Estimating Distributional Effects in the Provision of Ecosystem Services
or
Equity and Sustainability

Aliza Fleischer
Daniel Felsenstein

Spring Campus at Freie Universität Berlin 2017

Ecosystem Services (ES)

- An **ecosystem** is a community of living organisms in conjunction with the nonliving components of their environment (air, water, soil), interacting as a system

- Ecosystems in Israel: desert, marine, inland water, Mediterranean region, farmland, urban

- ES: 'the benefits people obtain from ecosystems' (Millennium Ecosystem Assessment, MEA 2003)

- Provisioning (food), regulating (water, climate) and cultural services (recreation)

Evaluation of Ecosystem Services (ES)

- Most ES have no market value

- In the economic discourse they are free of charge

- Valuation methods have been developed in the literature

- The main concern of world and country level assessments is to show the degradation of ES

- Global human population and consumption patterns are well above what can be supported without impairing vital life-support systems

- No reference to spatial and distributional effect of ES

Who benefits from ES?

- public policy geared towards improving the welfare of low-income groups is expected to promote the progressive consumption of ecosystem services

- This means that low-income groups are Rawles-compensated for social deprivation by receiving more ecosystem services than those received by high-income groups

- If this is the case, then the distribution of the ecosystem services should favor the poor

Motivation

- Global concern over change in ecosystems has prompted researchers and policymakers to consider the 'value of ecosystem services' in environmental management decisions

- **The Gap** -> equity implications of the distribution of these services → who benefits more?
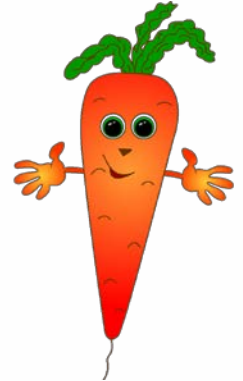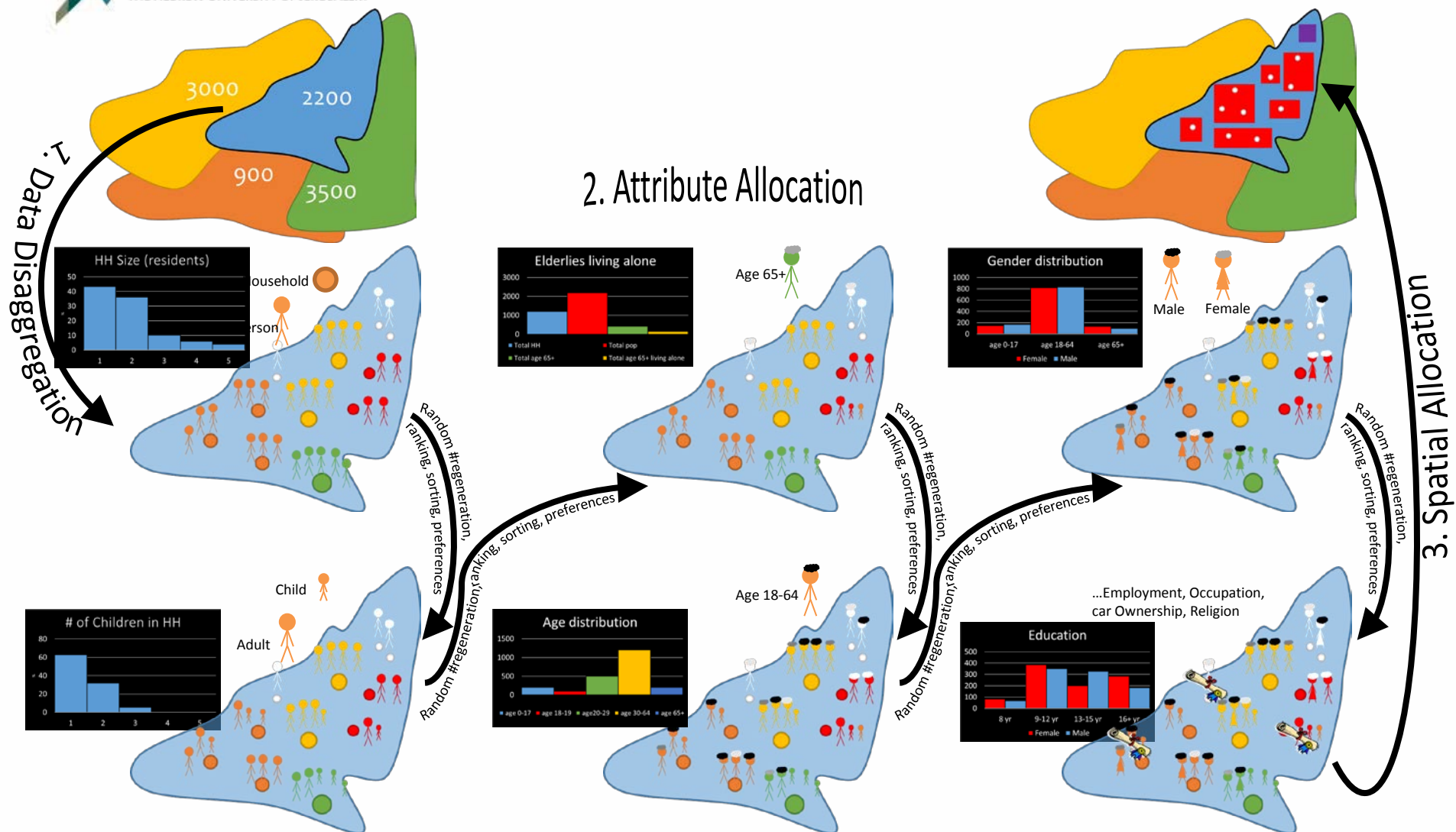
The Aim

