Epidemiological and Economic Effects of Lockdown

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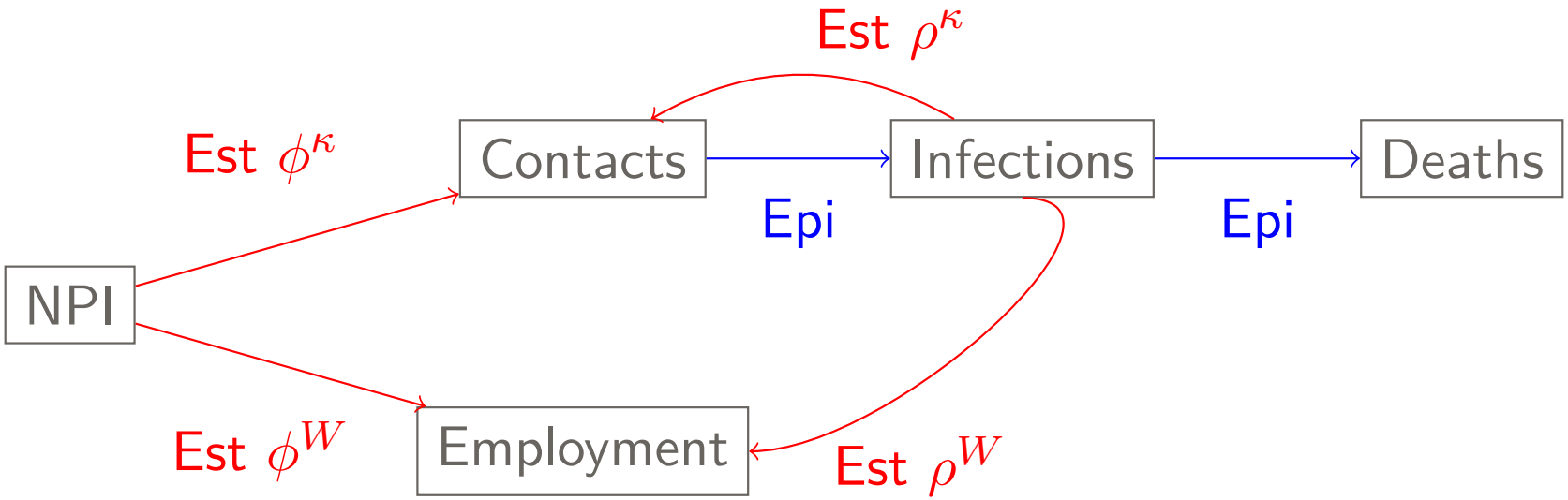
How effective are NPIs?

- How effective are NPIs in saving lives?
- And what are their costs in terms of employment?
- Impressive use of micro data and integrated approach to separately identify the effect of NPIs from behavioral response

An integrated approach



- Explicit modeling of behavioral response
- Diff in diff approach to estimate direct effects of NPIs and fear on contacts
- Integrate estimates with EPI model to evaluate effects on deaths

Main Findings

- Local NPIs explain small fraction decline in contact rates
- NPI in US avoided 33000 deaths (30%) during first 3 months of COVID
- Business closures least effective of NPIs

