The role of landowner behaviour in agglomeration payments for biodiversity conservation

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Introduction

Compensation payments for voluntary biodiversity conservation measures on private lands play an increasing role in Europe and other parts of the world

Agglomeration payments provide incentives to agglomerate habitats in space (Parkhurst et al. 2002, Parkhurst/Shogren 2007,2008, Drechsler et al. 2010)

The cost-effectiveness of the agglomeration payment compared to spatially homogenous payments depends on the existence of side payments among landowners (Drechsler et al. 2010)

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Introduction

Side payments require cooperative behaviour of landowners

I use results from game theory to model the cooperative behaviour of landowners and the side payments among them

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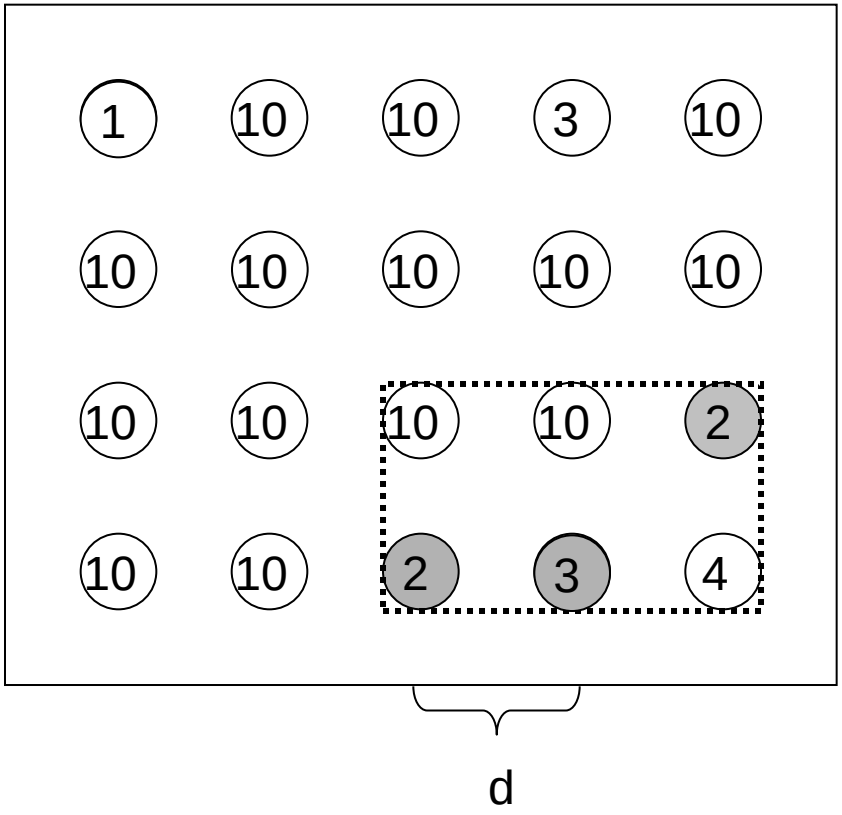
The agglomeration payment



Payment of p=2.6€

generate in an arbitrary landscape compartment
a habitat density λ is reached
For instance, λ > 3 patches / ($2d^2$)

Land users maximise their total profit
$\Pi=(p-c_1)+(p-c_2)+\ldots+(p-c_N)$
(N: Number of participating patches)

=> Land users generate the desired habitat network. The required budget is B=7.8€

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The agglomeration payment

The budget-effectiveness of the agglomeration payment compared to spatially homogenous payments depends on three effects (Drechsler et al. 2010):

- the connectivity effect
- the patch selection effect
- the surplus transfer effect

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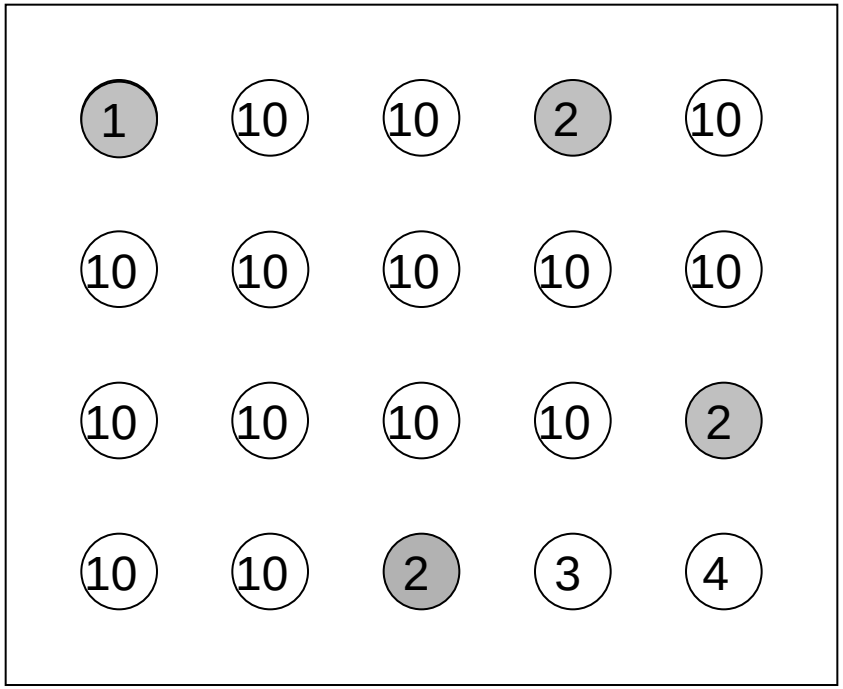
The agglomeration payment