- To develop a GIS based system for
  - identifying the main beneficiaries of ES in the population
  - simulating the distributional impacts of policy measure concerning ecosystems
- We focus on recreation services: beaches, urban parks, national parks

Methodology

➢ Accurate population distribution with socio-economic attributes

➢ All data disaggregation is conducted on a national data set of census tracts downscaled to the level of the individual household and geo-referenced to a dwelling unit

➢ Measuring distance to sites with automatic GIS system

➢ Estimate consumer surplus (welfare)

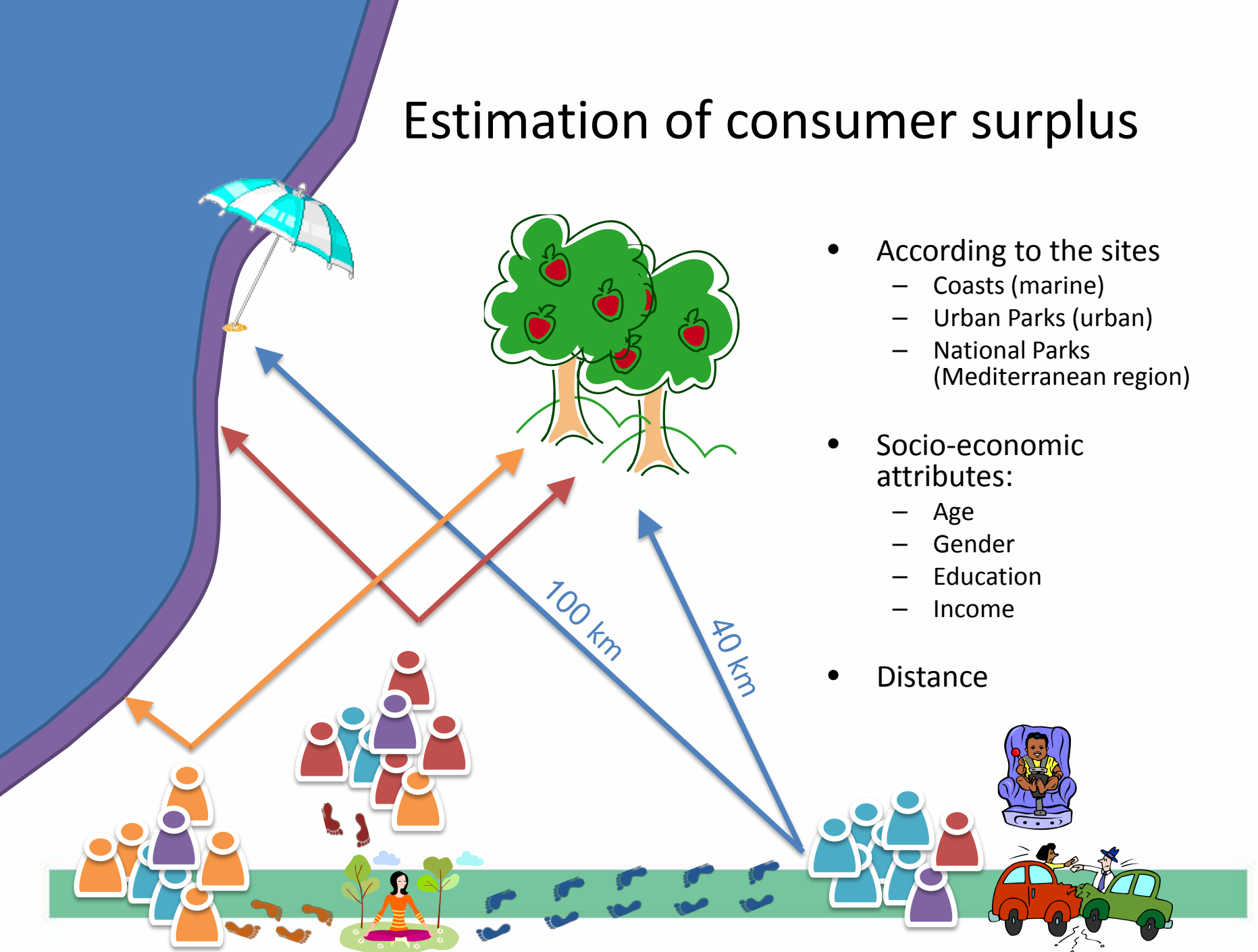➢ Simulate entrance fees scenarios

האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

1. Data Disaggregation

2. Attribute Allocation

3. Spatial Allocation

3000   2200
900   3500

HH Size (residents)

