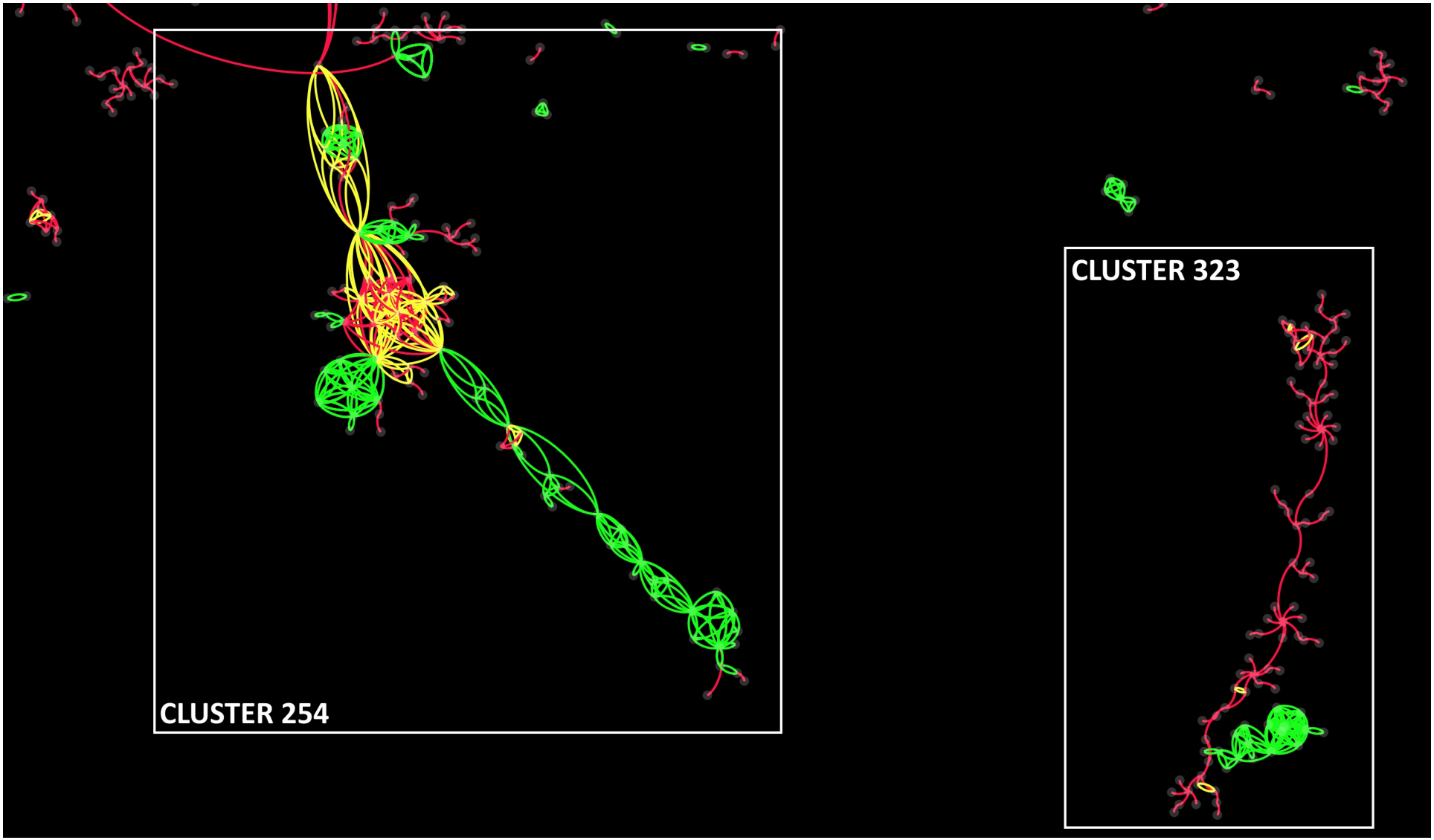
**... to this!**



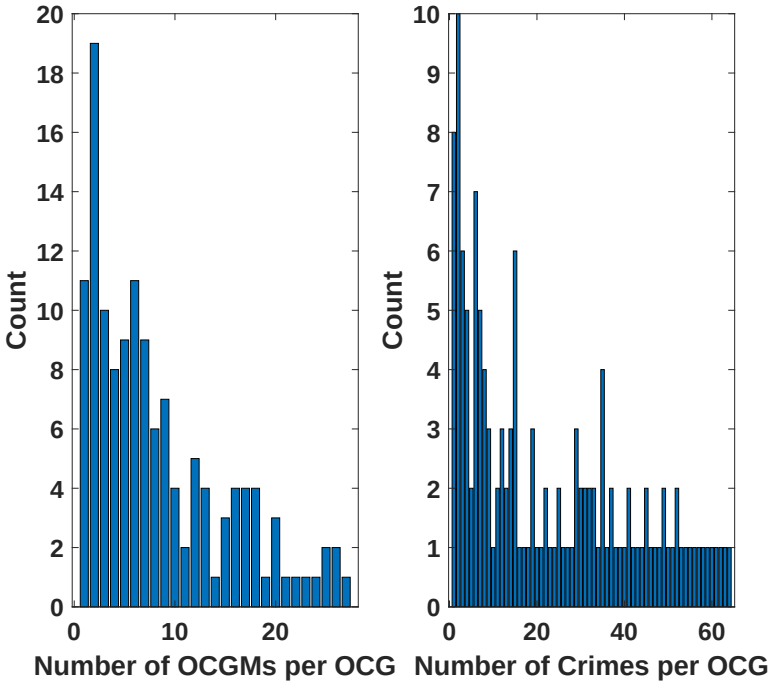

- **Aside**: Networks are flexible tools!
- Can describe complex, dynamic, multilayered relationships
- Layers can be anything (e.g., financial transactions, market stages, family relationships, etc.)