1. The connectivity effect



Homogenous payment p=2.6€

Cost: 7 Euros
Benefit: Low spatial connectivity

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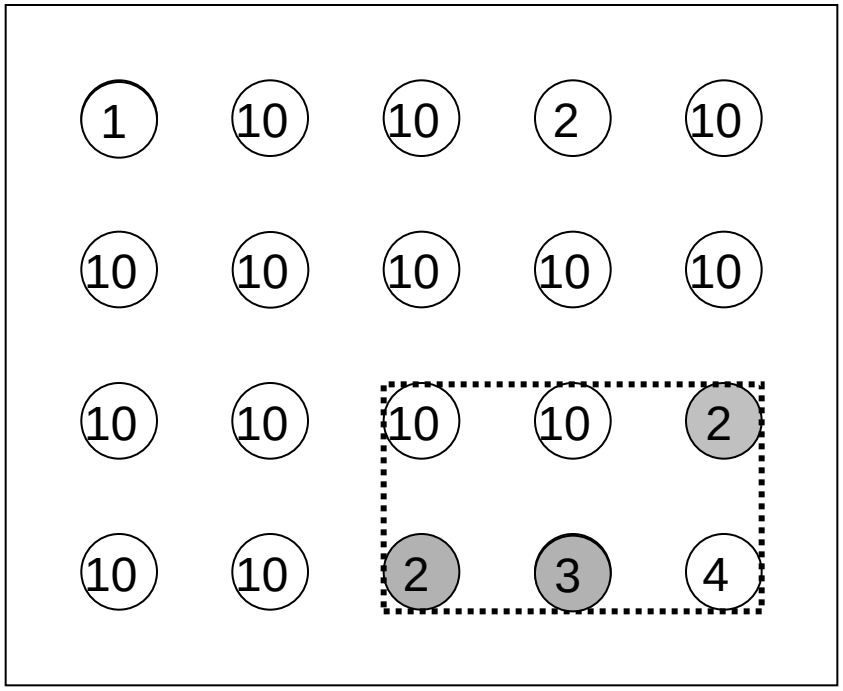
The agglomeration payment

1. The connectivity effect



Agglomeration payment p=2.6€

Cost: 7 Euros
Benefit: high spatial connectivity

Connectivity effect:
increases budget-effectiveness of agglomeration payment

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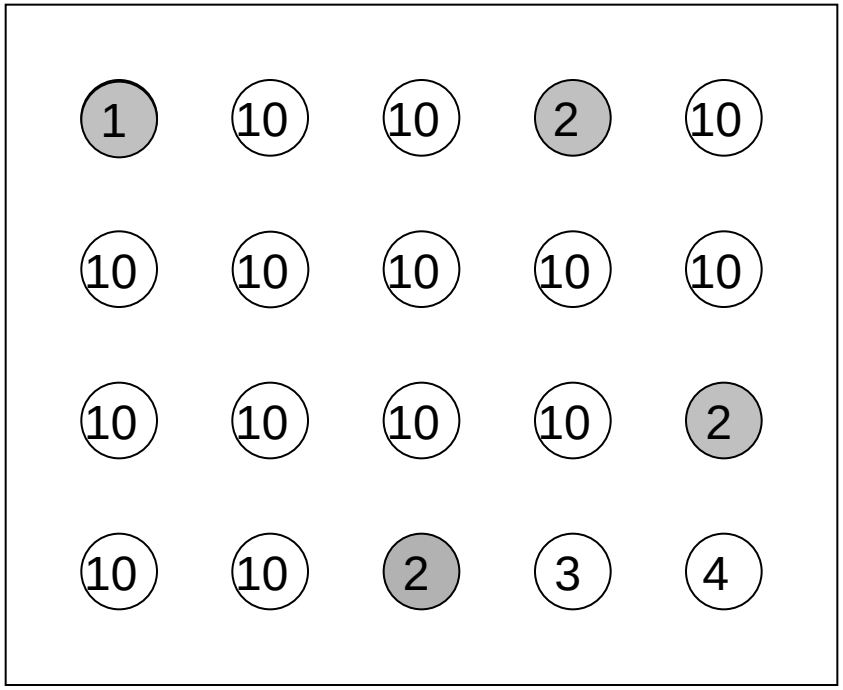
The agglomeration payment

