Decentralization for cost-effective conservation

Paper by Somanathan, Prabhakar, Mehta, (PNAS, edited by Elinor Ostrom)

Motivation

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- In 1930, after long protests, council managed forest areas were allowed
- What were the long term consequences?

Comparing costs between village-council managed forests and state forests

'The cost of administration in state forests is > 7 times as much as in council forests, reflecting the absence of bureaucracy in the councils and their greater flexibility in hiring watchmen.'

Comparing crown cover

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- Historical evidence: state forest lands had more cover
- Data collected on 217 villages and adjoining forests in 10 different areas
- Bottom line of paper: 'Village council management costs an order of magnitude less per unit area and does no worse, and possibly better, at conservation than state management.'

Matching methods

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- Matching method also used, we illustrate

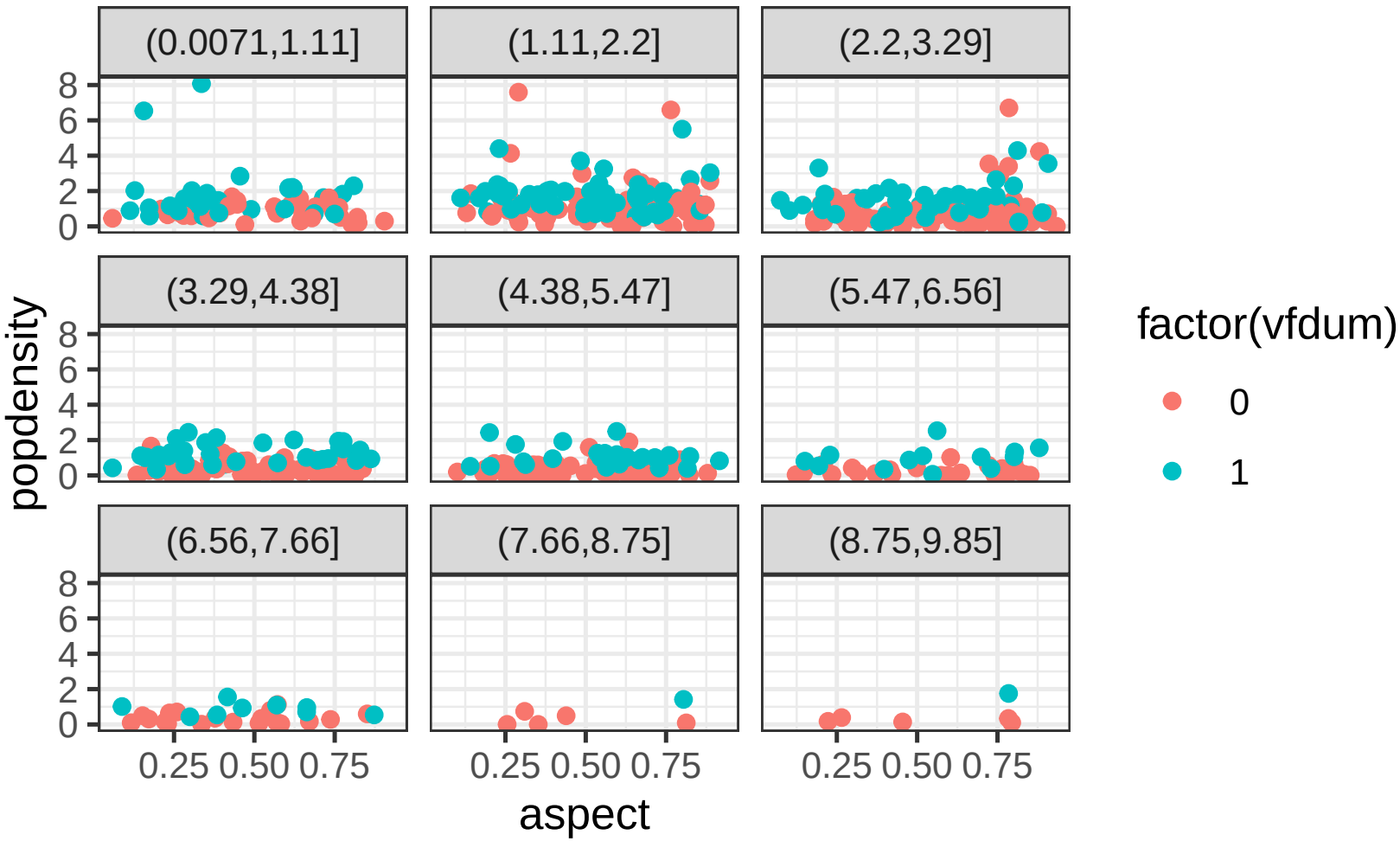
Variables

ccbl	vfdum	aspect	popdensity	Nstock
33.39	0	0.27	0.73	1.07
97.63	0	0.29	0.24	2.15
59.50	1	0.60	1.33	1.99
19.66	1	0.61	2.14	0.49
28.98	0	0.63	1.49	1.95
59.28	0	0.65	0.56	1.11
76.19	0	0.72	1.00	1.60
93.82	0	0.74	0.27	1.58
97.26	0	0.80	0.67	6.39
96.15	0	0.81	0.09	3.42