**Example**: London Network of co-offending and victimization (cross-section: 2018-2023). N = 304,635 accused individuals and/or victims. M = 59,026 coop links, L=153,079 victimization links

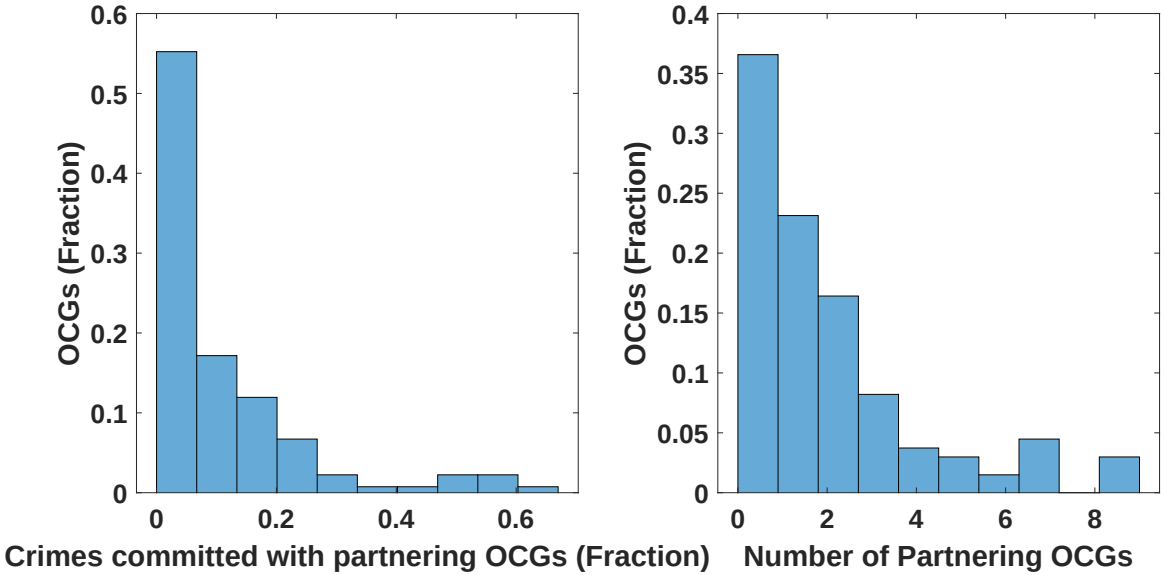



Zoom on two clusters (red: victimization. green: coop)