2. The patch selection effect



Homogenous payment p=2.6€

Cost: 7 Euros
Benefit: 4 habitats

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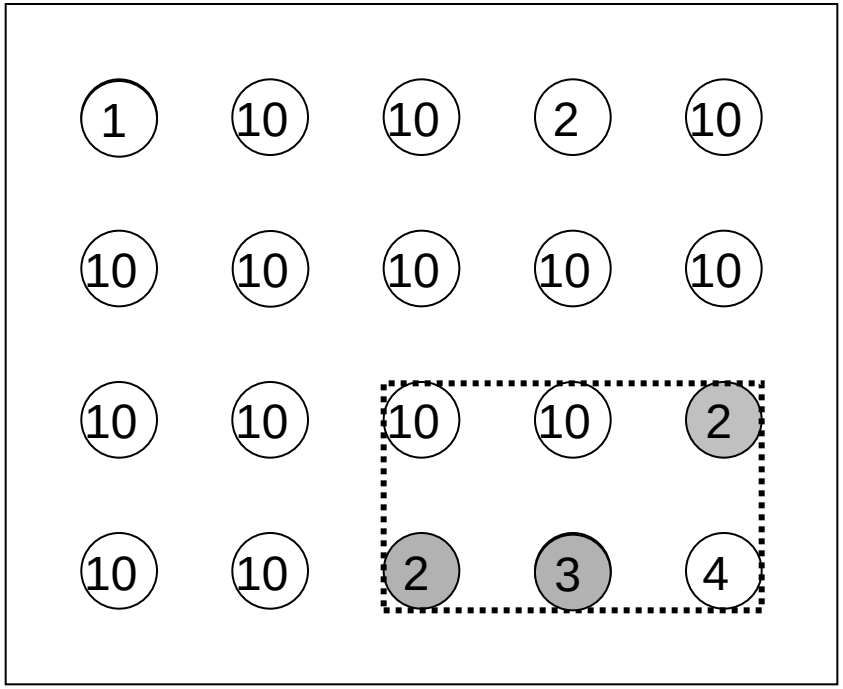
The agglomeration payment

2. The patch selection effect



Agglomeration payment p=2.6€

Cost: 7 Euros
Benefit: 3 habitats

Patch selection effect:
decreases budget-effectiveness of agglomeration payment

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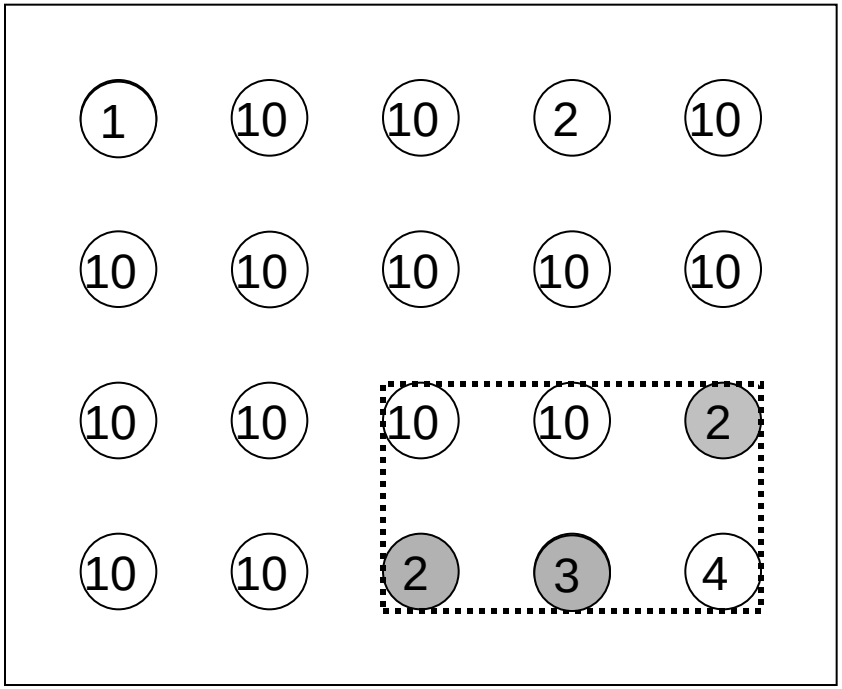
The agglomeration payment

Poor species dispersal and/or low variation in costs:
connectivity effect dominates patch selection effect and agglomeration payment is cost-effective

Good species dispersal and/or high variation in costs:
Patch selection effect dominates connectivity effect and agglomeration payment is not cost-effective

Third effect: surplus transfer effect

The surplus transfer effect



Payment of p=2.6€

Landowners have incentive to offer some of their surplus to high-cost landowner

Reduces overall surplus

Surplus transfer effect:
Increases budget-effectiveness of the agglomeration payment