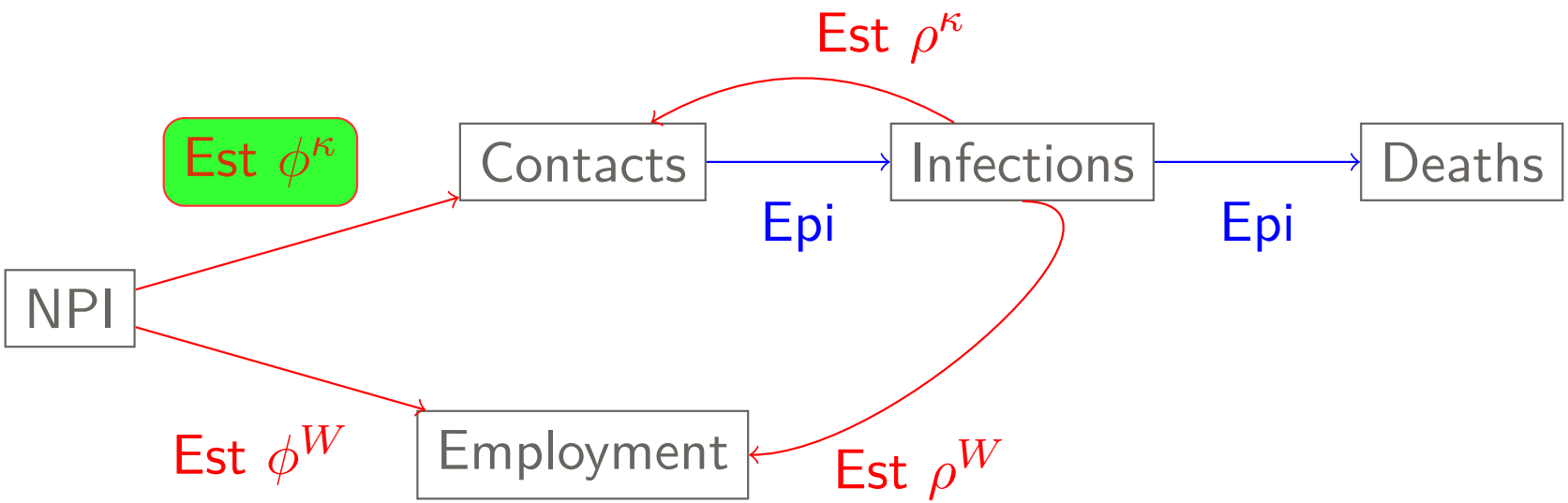
The effects of NPI: international studies

- Flaxman et al. (Nature 2020) and Hsiang et al. (Nature 2020) study effects of NPIs in various countries using similar methodology
- Both find very large effects:

	This paper	Hsiang		Flaxman
	deaths	cases		deaths
	US	US	Italy	Europe
Cases Averted	0.3	13	16	23
(Ratio to actual)				

- Why such a large difference? Very Important Question!

Outline of Discussion



- Comments on estimation of ϕ^{κ}: role of heterogeneity in local responses

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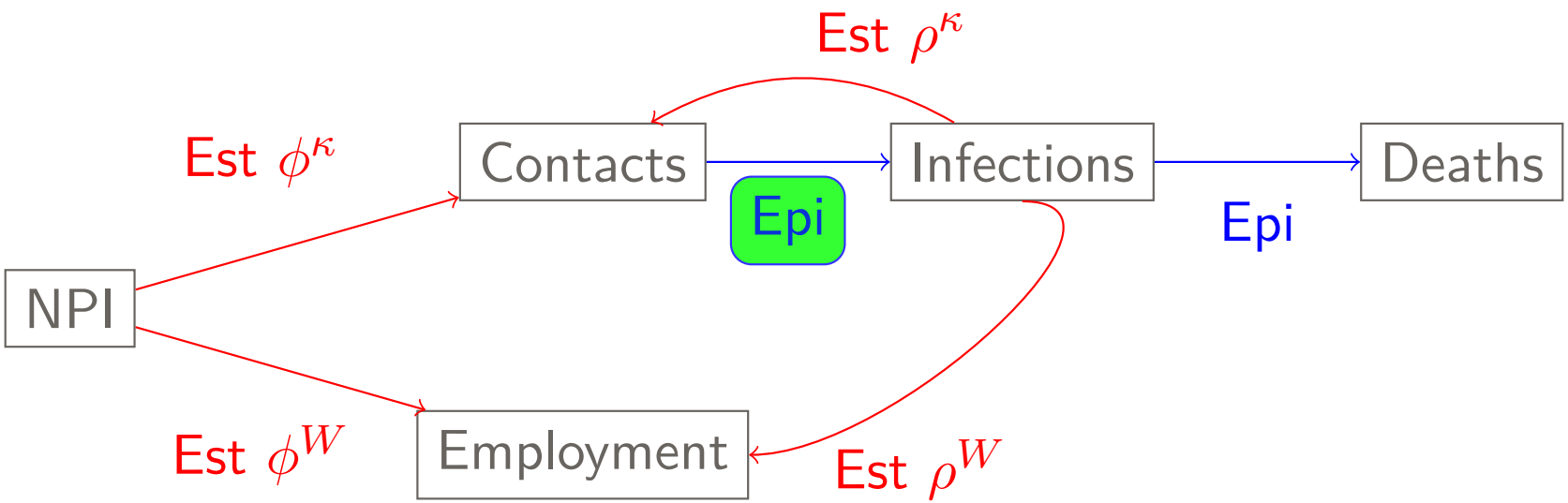