## OCGs are Heterogeneous in size

- **High dispersion** in both OCGM per OCG and number of crimes per OCG
- $67\%$ of OCGs: $N = 2 - 10$. Only 9 OCGs have $N > 20$.
- In line with studies showing that opportunistic/small OCGs are the predominant
  - Bouchard (2006): $60\%$ incarcerated dealers in Quebec in OCGs of $N = 2 - 10$. **But**: $13\%$ in OCGs with $N > 20$
  - Eck (2000): $35\%$ of Baltimore drug dealing cases involves OCGs of $N = 2 - 10$. **But**: $7.8\%$ OCGs of size $> 20$.




## OCGs are Heterogeneous in the Degree of Cooperation

- Cooperation unlocks fresh resources (via division of labor, collusion in price setting, improved market access...)
- Cooperation is **rational** but the type of pressure characterizing illegal frameworks may constraint its reach/duration to a subset of opportunistic interactions
- **In Merseyside**
  - $63\%$ of OCGs crime with other OCGs

## Question:

> What is the role of cooperation in **unboundedly competititive** markets?

## Our starting point:

1. In **contendible** markets competitive pressure hinders potential collaborations
2. In **legal** markets, enforceable **contracts/property rights** regulate firms cooperation through surplus sharing agreements

**Here**: competitive pressure + lack of rights $\rightarrow$ "**perverse incentives**"

**Example 1**: (Threat of) Violence used to enforce profit sharing/grabbing

**Example 2**: Surplus from successful ventures may be used to displace partners in future interactions

## We claim:

OCGs shape the landscape by **strategically** reacting to the environment in (at least) three dimensions:

1. **Establish (a weak) normative framework**
2. **Partner selection**
3. **Co-offending behavior**

## Theoretical core of our theory:

1. This is a competitive environment and cooperation is used to regularize relations. Hence, if cooperation falls apart, environmental/market pressure kicks in.

   In this light: violence is a consequence of failure to cooperate

   In other words: **Business falls** and **Violence surges**
2. OCGs **strategically select** their partners to minimize perverse incentives
3. OCGs factor in the **gain/risk ratio of potential deals** and only deals with a good-enough profile will stimulate cooperation

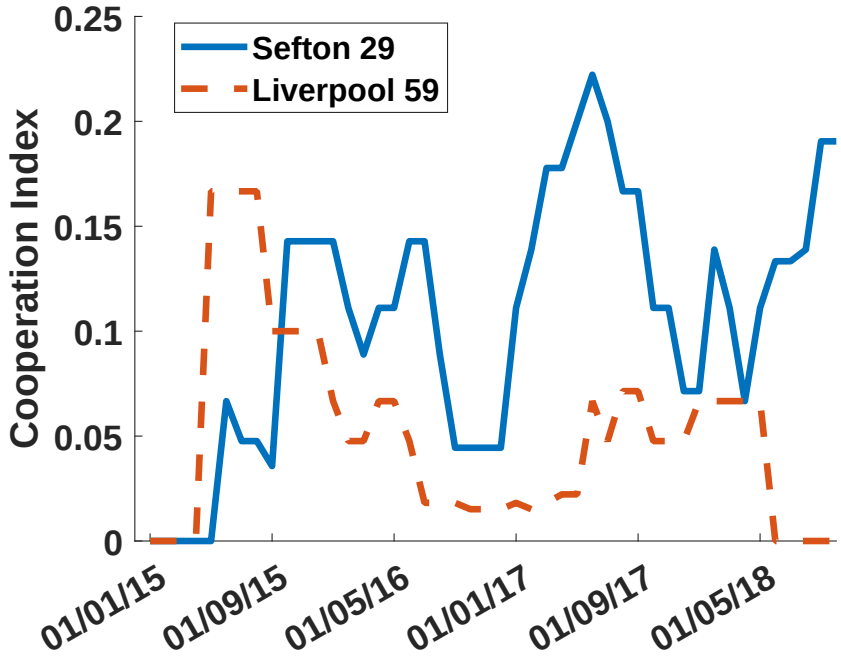
# 1. Cooperation and the Turf

- Cooperation jointly fosters economic opportunities **and** prevents conflict
- Hence, it must be that in unregulated competitive markets a failure to cooperate jointly affects violence **and** business across the turfs