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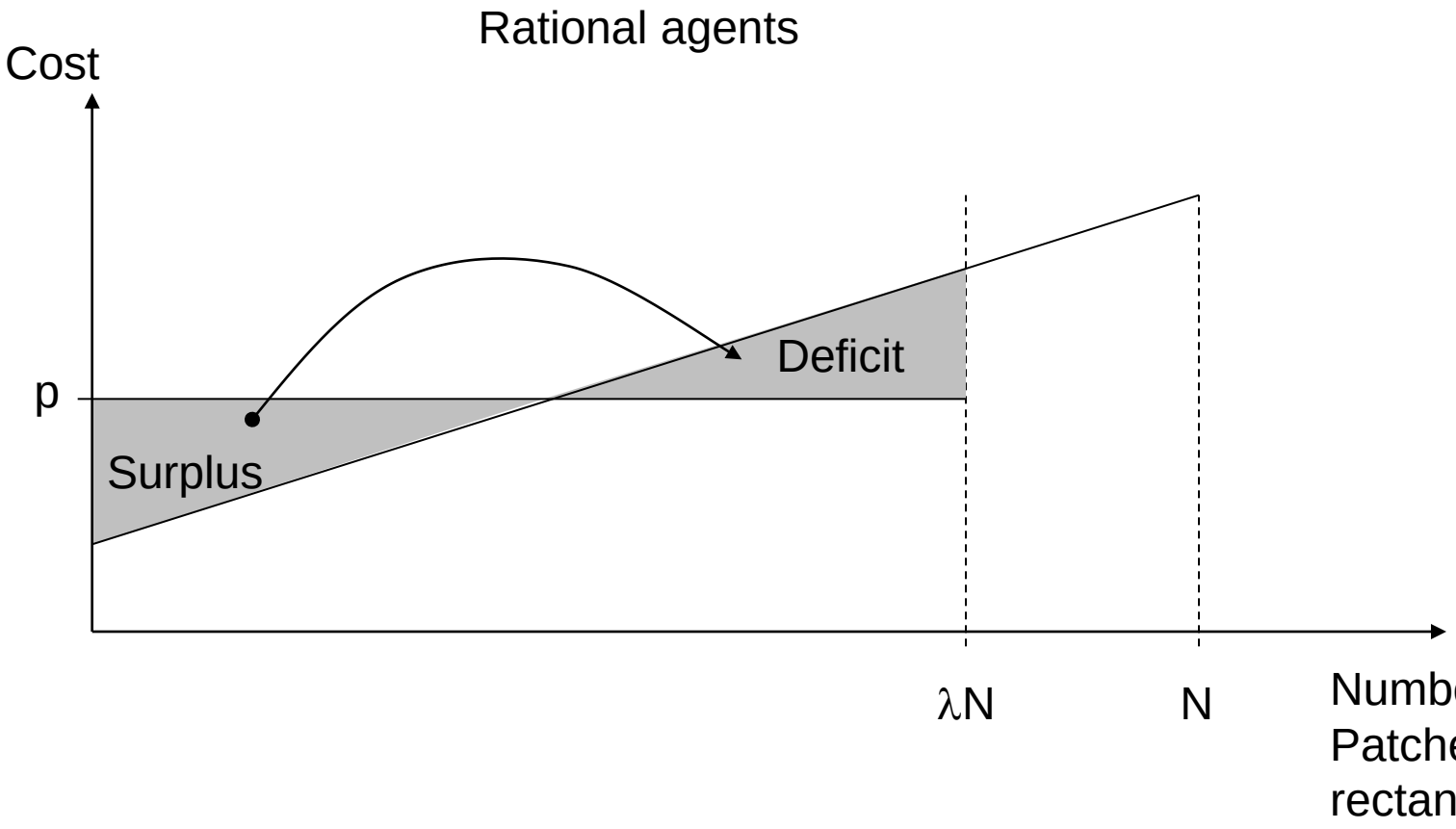
The surplus transfer effect



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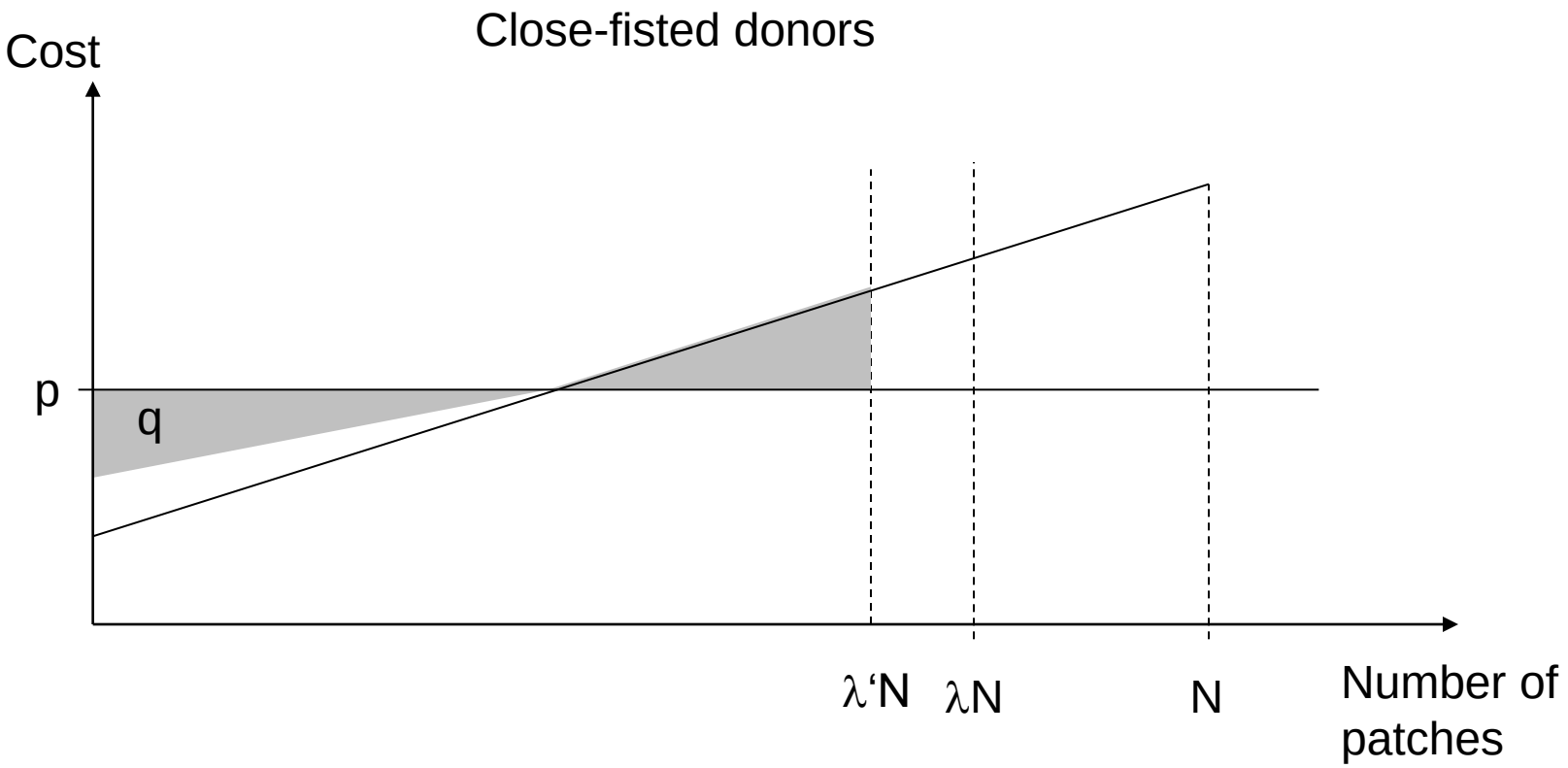
The surplus transfer effect