- Comments on EPI model: role of heterogeneity in type of contacts

Comments on the Estimation of ϕ^{κ}

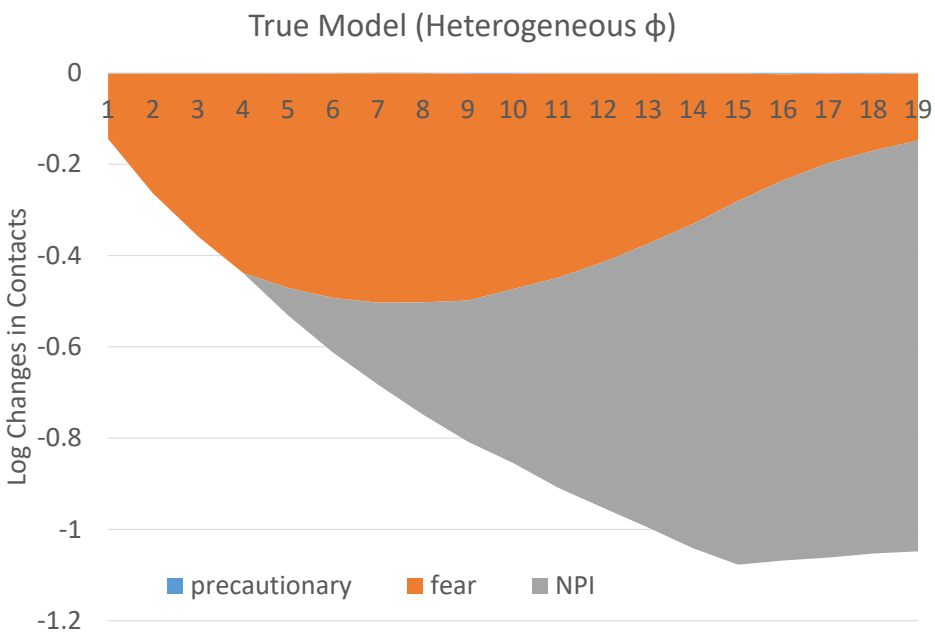
- Why heterogeneity in local responses matters

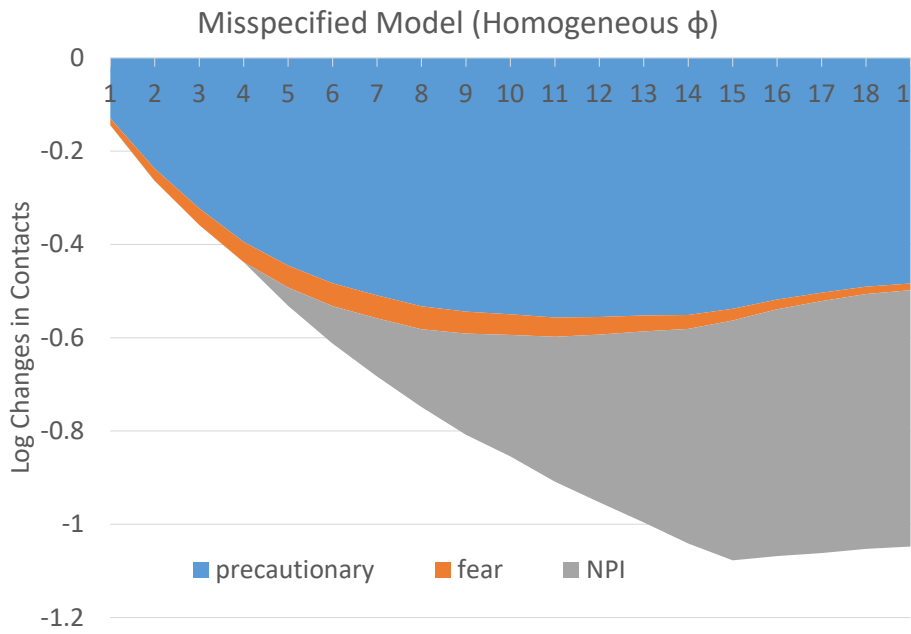
$$\ln(\kappa_{it}) = \omega_t X_i + \phi_i P_{it} + \rho c_{it} + \nu_{it}$$