- Construct a dynamic cooperation index for each turf $m$ and month $T$:

$$I_{m,T} = \frac{\text{links (across city) btw OCGs active in m at T}}{\text{potential links (across city) btw OCGs active in m at T}}$$

- For each month $T$, the index is built across all data recorded through a 1-year rolling window.




- Estimate a Dynamic Poisson model:

$$\log\left(E\left[\text{count crimes}_{m,t}\right]\right) = \text{fixed effects} + I_{m,T}$$

- **Important**: Fixed effect control for any time-varying and time-fixed (i.e. neighborhood, disorganization, etc.) motif.

# RESULT 1

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Drug Dealing (class A) | | | Violence with Injury | | |
| Cooperation Index | 0.011** | 0.012*** | **0.014*** | -0.01 | -0.010** | **-0.015**** |
| | (-0.01) | (0.00) | (0.00) | (-0.01) | (0.00) | (0.00) |
| Constant | -3.48*** | - | - | -2.37*** | - | - |
| | (-0.23) | - | - | (-0.08) | - | - |
| Time F.E. | N | Y | Y | N | Y | Y |
| Neighborhood F.E. | N | N | Y | N | N | Y |
| Observations | 6,792 | 3,639 | 2,283 | 6,792 | 3,639 | 2,283 |
| AIC | 2,000.02 | 1,444.69 | 1,457.72 | 4,285.27 | 3,429.42 | 3,406.32 |
| BIC | 2,020.50 | 1,450.89 | 1,550.71 | 4,305.74 | 3,435.97 | 3,504.57 |

Coefficients computed on a month-neighborhood basis (T = 1,...,42; m =1,...,201), % changes

- 1% increase in coop idx **jointly** and **strongly** associated to a 1.4% increase in the monthly neighborhood levels of OCG Drug dealing (class A) and $1.5\%$ decrease of violence with injury

# 2. Differential Cooperation

**Who collaborates with whom?** Does turf control (net of cooperation) affect the likelihood of cooperation?

1. **Measure turf control**: take the static dataset of all OCG crimes. For each turf $m$, compute the sum of crimes, for all OCGs $i$, $j$
2. Construct a **divergence index** of turf control measuring **disjoint** activity of each OCG:

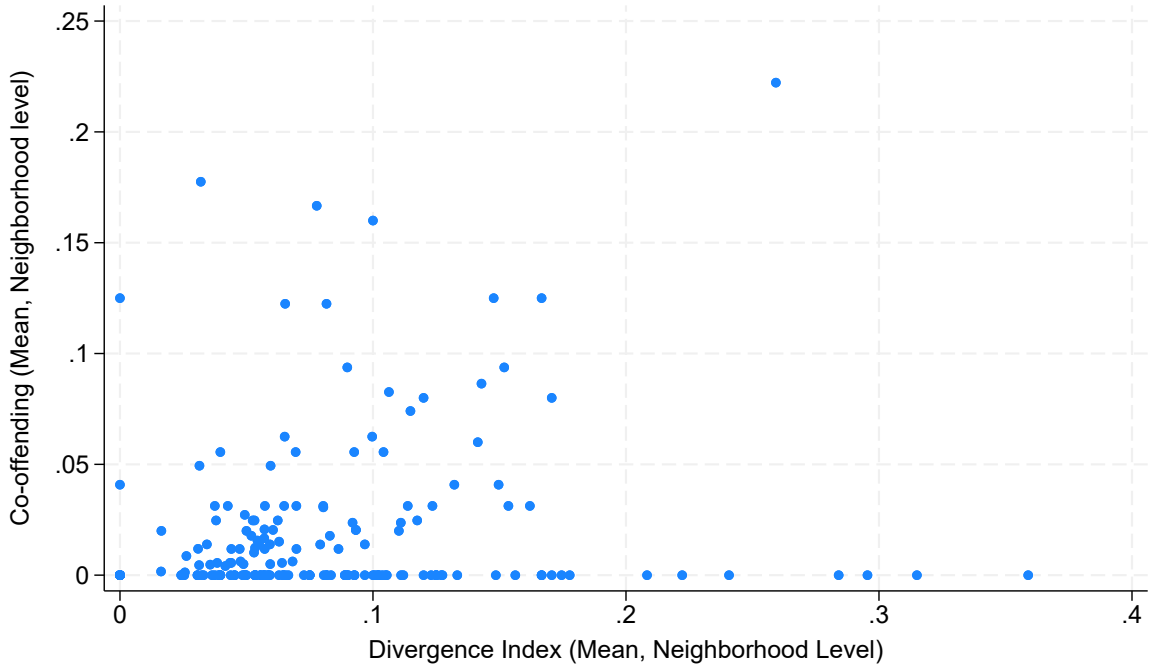
$$d_{i,j,m} = \left| \frac{\text{crimes of i w/o j in m}}{\text{total crimes in m}} - \frac{\text{crimes of j w/o i in m}}{\text{total crimes in m}} \right|$$

   Idea: compare crimes *net* of collaborations

3. Estimate:

$$P(\text{link btw } i \text{ and } j \text{ in } m) \;=\; f(X_i, X_j, X_m, d_{i,j,m}) \quad \text{for } d > 0$$