Household

Person

Elderlies living alone

Age 65+

Total HH   Total pop
Total age 65+   Total age 65+ living alone

Gender distribution

Male   Female

age 0-17   age 18-64   age 65+
Female   Male

Random #regeneration, ranking, sorting, preferences

# of Children in HH

Child

Adult

Age distribution

Age 18-64

...Employment, Occupation, car Ownership, Religion

Education

age 0-17   age 18-19   age20-29   age 30-64   age 65+

8 yr   9-12 yr   13-15 yr   16+ yr
Female   Male

Random #regeneration, ranking, sorting, preferences

National Park

UparksPoly

Streets and Roads

HH Educaltion

Very low

Low

Medium

High

Very High

Estimation of consumer surplus

- According to the sites
  - Coasts (marine)
  - Urban Parks (urban)
  - National Parks (Mediterranean region)

- Socio-economic attributes:
  - Age
  - Gender
  - Education
  - Income

- Distance

100 km

40 km

Estimation of benefits

1. Estimation of consumer surplus is based on Fleischer and Tsur (2003)

   $U_{mj} = x_{mj}\beta - \rho c_{mj} + \xi_{mj};\ m = 1,2,...,M;\ j = 1,2,....,J_m$
   represents the utility an individual derives from visiting site j in ecosystem type m, where x_{mj} is a vector of individual site characteristics, c_{ij} is the travel cost, and J_m the number of sites in ecosystem type m