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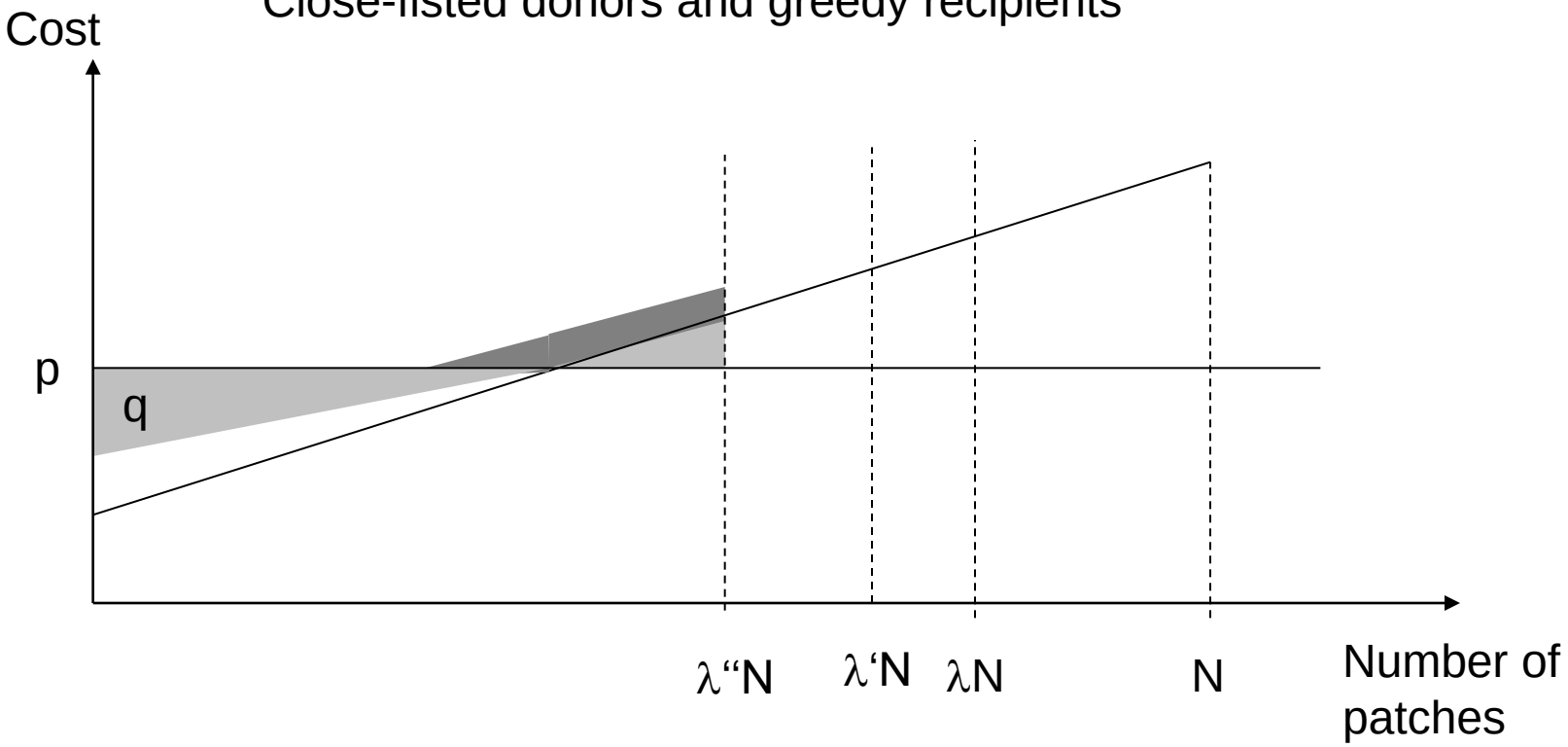
The surplus transfer effect