# RESULT



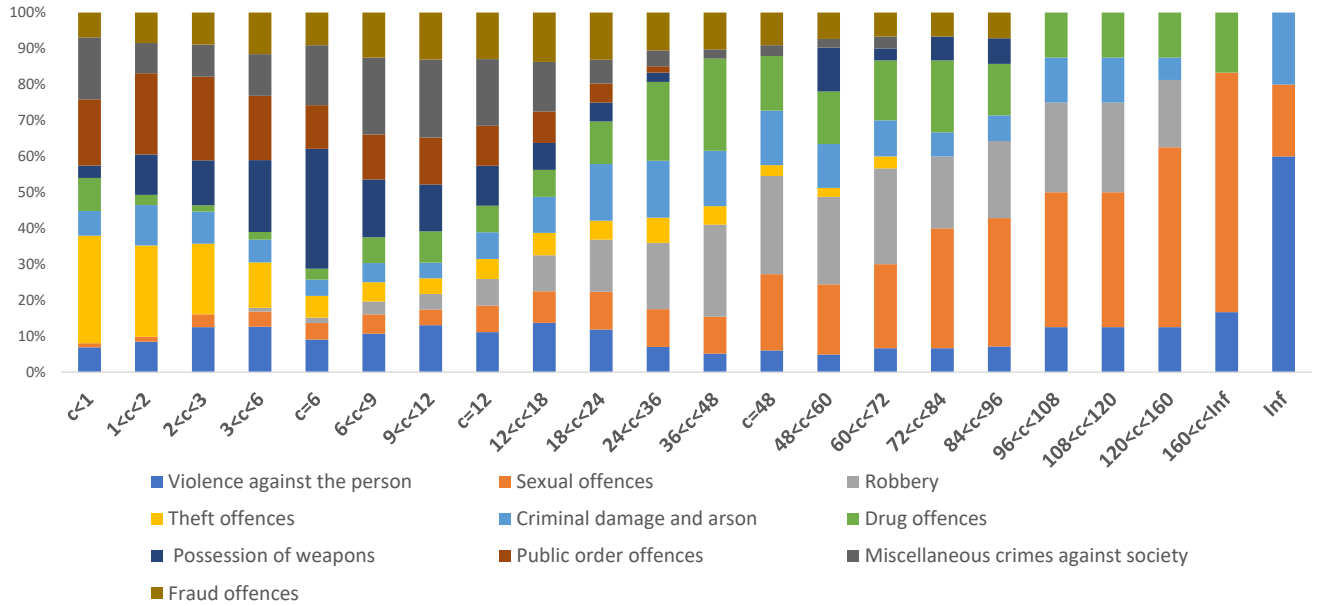

- On average, the probability for OCGs to collaborate is only 1.2%
- $10\%$ increase in divergence index associated to $13\%$ increase of probability of having at least a link between two OCGs (average marginal effects)
- Result holds after controlling for total turf activity of OCGs and the average age of OCG members

# CONCLUSIONS

- We introduced a theory that links the type of crime activities performed on turf to the structure of inter-OCG relationships
- We articulated the theory in three main hypotheses related to OCG behavior and their implication on the territory
- We tested them on the Merseyside Metropolitan Area