2. Estimation of aggregate utility value

3. Probability of visiting each type of recreational site

4. Calculation of consumer surplus for each household

5. Disaggregation of utility by socio-economic groups

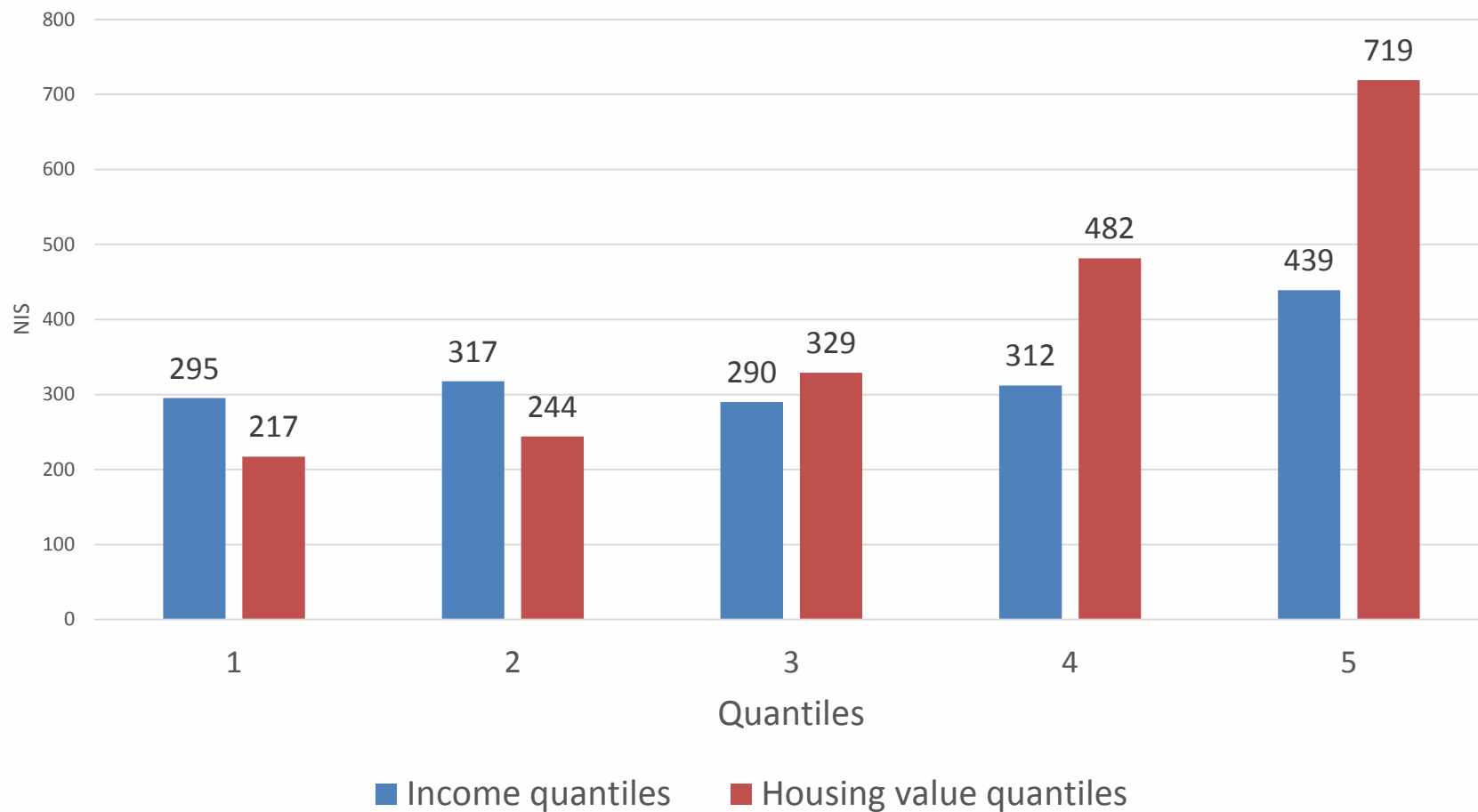# Annual average household benefits (NIS) by statistical area