Close-fisted donors and greedy recipients



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The ultimatum game

Player 1 gets M=100 Euros

He offers qM to player 2

Player 2 accepts offer =>Player 1 keeps (1-q)M and player 2 receives qM
Player 2 refuses offer => both players receive nothing

Acceptance by player 2 depends on evenness (q=0.5)

The ultimatum game in the surplus transfer problem

Player 1: donor landowner
Player 2: recipient landowner

Evenness measured by Gini coefficient Prob(acceptance)=1-αG(q)

q large: generous donors
q small: close-fisted donors

α large: greedy recipients
α small: modest recipients

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The ultimatum game in the surplus transfer problem

Conservation agency:

Maximise expected density of habitat patches for given budget by choosing appropriate magnitudes of

- payment p
- density target λ

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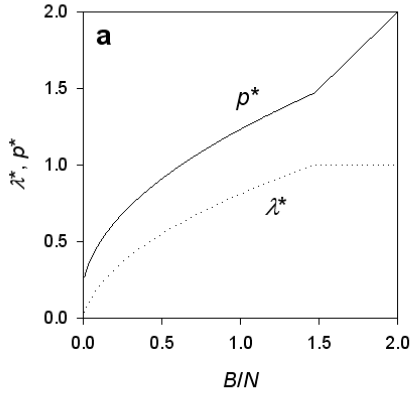
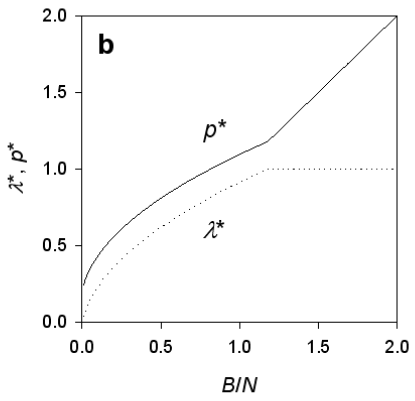
Results general model analysis