Balance

```
ggplot(frd3, aes(x = aspect, y = popdensity,
                 col = factor(vfdum))) +
  geom_point() +
  facet_wrap(~ factor(cut(Nstock,9))) +
  theme_bw()
```

Balance

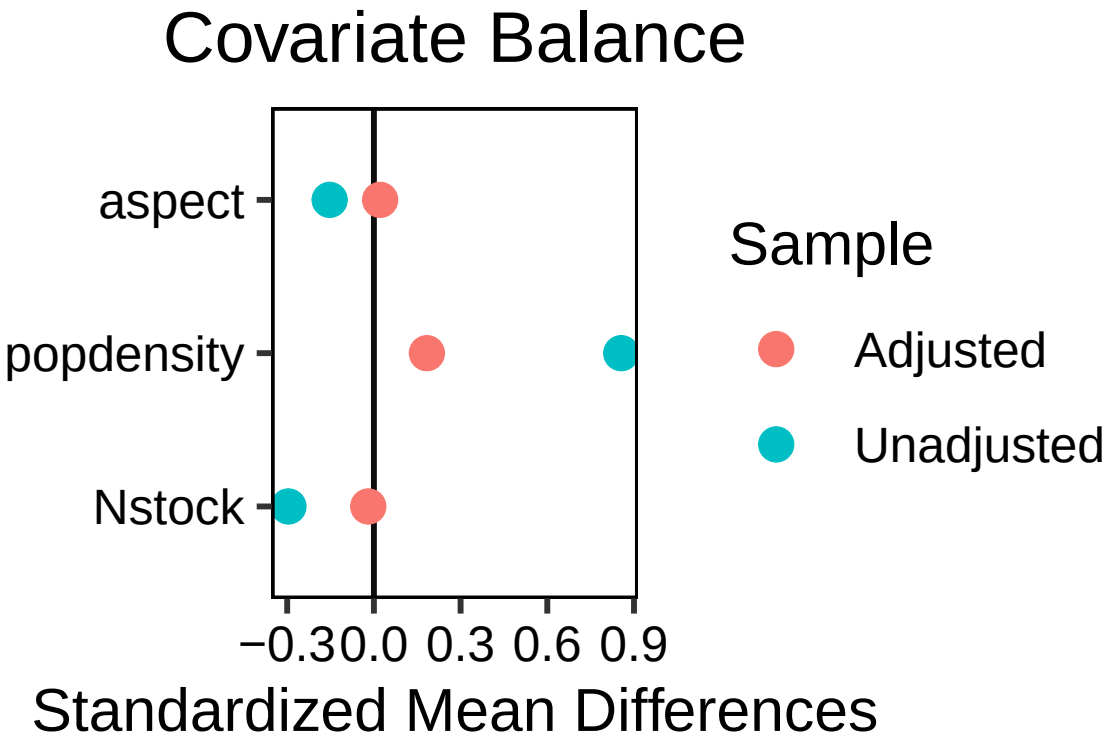

(0.0071,1.11]
(1.11,2.2]
(2.2,3.29]
(3.29,4.38]
(4.38,5.47]
(5.47,6.56]
(6.56,7.66]
(7.66,8.75]
(8.75,9.85]
popdensity
0
2
4
6
8
0.25 0.50 0.75
aspect
factor(vfdum)
0
1