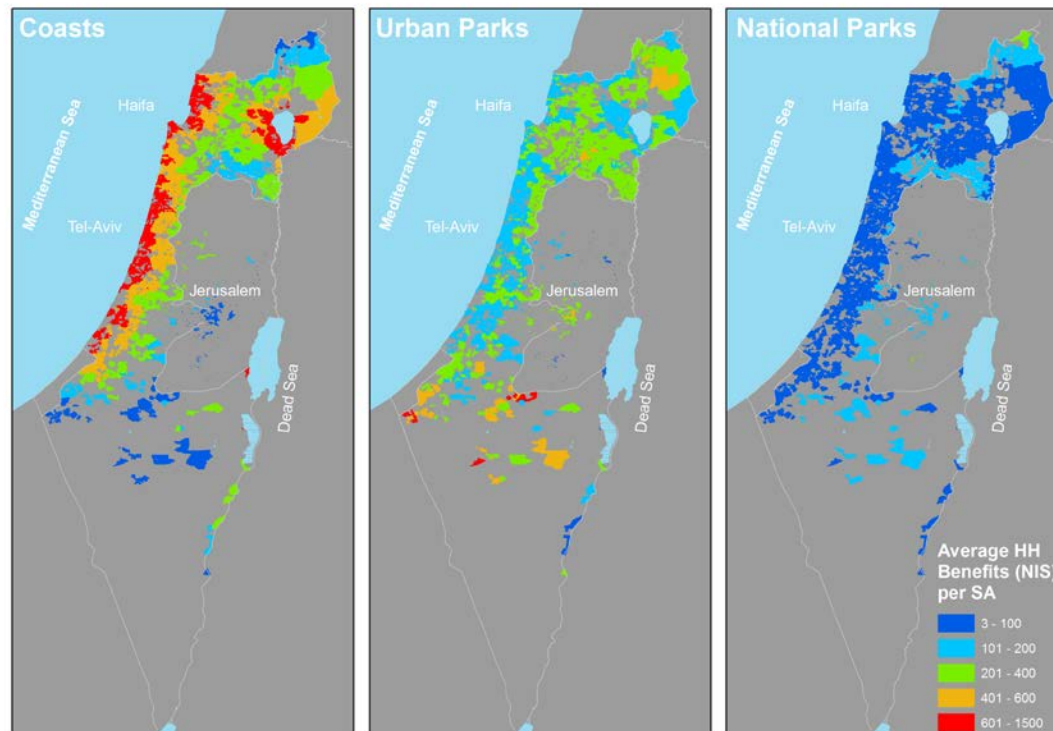
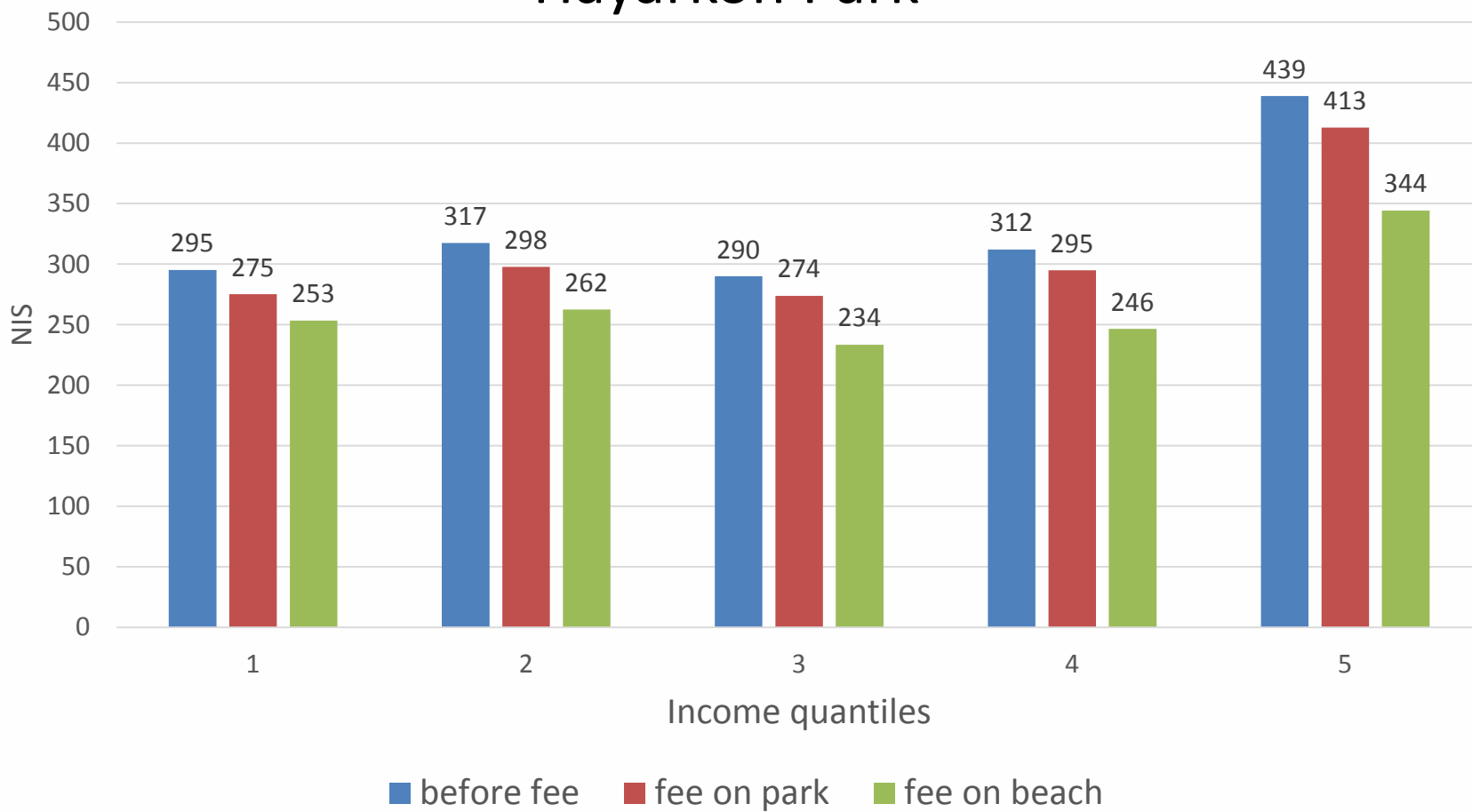# Total annual benefits per statistical area (thousand NIS)
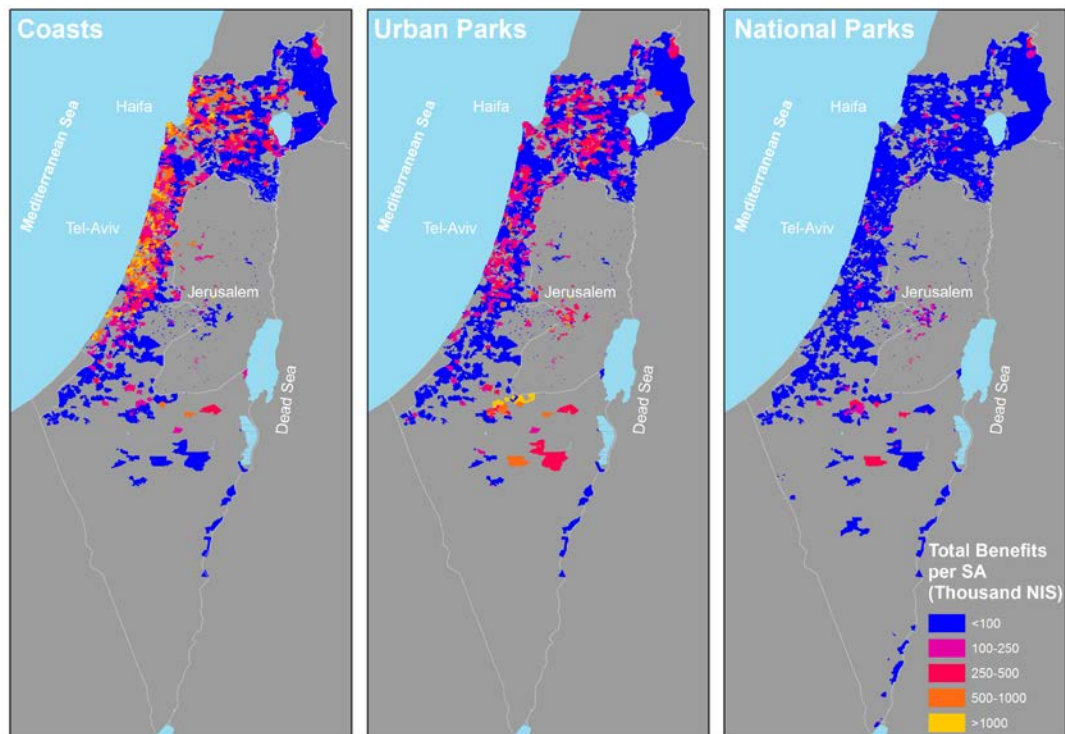
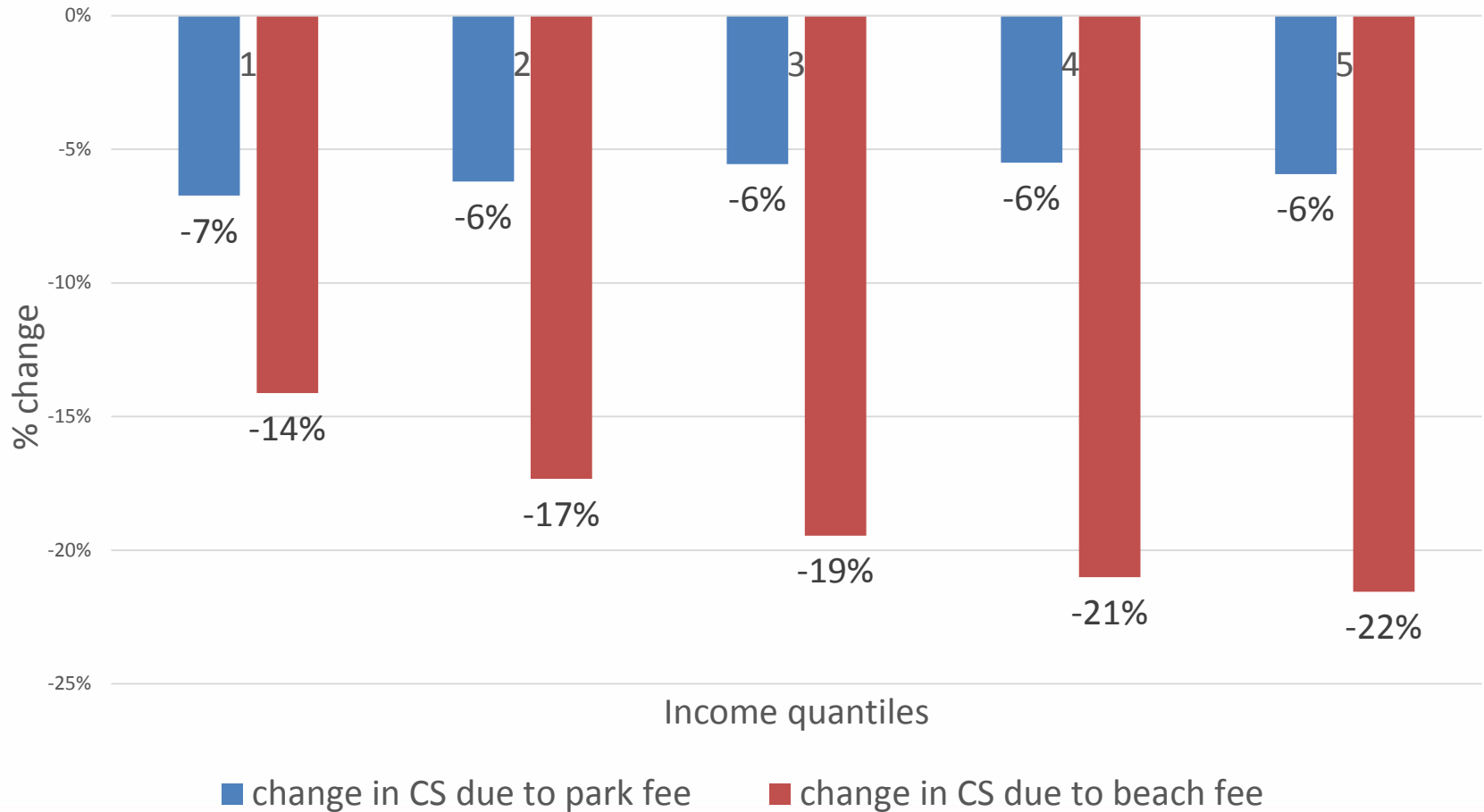# Annual