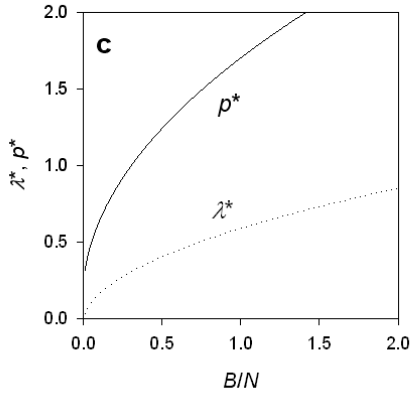
close-fisted/modest



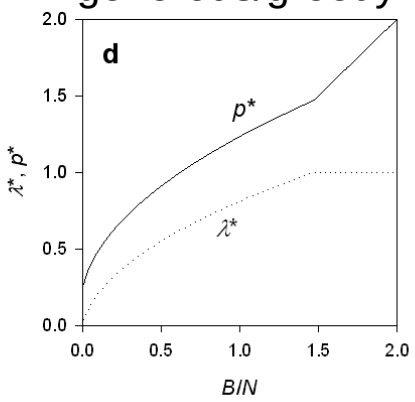
generous/modest



close-fisted/greedy



generous/greedy



Modesty buffers against close-fistedness

Generosity buffers against greediness

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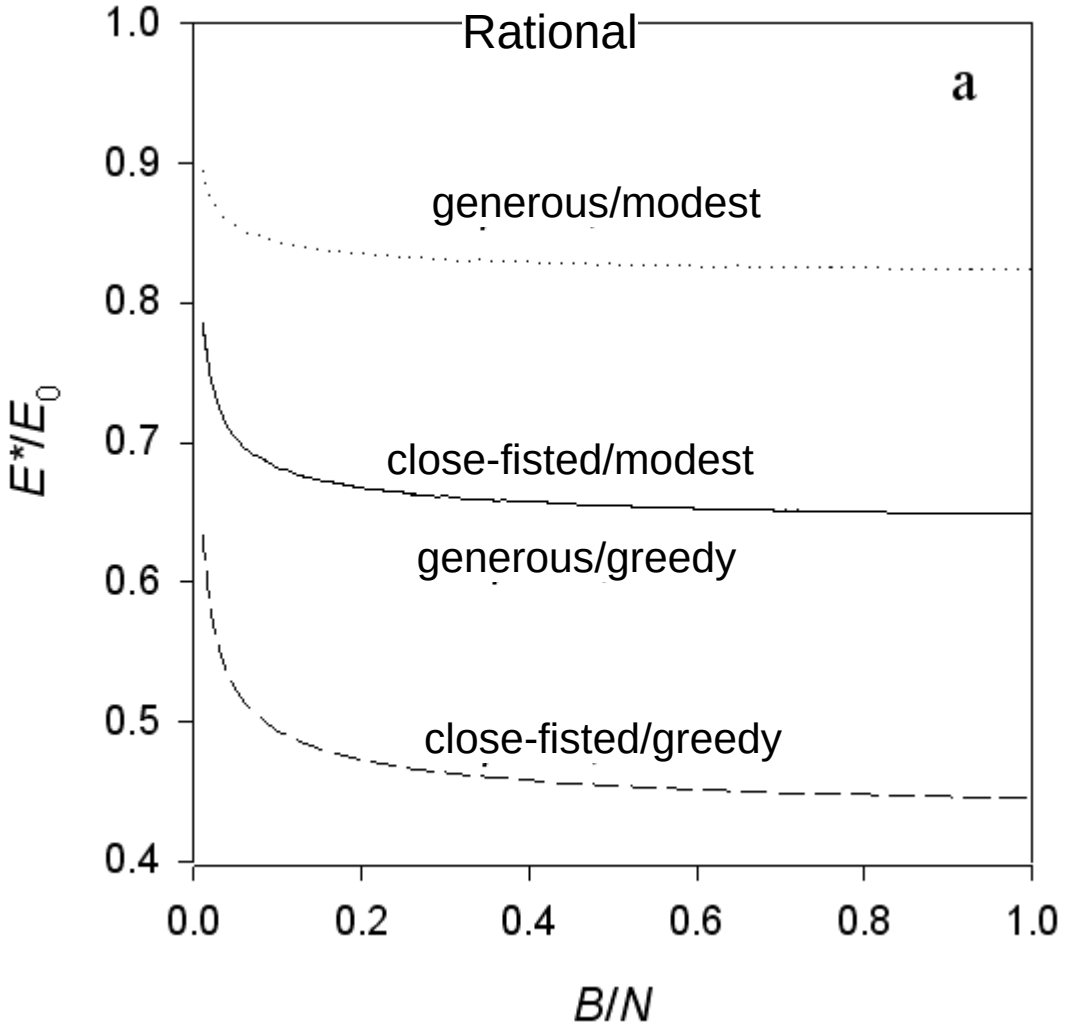
Results general model analysis



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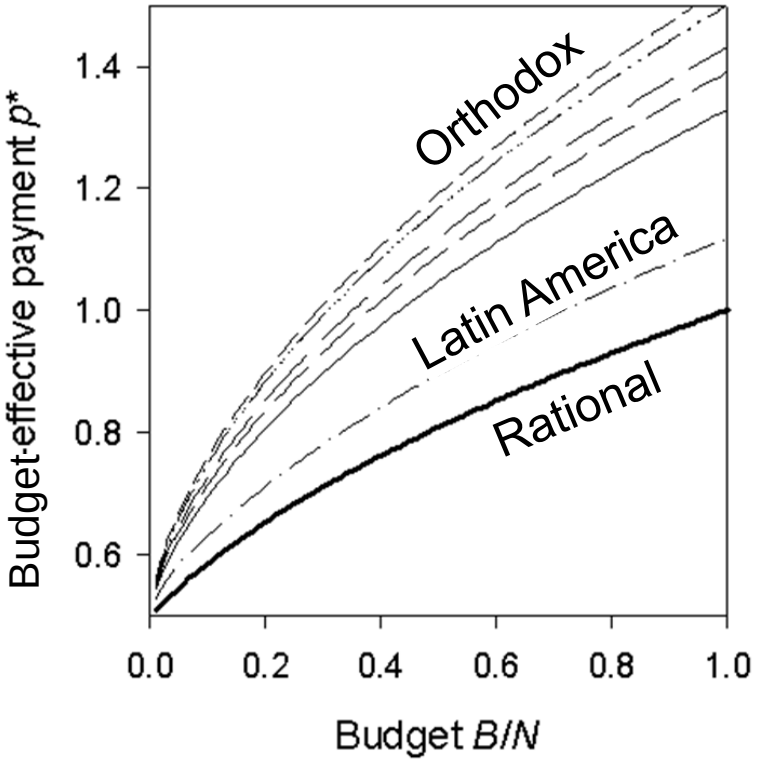
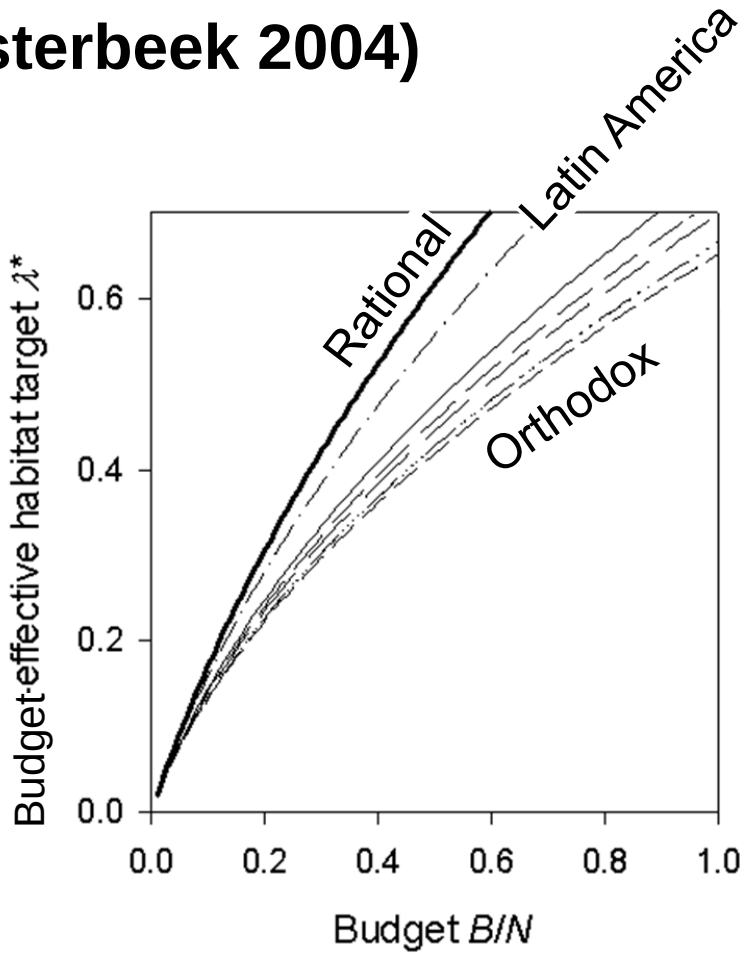
Results real world data
(data from Oosterbeek 2004)