$$c_{it+1} = \gamma \ln(\kappa_{it}) + \delta c_{it} + \epsilon_{it}$$

- Impact of NPI ϕ_i is heterogenous across locations
- NPIs introduced at random times after period 5
- True Model: $\omega_t = 2$ (No time varying precautionary motive), $\phi_i \sim U[-3, 0]$, $\rho = -0.8$,$\delta = 0.95$
- If no heterogeneity in ϕ_i, OLS estimates recover true parameters

Decomposition of decline in contacts





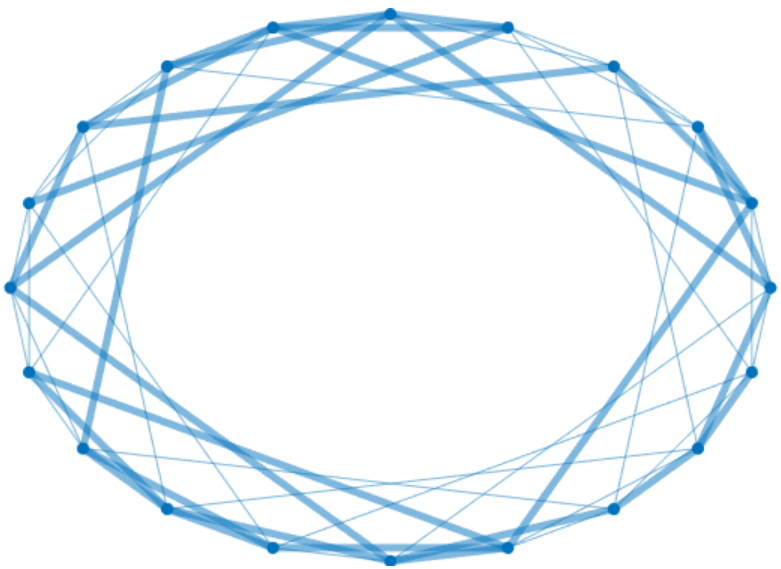
- If location i and j have same policies but different declines in contacts. Model tries to fit differences by increasing precautionary motive (which varies with location characteristics) and lowering estimates of ϕ
- If effects of NPIs are heterogeneous and they are estimated with a homogeneous model, their effect substantially underestimated $(-1.5- > -0.9)$

Why heterogeneity in local responses?

- Differences in compliance and enforcement
- Differences in initial number of contacts