# Appendix

# Cooperation and the Intensive Margin

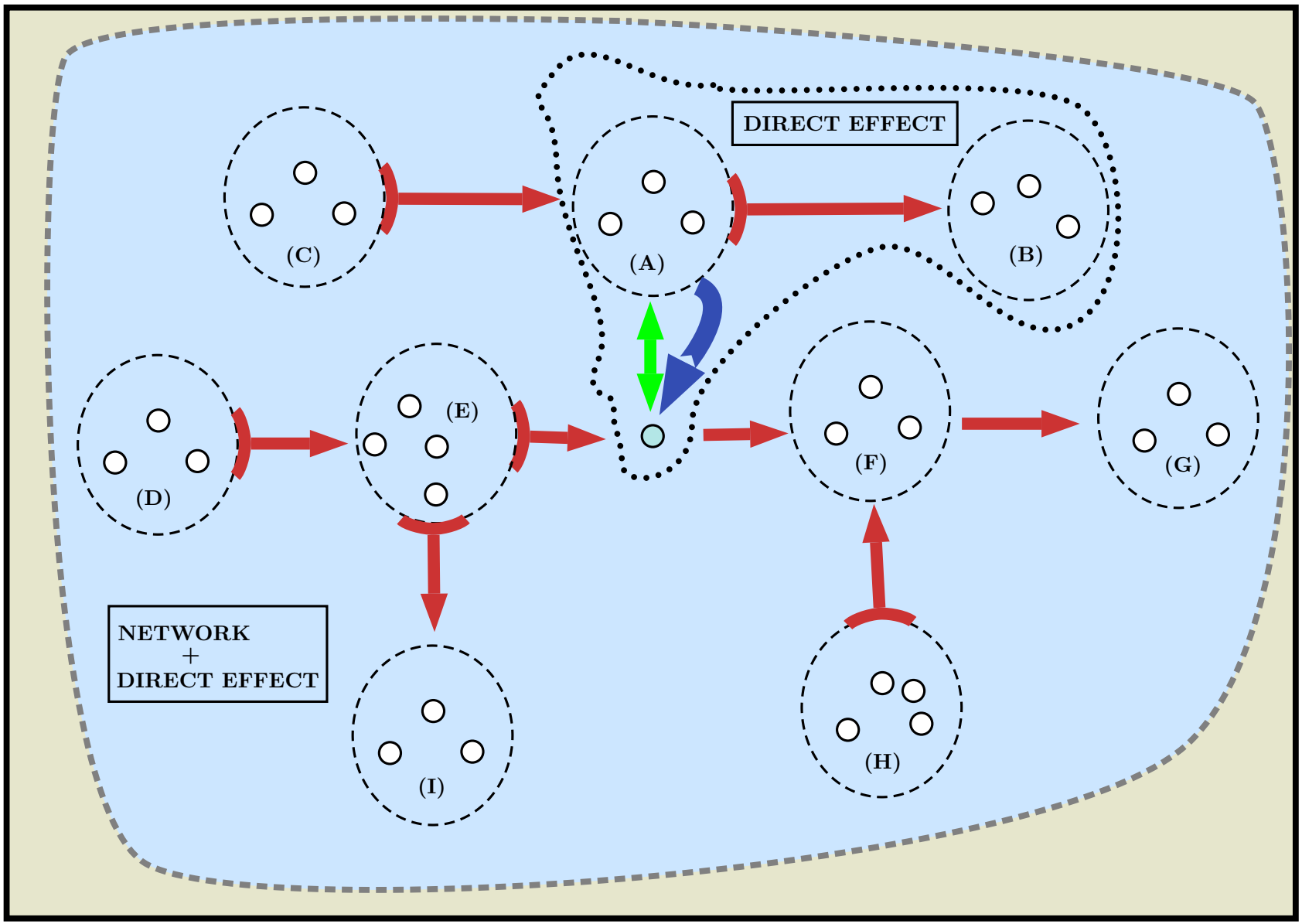



- **Intuition**: if market pressure exists, it must be that only worth-enough ventures stimulate cooperation
- **Proxy** the value of a crime with the average charge (in months) that similar crimes attracted
- Use count ERGM to estimate:

$$\text{intensity of cooperation btw } i \;\; j \;\; = F(\text{value}_i, \text{value}_j, X_i, X_j)$$

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Total Crime (sum) | | **1.330***** | | 0.965*** | |
| | | (0.194) | | (0.144) | |
| Total Crime (abs diff) | | **-1.883***** | | -1.507*** | |
| | | (0.394) | | (0.351) | |
| Drug Trafficking (sum) | | | 10.845*** | | 9.207*** |
| | | | (1.898) | | (1.749) |
| Drug Trafficking (abs diff) | | | -13.154*** | | -12.166*** |
| | | | (3.539) | | (3.535) |
| Acquisitive Crime (sum) | | | 6.506*** | | 5.272*** |
| | | | (1.493) | | (1.424) |
| Acquisitive Crime (abs diff) | | | -3.829 | | -3.246 |
| | | | (2.027) | | (1.928) |
| Violence with Injury (sum) | | | 1.623*** | | 1.310*** |
| | | | (0.243) | | (0.209) |
| Violence with Injury (abs diff) | | | -2.288*** | | -2.010*** |
| | | | (0.475) | | (0.454) |
| Weapons (sum) | | | 11.787** | | 8.790* |
| | | | (4.313) | | (4.027) |
| Weapons (abs diff) | | | -4.874 | | -3.653 |
| | | | (6.285) | | (6.335) |
| Age (abs diff) | -0.043** | -0.040** | -0.042** | -0.036** | -0.035* |
| | (0.013) | (0.015) | (0.014) | (0.013) | (0.014) |
| Density | 0.188 | -0.209 | -0.836*** | -0.269 | -0.778*** |
| | (0.138) | (0.160) | (0.246) | (0.156) | (0.224) |
| Triadic Closure | | | | **0.590***** | **0.499***** |
| | | | | (0.100) | (0.101) |
| Observations | 3,570 | 3,570 | 3,570 | 3,570 | 3,570 |

1. An increment of 1 unit of per-OCGM crime intensity throughout the period raises the odds of cooperation by roughly 3.278 times
2. A comparable increment in the **gap** of crime intensity reduces the odds of collaboration by 6.57
3. **Triadic closure** tests existence of network-based strategic effects. OCGs are 1.80 times more likely to cooperate with an OCG if any of their partners is already collaborating with that OCG.
4. **Disaggregating** for crime classes: relationship holds for given level of intensity
5. Crime typologies diverge in significance and magnitude of effects
   - Theoretical by-product: risk-reward profiles are **heterogeneous** across classes
   - Thin markets: For some classes risk-reward is too weak. Competition act as a leveler. Market forces hinder long-lasting cooperation
   - Thick markets: Drug trade $>$ Weapons $>$ Acquisitive $>$ Violence


DIRECT EFFECT
(A)
(B)
(C)
(D)
(E)
(F)
(G)
(H)
(I)
NETWORK
+
DIRECT EFFECT

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