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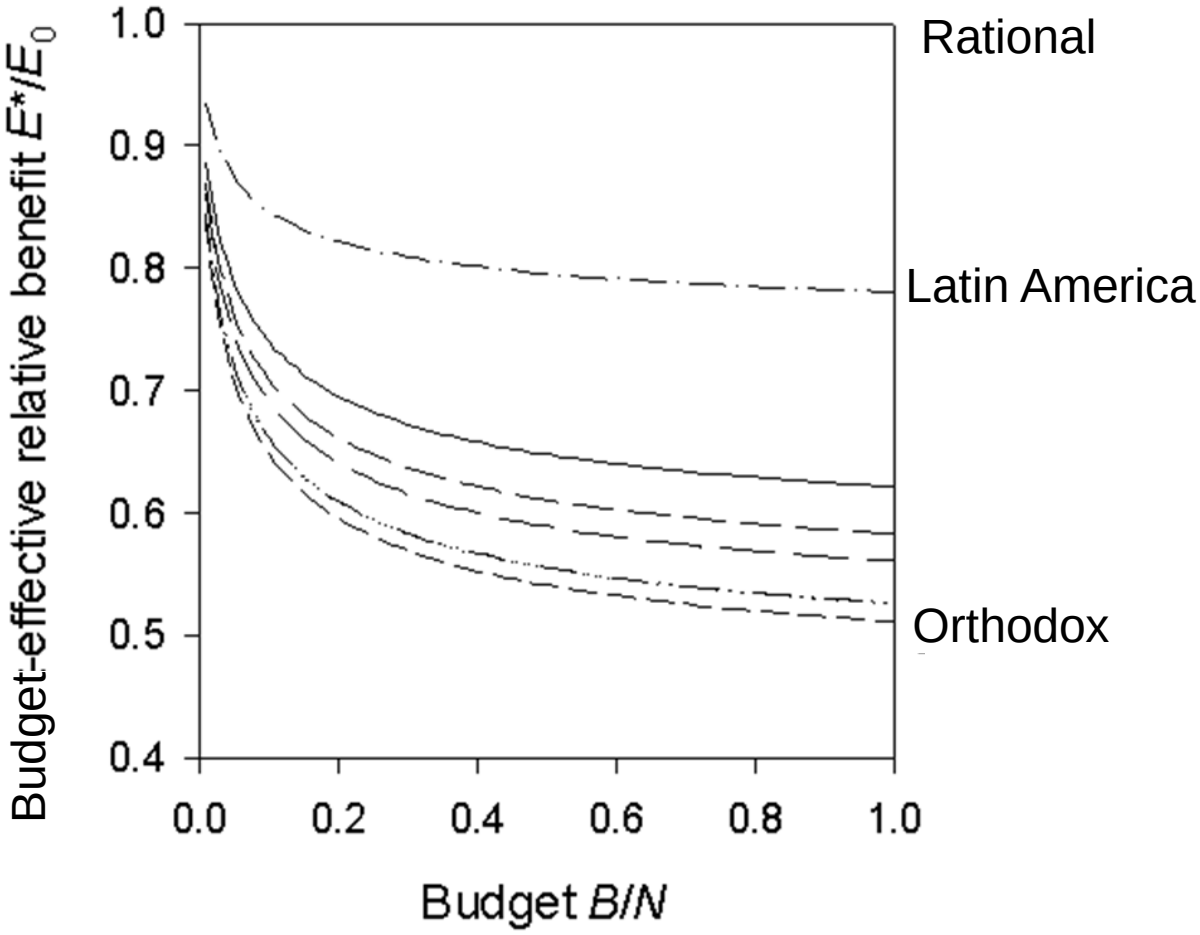

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Summary

- Surplus transfer effect decisive for budget-effectiveness of agglomeration payment
- Surplus transfer effect and budget-effectiveness of agglomeration payment are reduced if players are close-fisted and greedy
- Generosity buffers against greediness and modesty buffers against close-fistedness
- Cost-effectiveness of agglomeration payment strongly reduced in Orthodox countries and close to rational in Latin American countries
- Institutional setting: asymmetric information; earned surplus

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