A network model of contacts and NPIs

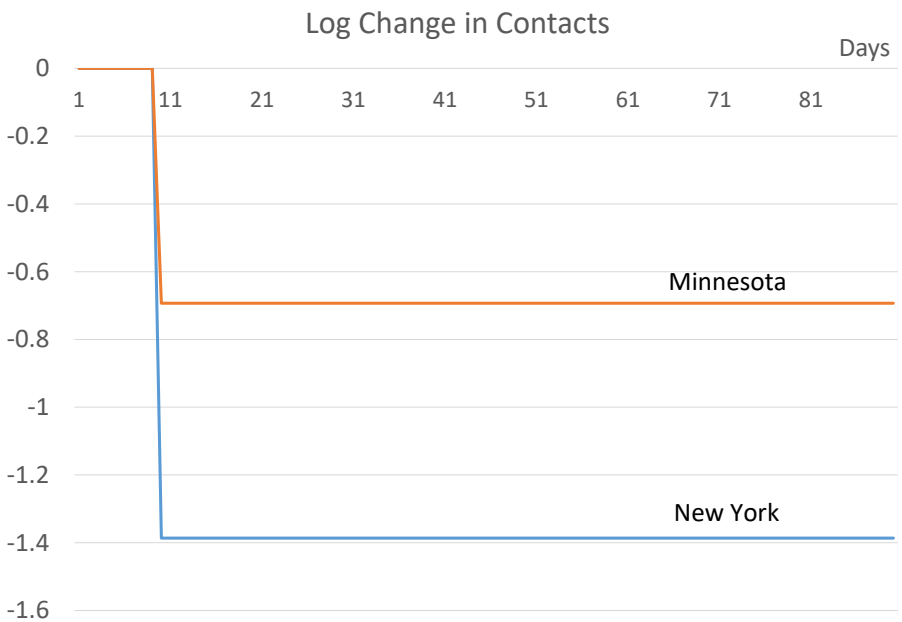
- Network:
  - set of M nodes
  - set of edges connecting nodes (MxM symmetric matrix G of 0/1)
- Each node/person has health status
- Evolution of health status depends on health and economic status of connections

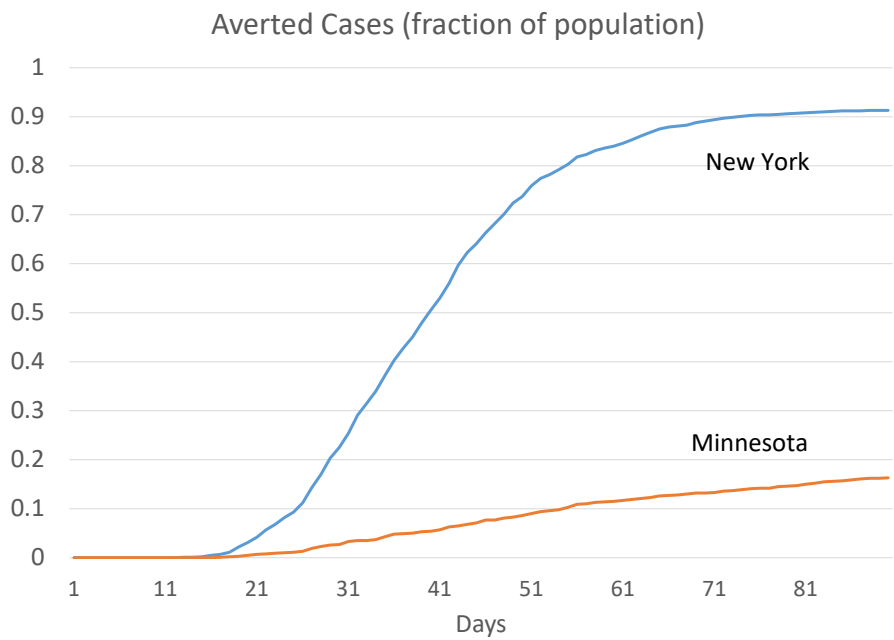


Experiment

- Start network with 99.9% of nodes susceptible, 0.01% infected
- Location 1 (New York): 8 active contacts per node
- Location 2 (Minnesota): 4 active contacts per node
- Both locations adopt stay at home order which bring number of active contacts to 2
- Key: same policy implies different reduction in contacts!

Same policy, very different impacts!