average number of visits per household by statistical area
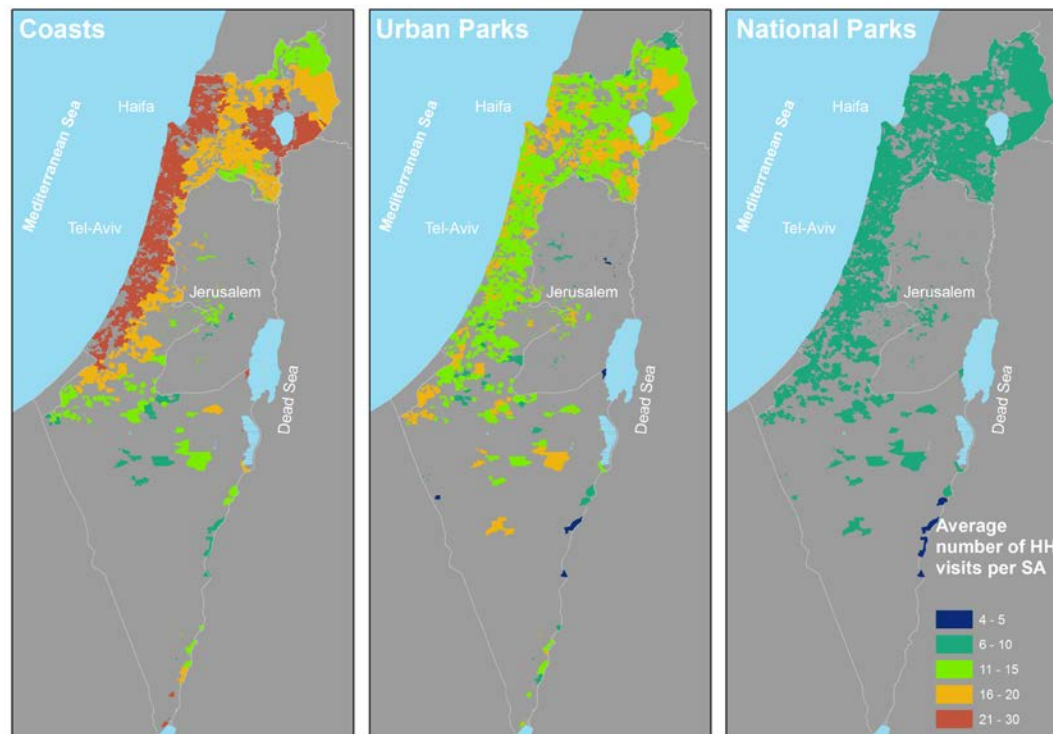
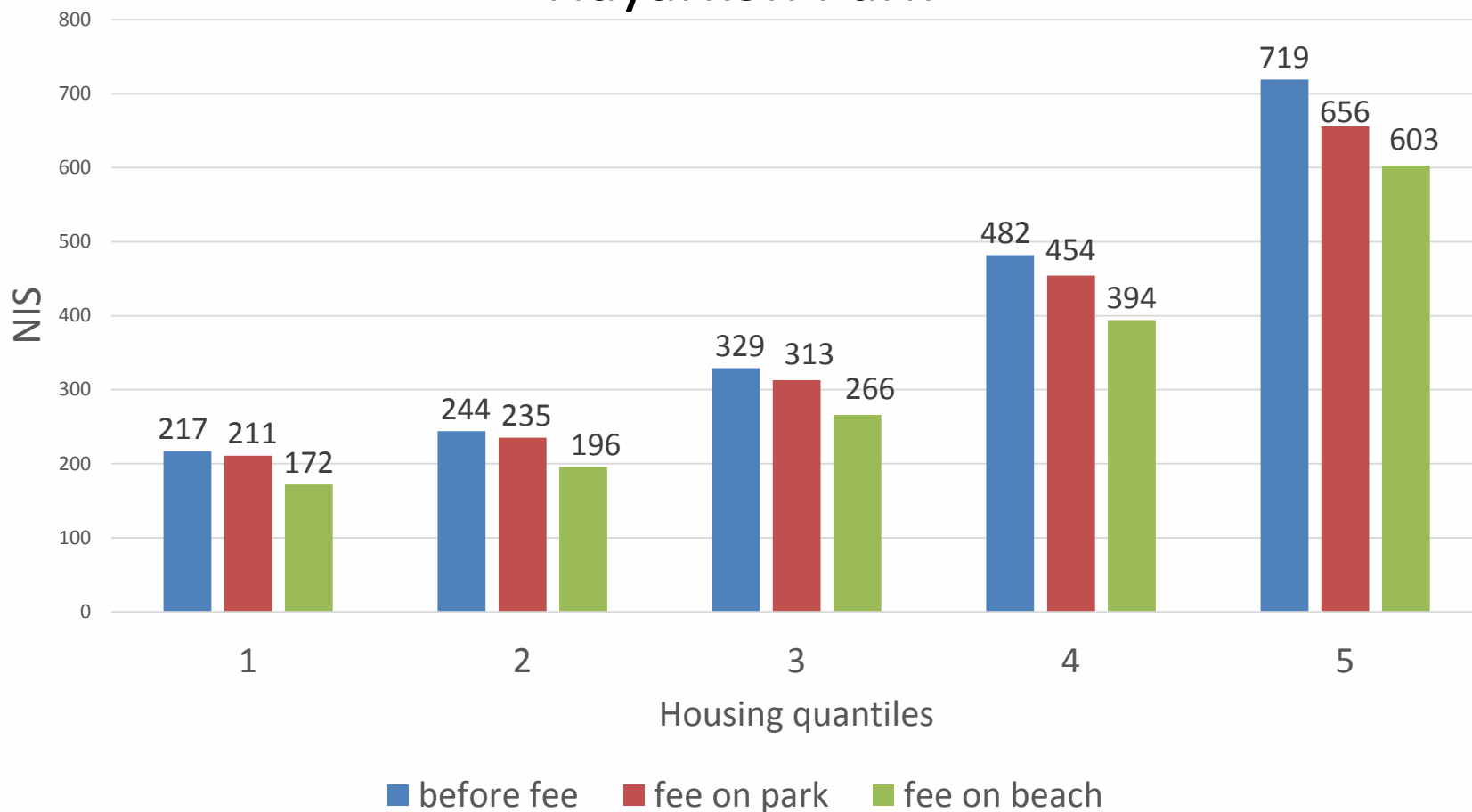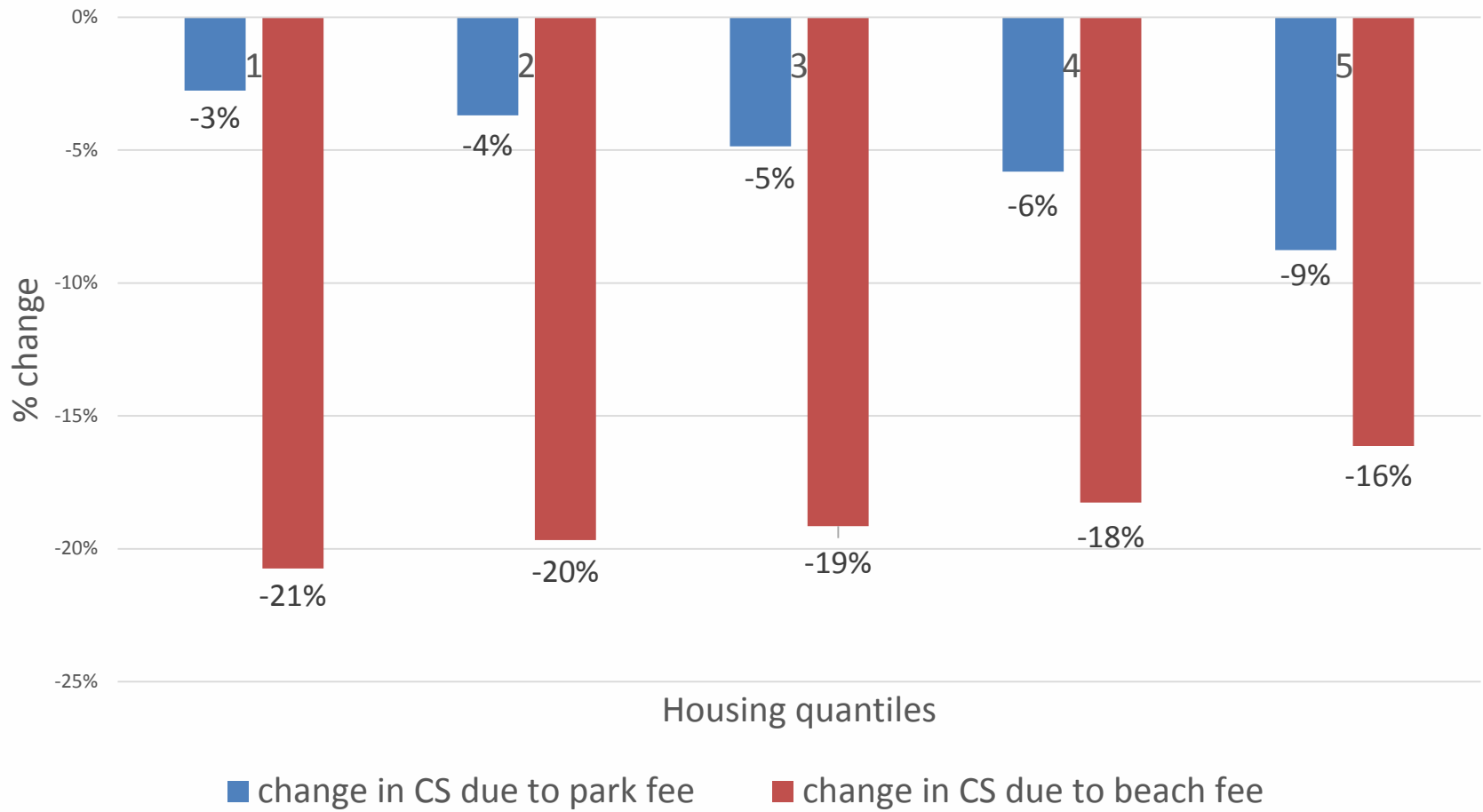# Distribution of ES benefits
(2015 NIS)

Simulation: Entrance fee $5.5 to Tel Aviv Beaches and Hayarkon Park

Simulation: Entrance fee $5.5 to Tel Aviv Beaches and Hayarkon Park

Simulation: Entrance fee $5.5 to Tel Aviv Beaches and Hayarkon Park

Simulation: Entrance fee $5.5 to Tel Aviv Beaches and Hayarkon Park

Concluding Remarks

1. Cultural services from ecosystems are not distributed equally across households

2. Wealthier households receive more ES

3. Although ES are free of charge they paid for in the housing market

4. Benefit loss from charging entrance fees varies between the type of ecosystem and the quantile typology

Fin