Matching

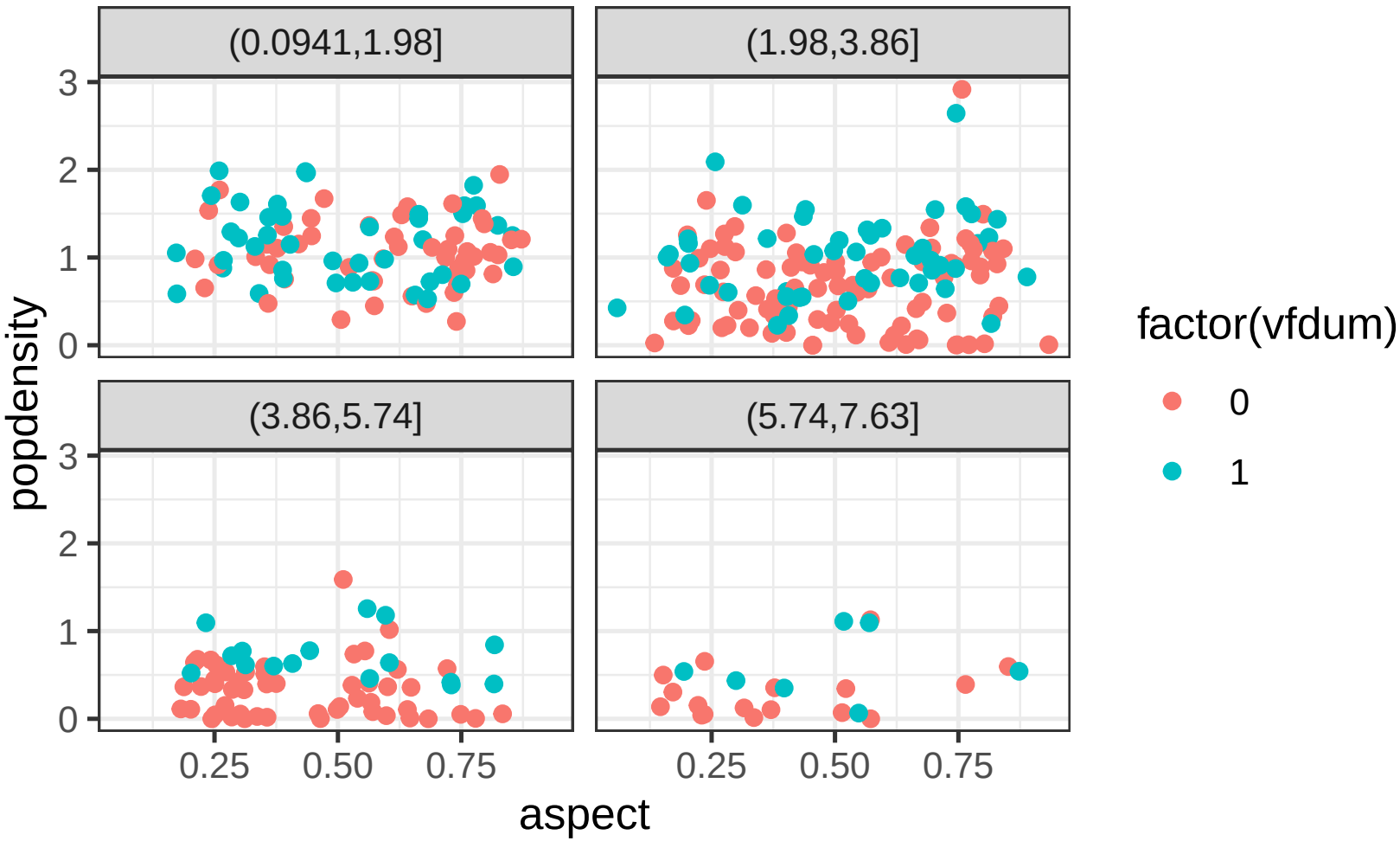
```
library(MatchIt)

bl_match_cem <- matchit(vfdum ~ aspect +
           popdensity + Nstock,
           method = "cem",
             discard = "treat" ,
           data = frd3)
matched_cem<- match.data(bl_match_cem)
```

```r
library(cobalt)
love.plot(bl_match_cem, drop.distance = TRUE)
```


Covariate Balance
aspect
popdensity
Nstock
−0.3
0.0
0.3
0.6
0.9
Standardized Mean Differences
Sample
Adjusted
Unadjusted

Post-match or pruned data



Reduce extrapolation beyond support of data, model dependence

	Model 1	Model 2	Model 3	Model 4
(Intercept)	42.73^{***}	48.12^{***}	56.90^{***}	58.84^{***}
	(3.00)	(3.18)	(4.79)	(5.28)
vfdum	-5.63^{**}	-1.94	-0.25	0.03
	(1.85)	(2.00)	(2.44)	(2.46)
aspect	28.03^{***}	28.80^{***}	24.55^{***}	24.43^{***}
	(3.77)	(3.71)	(5.40)	(5.41)
popdensity	-2.49^{*}	-11.29^{***}	-13.56^{***}	-18.47^{**}
	(0.99)	(2.17)	(2.56)	(6.20)
Nstock	6.05^{***}	5.53^{***}	4.67^{***}	4.55^{***}
	(0.46)	(0.47)	(0.77)	(0.78)
popdsq		1.60^{***}		2.55
		(0.35)		(2.93)
Num. obs.	582	582	322	322

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table: Statistical models