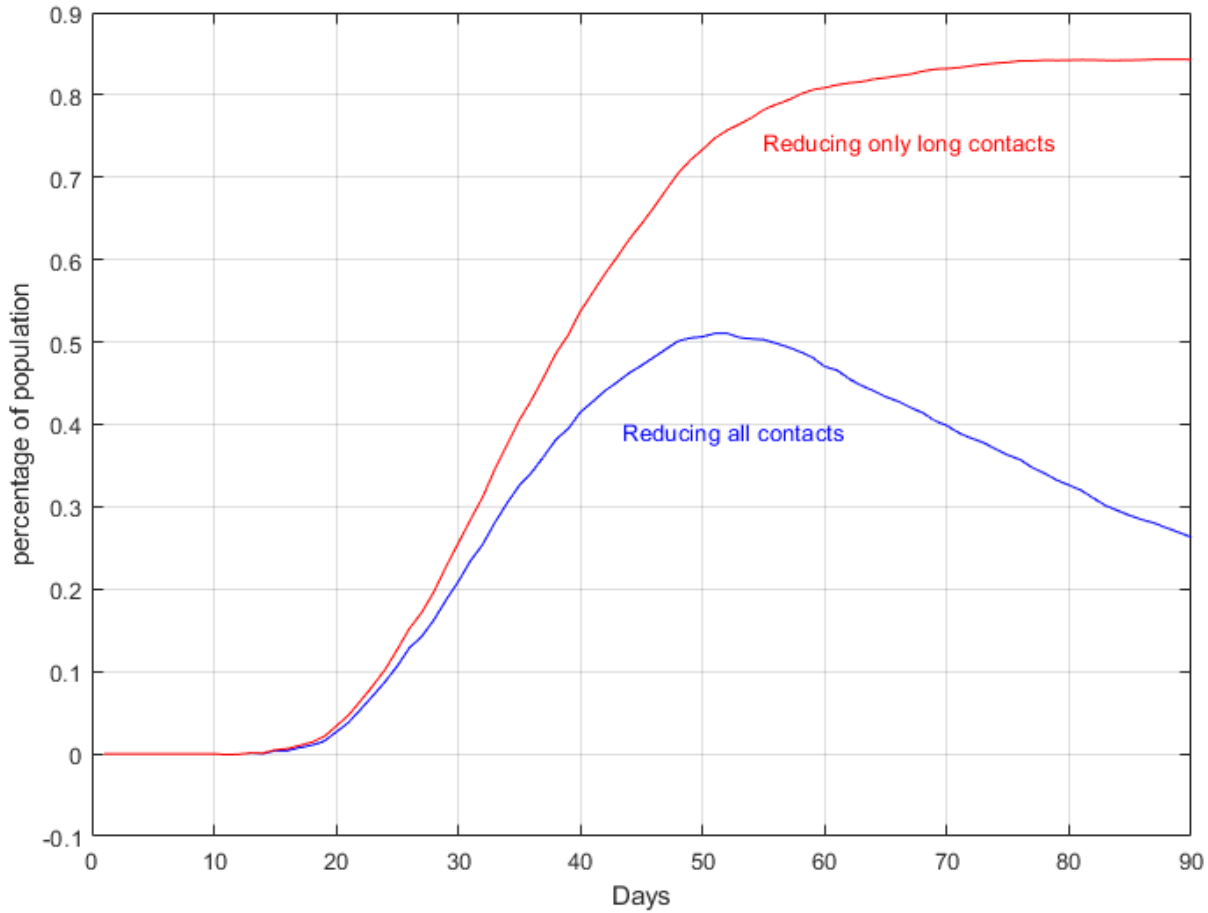




Comments on the EPI model

- Why heterogeneity in type of contacts matters
- Paper assumes all contacts have same effect on infections
- Network analysis suggest heterogeneity in how contacts impact infections (Azzimonti, Fogli, Perri and Ponder 2020)
  - Contacts with small group of close nodes have little impact on infections
  - Random contacts with far away nodes have very large impact

Differential impact of infections from cutting same number of contacts



- Even if some NPI have small effect on contacts (i.e. non essential business closures), they might have large impact on infections

Conclusions

- Important paper that challenges consensus view on NPI
- Consensus view: NPI have large impact
- This paper: Impact much more limited
- +: allow for behavioral responses
- -: does not allow for heterogeneity